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OF

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ENCYLOPÆDIA BRITANNICA.

GOU—GOU

GOUDA, or TER GOU, a town of the Netherlands in the province of South Holland, at the confluence of the Gouw with the Yssel, 12 miles N.E. of Rotterdam, at the junction of the rail from that city with the line between the Hague and Utrecht. The town is for the most part laid out in an open lightsome manner, and like the other towns of Holland intersected by numerous canals. Portions of the old fortifications are changed into promenades, and the suburban quarters, Fluweelensingel, Bleekerssingel, Kattensingel, and Turfsingel, are adorned with fine trees. The Groote Markt is the largest market square in Holland. Among the churches—five of which are Protestant, two Roman Catholic, and one Old Catholic—the first place belongs to the church of St John (Janskerk), a building of the 16th century, which replaced an earlier structure of the 15th, and which is not only remarkable for its dimensions, 345 feet in length and 150 feet broad, but possesses a celebrated organ, and a series of splendid painted windows, several of which are the workmanship of Dirk and Wouter Krabeth (1555–1603). (Compare *Explanation of the Famous and Renowned Glass Work*, &c., Gouda, 1876, reprinted from an older volume, 1718.) Of the other public buildings it is sufficient to mention the town-house, with a fine Gothic façade, founded in 1449, but rebuilt in 1690, the weighouse, the house of correction for women, the gymnasium, St Catherine's hospital, and the music hall. A public library containing many rare and valuable works is kept in St John's church, and a municipal museum of antiquities was opened in 1874. In the time of the counts the wealth of Gouda was mainly derived from brewing and cloth weaving: about 1510, for example, the breweries numbered 56, and upwards of 1000 pieces of cloth were made in the course of the year; but at a later date the making of tobacco pipes became the staple trade, and in the middle of the 18th century gave employment to 3000 men. Though this industry has in turn declined, Gouda still possesses large pipe works and potteries; and among its other establishments are a celebrated manufactory of stearine candles, a yarn factory, an oil refinery, and cigar factories. It has also a good transit and shipping trade, and its market for cheese has made its name widely known throughout Europe. The population of the commune was, in 1796, 11,715; in 1830, 14.878; in 1850, 13,788; in 1860, 14,843; and in 1870, after a slight addition of area, 16,233. At the last date the town proper numbered 15,174 inhabitants. The greater proportion belong to the Dutch Reformed Church, but nearly 5000 are Roman Catholics. Gouda received its constitution as a town from Count Floris V. in 1272. In 1382 it had only 820 houses; but it rapidly increased, and in the 14th century it was the fifth in size of the towns of Holland. The rise of Amsterdam made it only the sixth; but it retained this position till the revolution of 1795. The principal facts in its history are the attack by the people of Utrecht in 1488; the repulse of the Spaniards in 1574; the destruction of the castle of the lords of Gouda in 1577; the voluntary flooding of the surrounding country as a defence against the French in 1672; the great inundation of November 1775; and the riots of 1787.

GOUDIMEL, CLAUDE, composer of the 16th century, must be named amongst the founders of modern music. The French and the Belgians claim him as their countryman, and the place of his birth is not sufficiently established. In all probability, however, he was born at Vaison near Avignon, about the year 1510. As to his early education we know little or nothing, but the excellent Latin in which some of his letters were written prove that, in addition to his musical knowledge, he also acquired a good classical training. In 1540 we find him established in Rome at the head of a music-school, and here, amongst many other celebrated musicians, Palestrina, the greatest master of the early Italian school, and one of the greatest masters of all schools, was amongst his pupils. About the middle of the century he seems to have left Rome for Paris, where, in conjunction with Jean Duchemin, he published, in 1555, a setting of Horace's *Odes*, entitled, *Horatii Flacci odæ omnes quotquot carminum generibus differunt ad rhythmos musicos redactæ*. Infinitely more important is another collection of vocal pieces, a setting of the celebrated French version of the Psalms by Marot and Beza (*Les Pseaumes de David, mis en rime Française par Clement Marot et Théodore de Bèze, mis en musique par Claude Goudimel*), published in 1565. It is written in four parts, the melody being assigned to the tenor. Some of the tunes were probably of popular origin, and they are still used by the French Protestant Church. Others were adopted by the German

Lutherans, a German imitation of the French versions of the Psalms in the same metre having been published at an early date. There is little doubt that, at the time of the last-named composition, Goudimel had embraced the new faith, although the French version of the Psalms was at first used by Catholics as well as Protestants. Some years later he fell a victim to religious fanaticism during the St Bartholomew massacre at Lyons (24th August 1572), his death, it is stated, being due to "les ennemis de la gloire de Dieu et quelques méchants envieux de l'honneur qu'il avait acquis." In addition to the collections already named, many of his works are preserved. Masses and motets belonging to his Roman period are found in the Vatican library, and in the archives of various churches in Rome, others were published. Thus the work entitled *Missæ tres a Claudio Goudimel præstantissimo* [illegible] *nunc primum in lucem editæ*, contains one mass by the learned editor himself, the other two being by Claudius Sermisy and Jean Maillard respectively. Another collection, *La fleur des chansons des deux plus excellents musiciens de notre temps*, consists of part songs by Goudimel and Orlando di Lasso. Burney gives a motet of Goudimel's, *Domine quid multiplicati sunt*, in his history.

GOUGH, HUGH GOUGH, VISCOUNT (1779–1869), British field-marshal, was of Irish origin, and was a descendant of Francis Gough, who was made bishop of Limerick in 1626. He was born at Woodstown, Limerick, November 3, 1779. After holding for a short time a commission in his father's regiment of militia, he was transferred to the line as ensign in August 1794, and was very soon after promoted lieutenant. In the following year he served with the 78th Highlanders at the Cape of Good Hope, taking part in the capture of Cape Town and of the Dutch fleet in Saldanha Bay. His next service was in the West Indies, where, with the 87th (Royal Irish Fusiliers), he shared in the attack on Porto Rico, the capture of Surinam, and the brigand war in St Lucia. In 1809 he was called to take part in the Peninsular War, and, joining the army under Wellington, commanded his regiment as major in the operations before Oporto, by which the town was taken from the French. At Talavera he was severely wounded, and had his horse shot under him. For his conduct on this occasion he was afterwards promoted lieutenant-colonel, his commission, on the recommendation of Wellington, being antedated from the day of the duke's despatch. He was thus, as pointed out in *Hart's Army List*, the first officer who ever received brevet rank for services performed in the field at the head of a regiment. He was next engaged at the battle of Barrosa, at which his regiment captured a French eagle. At the defence of Tarifa the post of danger was assigned to him, and he compelled the enemy to raise the siege. At Vittoria, where Gough again distinguished himself, his regiment captured the baton of Marshal Jourdan. He was again severely wounded at Nivelle, and was soon after created a knight of St Charles by the king of Spain. In recognition of his services the citizens of Dublin presented him with the freedom of the city and with a costly sword. At the close of the war he returned home [illegible] on the scene indispensable Gough was appointed commander-in-chief of the B orces in China. This post he held during all the o ns of the war; and by his great achievements and ns victories in the face of immense difficulties, he a h enabled the English plenipotentiary, Sir H. Potti o dictate peace on his own terms, and on terms of per uality with the emperor. After the conclusion of the of Nanking in August 1842 the British forces were drawn; and before the close of the year Gough wa ed a baronet, and was invested with the grand cross Bath. He also received the thanks of both Houses liament. Returning to India, he was appointed (A 1843) commander-in-chief of the British forces in I In December 1843 he took the command in perso nst the Mahrattas, and defeated them at Maharajpo turing more than fifty guns. He defeated them a at Punniar, and peace was then concluded at Gwal In 1845 occurred the rupture with the Sikhs, who ed the Sutlej in large numbers, and Sir Hugh Gou nducted the operations against them. In this camp he was well supported by Lord Hardinge, the gove general, who had been his comrade in the Peninsu nd now volunteered to serve under him. The Sikhs defeated in three great battles in rapid succession— oodkee, Ferozeshah, and Sobraon,—and submitted to ke peace soon after at Lahore. The services of Sir H Gough on these occasions were rewarded by a vote of ks from both Houses of Parliament, and by his eleva to the peerage of the United Kingdom as Baron Go (April 1846). The war broke out again in 1848, and in Lord Gough took the field. With unabated energ defeated the Sikhs at Ramnuggar, and at Chillianwa, and finally broke their power by his decisive victory Gujrat (February 1849). He was now succeeded as comm der-in-chief by Sir Charles Napier, and, returning to E nd, was raised to a viscountcy, and for the third time ceived the thanks of both Houses of Parliament. A pens of £2000 per annum was granted to him by parliament, an equal pension by the East India Company. He did t again see active service. In 1854 he was appointed onel of the Royal Horse Guards, and two years later h as sent to the Crimea to invest Marshal Pelissier and ot officers with the insignia of the Bath. Honours were ltiplied upon him during his latter years. He was ma a knight of St Patrick, being the first knight of the der who did not hold an Irish peerage, was sworn a p councillor, was named a knight grand commander of e Star of India, and in November 1862 was made fi marshal. He was twice married, and left children by th his wives. He died at his seat near Dublin, March 2 869.

GOUGH, RICHARD (1735–1809), an English antiquary, was the son of a wealthy East India director, and was born in London, October 1, 1735. He received his early education privately, and his literary talents developed with such precocity that, at the age of twelve and a half years, he had completed the translation of a history of the Bible from the French, which his mother printed for private circulation; at the age of fifteen he wrote a translation of Fleury's work on the customs of the Israelites, and at sixteen he had published an elaborate work entitled [illegible]. In 1752 he entered Benet College, Cambridge, where his taste for antiquarian research received a decided impulse, and where he commenced his work on British topography, which was published in 1768. After leaving college in 1756 he began a series of antiquarian excursions [illegible] Great Britain, the fruits of which [illegible] in English of Camden [illegible], but the work did not appear till 1789. Meantime he published, in 1786, the first volume of his splendid work, the *Sepulchral Monuments of Great Britain, applied to illustrate the history of families, manners, habits, and arts at the different periods from the Norman Conquest to the Seventeenth Century.* This volume, which contained the first four centuries, was followed in 1796 by a second volume containing the 15th century, and an introduction to the second volume appeared in 1799. Gough was chosen a fellow of the Society of Antiquaries of London in 1767, and from 1771 to 1791 he was its director. He was elected F.R.S. in 1775. He died at his residence at Enfield, 20th February 1809. His books and manuscripts relating to Anglo-Saxon and northern literature, all his collections in the department of British topography, and a large number of his drawings and engravings of other archæological remains, were bequeathed to the university of Oxford.

Among the many other works of Gough are *An Account of the Bedford Missal (a MS.)*; *A Catalogue of the Coins of Canute, King of Denmark*, 1777; *History of Pleshy in Essex*, 1803; *An Account of the Coins of the Seleucidæ, Kings of Syria*, 1803; and *History of the Society of Antiquaries of London*, prefixed to their *Archæologia*. He also published several new editions of antiquarian works by other authors.

GOUJET, Claude Pierre (1697–1767), a French abbé and litterateur, was born at Paris, 19th October 1697. He studied at the college of the Jesuits, and at the Collége Mazarin, but he nevertheless became a strong Jansenist. In 1705 he assumed the ecclesiastical habit, in 1719 entered the order of Oratorians, and soon afterwards was named canon of St Jacques l'Hôpital. On account of his extreme Jansenist opinions he suffered considerable persecution from the Jesuits, and several of his works were suppressed at their instigation. In his latter years his health began to fail, and he lost his eyesight. As he received little remuneration for his writings, he came also to be in circumstances of great poverty, and was compelled to sell his library, a sacrifice which hastened his death, which took place at Paris, 1st February 1767.

He is the author of a large number of works, of which the principal are:—*Supplément au Dictionnaire de Moréri*, Paris, 1735, and a *Nouveau Supplément* to a subsequent edition of the work; *Bibliothèque française, ou Histoire littéraire de la France*, 18 vols., Paris, 1740–1759; *Vies des Saints*, 7 vols., 1730; *Mémoires historiques et littéraires sur le Collège royal de France*, 3 vols., Paris, 1758; *Histoire des Inquisitions*, Paris, 1752; and an edition of the *Dictionnaire*, of which he has also given an abridgment. See *Mémoires hist. et litt. de l'Abbé Goujet*, 1767.

GOUJON, Jean, was the most distinguished sculptor produced by France during the 16th century. Although some evidence has been offered in favour of the date 1520 (*Archives de l'Art français*, vol. iii. p. 350), the time and place of his birth are still uncertain. The first mention of his name occurs in the accounts of the church of St Maclou at Rouen in the year 1540, and in the following year he was employed at the cathedral of the same town, where he added to the tomb of Cardinal d'Amboise a statue of his nephew Georges, afterwards removed. The tomb of Louis de Brezé, executed some time after 1545, has also been attributed to Goujon, but there is no evidence in point, nor even any tradition, of the fact. On leaving Rouen, Goujon was employed by Pierre Lescot, the celebrated architect of the Louvre, on the restorations of St Germain l'Auxerrois; the building accounts—some of which for the years 1542–44 were discovered by M. de Laborde on a piece of parchment binding—specify as his work, not only the carvings of the pulpit (Louvre), but also a Notre Dame de Piété, now lost. In 1547 appeared Martin's French translation of Vitruvius, the illustrations of which were due, the translator tells us in his "Dedication to the King" to Goujon, "naguères architecte de Monseigneur le Connetable, et maintenant un des vôtres." We learn from this statement, not only that Goujon had been taken into the royal service on the accession of Henry II., but also that he had been previously employed under Bullant on the chateau of Ecouen. At the Louvre, Goujon, under the direction of Lescot, executed the carvings of the south-west angle of the court, the reliefs of the Escalier Henri II., and the Tribune des Cariatides. About a year before the execution of the Caryatides, for which Goujon received 737 livres on September 5, 1550, he produced, according to unbroken tradition, the reliefs of the Fontaine des Innocents (Louvre, and *in situ*); after which he is supposed to have been occupied in work destined for the decoration of the chateau of Anet, then building for Diana of Poitiers. Unfortunately the building accounts of Anet have disappeared, but tradition not only ascribes to Goujon the *chef d'œuvre* of French sculpture, the Diane Chasseresse now in the Louvre, but asserts that he also executed a vast number of other works of equal importance, destroyed or lost since 1792. In 1555 his name appears again in the Louvre accounts, and continues to do so every succeeding year up to 1561, when all trace of him is lost. In the course of this year an attempt was made to turn out of the royal employment all those who were suspected of Huguenot tendencies. Goujon has always been claimed as a Reformer; it is consequently possible that he was one of the victims of this attack. We should therefore probably ascribe the work attributed to him in the Hôtel Carnavalet (*in situ*), together with much else executed in various parts of Paris—but now dispersed or destroyed—to a period intervening between the date of his dismissal from the Louvre and his death (of which there is no evidence), which is said to have taken place during the St Bartholomew massacre in 1572. Goujon's work is remarkable—as may be observed in the sculpture of the Louvre—for its perfect harmony with the architectural lines which it was intended to enrich or accompany, and is distinguished in a supreme degree by that elegance which was the leading characteristic of the school of which he was the chief representative. His treatment of the nude (Diane Chasseresse), both in style of line and choice of forms, attains a degree of accomplished perfection which, in its complete fulfilment of the proposed—though very different—ideal, comes nearer to the character of tranquil achievement, which marks all classic art, than any other work of modern times.

Engravings after Goujon will be found in Cicognara's *Storia della Scultura*, and in M. de Clarac's *Musée du Louvre*. M. Berty has given a brief notice of his life and works in *Grands architectes français de la Renaissance*; and a fuller account will be found in Mrs Pattison's *Renaissance of Art in France*.

GOULD, Augustus Addison (1805–1866), American conchologist, was born at New Ipswich, New Hampshire, April 23, 1805, graduated at Harvard College in 1825, and took his degree of doctor of medicine in 1830. Thrown from boyhood on his own exertions, it was only by industry, perseverance, and self-denial that he obtained the means to pursue his earlier and later studies. Establishing himself in Boston, he devoted himself to the practice of medicine, and finally rose to high professional rank and social position. He became president of the Massachusetts Medical Society, and was employed as authority in editing the vital statistics of the state. As a conchologist his reputation is world-wide. With Say, Conrad, Adams, Anthony, Lea, Binney, and others, he was a pioneer of the science in America. His writings fill many pages of the publications of the Boston Society of Natural History (see vol. xi. p. 197 for a list) and other periodicals. He published with Agassiz the *Principles of Zoology*; he edited the *Terrestrial Air-breathing Mollusks* of Binney; he translated Lamarck's *Genera of Shells*. The two most important monuments to his scientific work, however, are *The Mollusks and Shells* of the United States exploring expedition under Commodore Wilkes, published by the Government, and the *Report on the Invertebrata* published by order of the legislature of Massachusetts in 1841. A second edition of the latter work was authorized in 1865, and published in 1870 after the author's death, which took place at Boston, September 18, 1866. Gould was an active member of the Boston Society of Natural History, and a corresponding member of all the prominent American scientific societies, and many of those of Europe, including the English Royal Society.

GOUR. See GAUR.

GOURD, a name given to various plants of the order *Cucurbitaceæ*, but more strictly applied to those belonging to the genus *Cucurbita*, numerous trailing herbs of annual duration, with long succulent stems furnished with tendrils, and large, rough, palmately-lobed leaves; the flowers, reticulated with veins, are generally large and of a bright yellow or orange colour, the barren ones with the stamens united; the fertile are followed by the large, succulent fruit that gives the gourds their chief economic value. Many varieties of *Cucurbita* are under cultivation in tropical and temperate climates, especially in southern Asia; but it is extremely difficult to refer them to definite specific groups, on account of the facility with which they hybridize; while it is very doubtful whether any of the original forms now exist in the wild state. M. Naudin, who made a careful and interesting series of observations upon this genus, came to the conclusion that all varieties known in European gardens might be referred to six original species; probably three, or at most four, have furnished the edible kinds in ordinary cultivation; and, as all these appear occasionally to hybridize, their limits must be regarded as very uncertain. Adopting the specific names usually given to the more familiar forms, the most important of the gourds, from an economic point of view, is perhaps *C. maxima*, the *Potiron Jaune* of the French, the red and yellow gourd of British gardeners, the spheroidal fruit of which is remarkable for its enormous size: the colour of the somewhat rough rind varies from white to bright yellow, while in some kinds it remains green; the fleshy interior is of a deep yellow or orange tint. This valuable gourd is grown extensively in southern Asia and Europe. In Turkey and Asia Minor it yields, at some periods of the year, an important article of diet to the people; immense quantities are sold in the markets of Constantinople, where in the winter the heaps of one variety with a white rind are described by Walsh as resembling mounds of snowballs. The yellow kind attains occasionally a weight of upwards of 240 lb. It grows well in central Europe and the United States, while in the south of England it will produce its gigantic fruit in perfection in hot summers. The yellow flesh of this gourd and its numerous varieties yields a considerable amount of nutriment, and is the more valuable as the fruit can be kept, even in warm climates, for a long time. In France and in the East it is much used in soups and ragouts, while simply boiled it forms a substitute for other table vegetables; the taste has been compared to that of a young carrot. In some countries the larger kinds are employed as cattle food. The seeds yield by expression a large quantity of a bland oil, which is used for the same purposes as that of the poppy and olive. The "mammoth" gourds of English and American gardeners appear to belong to this species, or to hybrids between it and another valuable member of the group, the pumpkin, *C. Pepo*, well known in English cottage gardens, and largely cultivated in continental Europe and North America. The pumpkin varies much in form, being sometimes nearly globular, but more generally oblong or ovoid in shape; the rind is smooth, and very variable in colour. This gourd is a useful plant to the American backwoods farmer, yielding, both in the ripe and unripe condition, a valuable fodder for his cattle and pigs, being frequently planted at intervals among the maize that constitutes his chief crop. The larger kinds acquire a weight of from 40 to 80 lb, but smaller varieties are in more esteem for garden culture. When ripe, the pumpkin is boiled or baked, or made into various kinds of pie, alone or mixed with other fruit; while small and green, it may be eaten like the vegetable marrow. Some of the varieties of *C. maxima* and *Pepo* contain a considerable quantity of sugar, amounting in the sweetest kinds to 4 or 5 per cent., and in the hot plains of Hungary efforts have been made to make use of them as a commercial source of sugar. The young shoots of both these large gourds may be given to cattle, and admit of being eaten as a green vegetable when boiled. The vegetable marrow, *C. ovifera*, regarded by Naudin as a variety of *C. Pepo*, is much esteemed in England for the delicate flavour of its fruit, which is eaten boiled, in the immature state, as a pleasant summer vegetable. A large number of varieties are in cultivation,—the larger oblong or pear-shaped kinds growing a foot or more in length, while some are comparatively small. This useful esculent will succeed in any warm and open situation, if planted over a small trench filled with manure; it is often trained over the fences of cottage gardens, and may be sometimes seen flourishing on the sunny side of railway cuttings in the south of England. *C. Melopepo*, is the squash or bush gourd, a favourite vegetable in the United States and in parts of continental Europe, but less cultivated in Britain than the preceding. It has a somewhat different habit from most of the family, having more rigid shoots and a tendency towards a shrubby mode of growth; the fruit, yellowish when ripe, is smaller than the pumpkin, and of various shapes, usually with many angles or projections; some sorts resemble a turban, others many-cornered hats, whence fanciful names have been applied to them. The number of kinds is considerable, especially in the United States, where the squashes are much cultivated; the larger kinds are grown as food for pigs and cattle, besides being valued as table esculents; for cooking they should be used in the unripe condition. Many smaller gourds are cultivated in India and other hot climates, and some have been introduced into English gardens, rather for the beauty of their fruit and foliage than for their esculent qualities. Among these is *C. Aurantia*, the orange gourd, bearing a spheroidal fruit, like a large orange in form and colour; in Britain it is generally too bitter to be palatable, though applied to culinary purposes in Turkey and the Levant. *C. pyriformis*, *C. verrucosa*, and *C. moschata* are likewise occasionally eaten, especially in the immature state; and several other gourds are used as esculents in India and the neighbouring countries.

The bottle-gourds are now generally placed in a separate genus, *Lagenaria*, chiefly differing from *Cucurbita* in the anthers being free instead of adherent. The bottle-gourd properly so called, *L. vulgaris*, is a climbing plant with downy, heart-shaped leaves and beautiful white flowers: the remarkable fruit first begins to grow in the form of an elongated cylinder, but gradually widens towards the extremity, until, when ripe, it resembles a flask with a narrow neck and large rounded bulb; it sometimes attains a length of 7 feet. When ripe, the pulp is removed from the neck, and the interior cleared by leaving water standing in it; the woody rind that remains is used as a bottle: or the lower part is cut off and cleared out, forming a basin-like vessel applied to the same domestic purposes as the calabash (*Crescentia*) of the West Indies; the smaller varieties, divided lengthwise, form spoons. The ripe fruit is apt to be bitter and cathartic, but while immature it is eaten by the Arabs and Turks. When about the "size of a small cucumber," Lane says, it is stuffed with rice and minced meat, flavoured with pepper, onions, &c., and then boiled, forming a favourite dish with Eastern epicures. The elongated snake-gourds of India and China (*Trichosanthes*) are said to be used in curries and stews.

All the gourds have a tendency to secrete the cathartic principle *colocynthin*, and in many varieties of *Cucurbita* and the allied genera it is often elaborated to such an extent as to render them unwholesome, or even poisonous. The seeds of some species possess rather strong anthelmintic properties; those of the common pumpkin are frequently administered in America as a vermifuge. The cultivation of gourds commenced far beyond the dawn of history, and the esculent species have become so modified by culture that the original plants from which they have descended can no longer be traced. The abundance of varieties in India would seem to indicate that part of Asia as the birthplace of the present edible forms; but some appear to have been cultivated in all the hotter regions of that continent, and in North Africa, from the earliest ages, while the Romans were familiar with at least certain kinds of *Cucurbita*, and with the bottle gourd. It is even doubtful whether the culture of gourds had not spread to the American continent before its discovery by Europeans; for the Indian tribes of the interior were certainly in possession of some kinds at a date so early that it is difficult to believe they had received them from the settlers. Dr Asa Gray has even suggested that some of these esculent forms may possibly have been indigenous to the American plains.

Most of the annual gourds may be grown successfully in Britain. They are usually raised in hotbeds or under frames, and planted out in rich soil in the early summer as soon as the nights become warm. The more ornamental kinds may be trained over trellis-work, a favourite mode of displaying them in the East; but the situation must be sheltered and sunny. Even the *Lagenariæ* will sometimes produce fine fruit when so treated in the southern counties. (C. P. J.)

GOURGAUD, GASPARD, BARON (1783–1852), a French general of artillery, was born at Versailles, 14th September 1783. After studying at the polytechnic school and at the artillery school of Châlons, he joined the artillery in 1802, and, having acquitted himself with distinction in several campaigns, he received in 1807 the cross of honour and the grade of captain. He served in the subsequent Spanish and Austrian campaigns, and in 1811 he was sent to report on the strength of the fortifications of Dantzic, a mission which he fulfilled so much to the satisfaction of Napoleon that he was named one of the emperor's ordnance officers. During the Russian campaign he was the first to enter the Kremlin at Moscow, where he removed the match from a large quantity of powder the explosion of which would in all probability have destroyed the emperor's life. For this service he received the title of baron. He accompanied the emperor in his subsequent campaigns, and in 1814, at the battle of Brienne, was again successful in delivering him from imminent peril. After the accession of Louis XVIII. he was named chief of the staff of the first artillery division, but on the return of Napoleon from Elba he was nevertheless named by him adjutant and general, and took part in the battle of Waterloo. Being one of the three French officers chosen by Napoleon to accompany him to St Helena, he was employed there in collecting materials for a history of Napoleon's campaigns, but on account of some misunderstanding with Montholon, he left the island, and went to England. He published in 1818 *La Campagne de* 1815, and he also endeavoured to interest the emperors of Russia and Austria in Napoleon's behalf. Shortly afterwards he was expelled from England as a spy of Napoleon's. Returning to France in 1821, he published, along with Montholon, in 1823, *Mémoires de Napoléon à Sainte-Hélène*. His reply in 1825 to Ségur's *Histoire de la Grande Armée* was the occasion of a duel between the two authors: and he also, in 1827, became involved in a controversy with Sir Walter Scott regarding some statements made by the latter in his life of Napoleon. After the July revolution of 1830, Gourgaud was appointed to the command of the artillery of Paris and Vincennes; in 1832 he was named aide-de-camp of the king, and in 1835 lieutenant-general. In 1840 he was one of the commissioners sent to bring the remains of Napoleon to France. On the occurrence of the revolution of February 1848 his name was struck off the list of generals, but after the events of the following June he was chosen colonel of the first legion of the national guard of Paris. In 1849 he was elected representative of the legislative assembly for the department of Deux-Sèvres. He died 25th July 1852.

GOUT, a specific constitutional disorder connected with excess of uric acid in the blood, and manifesting itself by inflammation of joints, with deposition therein of urate of soda, and also by morbid changes in various important organs.

The term gout, which was first used about the end of the 13th century, is derived through the French *goutte* from the Latin *gutta*, a drop, in allusion to the old pathological doctrine (which in the present case seems to be essentially the correct one) of the dropping of a morbid material from the blood within the joints. The disease was known and described by the ancient Greek physicians under various terms, which, however, appear to have been applied by them alike to rheumatism and gout. The general term *arthritis* (ἄρθρον, a joint) was employed when many joints were the seat of inflammation; while in those instances where the disease was limited to one part the terms used bore reference to such locality; hence *podagra* (ποδάγρα, from πούς, the foot, and ἄγρα, a seizure), *chiragra* (χείρ, the hand), *gonagra* (γόνυ, the knee), &c.

Hippocrates in his *Aphorisms* speaks of gout as occurring most commonly in spring and autumn, and mentions the fact that women are less liable to it than men. He also gives directions as to treatment. Celsus gives a similar account of the disease. Galen regarded gout as an unnatural accumulation of humours in a part, and the chalkstones as the concretions of these, and he attributed the disease to over-indulgence and luxury. Gout is alluded to in the works of Ovid and Pliny, and Seneca in his 95th epistle mentions the prevalence of gout among the Roman ladies of his day as one of the results of their high-living and debauchery. Lucian in his *Tragopodagra* gives an amusing account of the remedies employed for the cure of gout.

In all times this disease has engaged a large share of the attention of physicians, from its wide prevalence, and from the amount of suffering which it entails. Sydenham, the famous English physician of the 17th century, wrote an important treatise on the subject, and his description of the gouty paroxysm, all the more vivid from his having himself been afflicted with the disease for thirty-four years, is still quoted by writers as the most graphic and exhaustive account of the symptomatology of gout. Subsequently Cullen, recognizing gout as capable of manifesting itself in various ways, divided the disease into *regular gout*, which affects the joints only, and *irregular gout*, where the gouty disposition exhibits itself in other forms; and the latter variety he subdivided into *atonic gout*, where the most prominent symptoms are throughout referable to the stomach and alimentary canal; *retrocedent gout*, where the inflammatory attack suddenly disappears from an affected joint and serious disturbance takes place in some internal organ, generally the stomach or heart; and *misplaced gout*, where from the first the disease does not appear externally, but reveals itself by an inflammatory attack of some internal part. Dr Garrod, one of the most eminent living authorities on gout, adopts a division somewhat similar to though simpler than that of Cullen, namely, *regular gout*, which affects the joints alone, and is either acute or chronic, and *irregular gout*, affecting non-articular tissues, or disturbing the functions of various organs.

It is often stated that the attack of gout comes on without any previous warning; but, while this is true in many instances, the reverse is probably as frequently the case, and the premonitory symptoms, especially in those who have previously suffered from the disease, may be sufficiently precise to indicate the impending seizure. Among the more common of these may be mentioned marked disorders of the digestive organs, with a feeble and capricious appetite, flatulence and pain after eating, and uneasiness in the right side in the region of the liver. A remarkable tendency to grinding of the teeth is sometimes observed. This symptom was first noticed by Dr Graves, who connected it with irritation in the urinary organs, which also is present as one of the premonitory indications of the gouty attack. Various forms of nervous disturbance also present themselves in the form of general discomfort, extreme irritability of temper, and various perverted sensations, such as that of numbness and coldness in the limbs. These symptoms may persist for many days and then undergo amelioration immediately before the impending paroxysm. On the night of the attack the patient retires to rest apparently well, but about two or three o'clock in the morning is awoke with a painful feeling in the foot, most commonly in the ball of the great toe, but it may be in the instep or heel, or in the thumb. With the pain there often occurs a distinct shivering followed by feverishness. The pain soon becomes of the most agonizing character: in the words of Sydenham, "now it is a violent stretching and tearing of the ligaments, now it is a gnawing pain, and now a pressure and tightening; so exquisite and lively meanwhile is the part affected that it cannot bear the weight of the bedclothes, nor the jar of a person walking in the room."

When the affected part is examined it is found to be swollen and of a deep red hue. The superjacent skin is tense and glistening, and the surrounding veins are more or less distended. After a few hours there is a remission of the pain, slight perspiration takes place, and the patient may fall asleep. The pain may continue moderate during the day but returns as night advances, and the patient goes through a similar experience of suffering to that of the previous night, followed with a like abatement towards morning. These nocturnal exacerbations occur with greater or less severity during the continuance of the attack, which generally lasts for a week or ten days. As the symptoms decline the swelling and tenderness of the affected joint abate, but the skin over it pits on pressure for a time, and with this there is often associated slight desquamation of the cuticle. During the attacks there is much constitutional disturbance. The patient is restless and extremely irritable, and suffers from cramps in the limbs and from dyspepsia, thirst, and constipation. The urine is scanty and high-coloured, with a copious deposit consisting chiefly of urates. During the continuance of the symptoms the inflammation may leave the one foot and affect the other, or both may suffer at the same time. After the attack is over the patient feels quite well and frequently is better than he had been for a long time before, hence the once popular notion that a fit of the gout was capable of preventing other ailments. Any such idea, however, is really refuted by the experience of severe sufferers from this disease. It is rare that the first is the only attack of gout, and another is apt to occur within a year, [illegible] The disease, however, eventually tends to take a firmer hold on the constitution and to remain. In the earlier recurrences the same joints as were formerly the seat of the gouty inflammation suffer again, but in course of time others become implicated, until in advanced cases scarcely any articulation escapes, and the disease thus becomes chronic. It is to be noticed that when gout assumes this form the frequently recurring attacks are usually attended with less pain than the earlier ones, but their disastrous effects are evidenced alike by the disturbance of various important organs, especially the stomach, liver, kidneys, and heart, and by the remarkable changes which take place in the joints from the formation of the so-called chalk-stones or tophi. These deposits, which are highly characteristic of gout, appear at first to take place in the form of a semifluid material, consisting for the most part of urate of soda, which gradually becomes more dense, and ultimately quite hard. When any quantity of this is deposited in the structures of a joint the effect is to produce stiffening, and, as deposits appear to take place to a greater or less amount in connexion with every attack, permanent thickening and deformity of the parts is apt to be the consequence. The extent of this depends of course on the amount of the deposits, which, however, would seem to be in no necessary relation to the severity of the attack, being in some cases even of chronic gout so slight as to be barely appreciable externally, but on the other hand occasionally causing great enlargement of the joints, and fixing them in a flexed or extended position which renders them entirely useless. Dr Garrod describes the appearance of a hand in an extreme case of this kind, and likens its shape to a bundle of French carrots with their heads forward, the nails corresponding to the stalks. Any of the joints may be thus affected, but most commonly those of the hands and feet. The deposits take place in other structures besides those of joints, such as along the course of tendons, underneath the skin and periosteum, in the sclerotic coat of the eye, and especially on the cartilages of the external ear. When largely deposited in joints an abscess sometimes forms, the skin gives way, and the concretion is exposed. Sir Thomas Watson quotes a case of this kind where the patient when playing at cards was accustomed to chalk the score of the game upon the table with his gouty knuckles.

The recognition of what is termed irregular gout is less easy than that form above described, where the disease gives abundant external evidence of its presence; but that other parts than joints suffer from gouty attacks is beyond question. The diagnosis may often be made in cases where in an attack of ordinary gout the disease suddenly leaves the affected joints and some new series of symptoms arises. It has been often observed when cold has been applied to an inflamed part that the pain and inflammation in the part ceased, but that some sudden and alarming seizure referable to the stomach, brain, heart, or lungs supervened. Such attacks, which correspond to what is termed by Cullen retrocedent gout, often terminate favourably, more especially if the disease again returns to the joints. Further, the gouty nature of some bronchial, intestinal, or cutaneous disorder may be rendered apparent by its disappearance on the outbreak of the paroxysm in the joints. Gout, when of long standing, is often found associated with degenerative changes in the heart and large arteries, the liver, and especially the kidneys, which are apt to assume the contracted granular condition already alluded to as one of the forms of Bright's disease (see Bright's Disease). A variety of [illegible] in the kidneys [illegible] in connexion with gout; hence the well-known association of this disease with gravel.

As regards the pathology of gout, all inquiry appears to connect it closely with an abnormal state of the blood, more particularly with the presence in that fluid in excessive amount of uric acid, and its subsequent deposition in the joints in the form of urate of soda. Uric acid is formed in the system in the processes of nutrition, and is excreted by the kidneys, the amount passing off by the urine being estimated at about 8 grains daily. In the healthy human subject the blood contains the merest trace of this acid, but in gout it may be detected in abundance in the blood-serum both prior to and during the acute attack, while in chronic gout it becomes a constant constituent of the blood and of other fluids of the body, both natural and morbid. According to Dr Garrod it is not merely the presence of the uric acid in the blood but its deposition in the inflamed part that gives rise to the attack of gout, the inflammation being the effect and not the cause of the deposit. The gouty paroxysm thus induced appears to rid the system to a certain extent of the accumulated uric acid, although such relief is generally of but temporary duration.

Whether the accumulation of urates in the blood be due, as some affirm, to their excessive formation in the system as the result of functional derangement of the liver, or, as others hold, depends simply on the defective excreting power of the kidneys of the daily amount, is disputed, although it has been often observed during an attack of gout that the amount of uric acid excreted was markedly deficient. The likelihood is that both these conditions concur, and that while the kidneys retain their functional integrity even an excessive amount of uric acid in the system may be got rid of, but that these organs, becoming themselves affected by the deposition of urates in their tubular structure, lose to a large extent their excreting power, and thus the blood is overcharged with the product which the kidneys can no longer entirely remove. Another view of the pathology of gout recently advanced regards the disease as resulting from special degenerative changes in the fibrous textures of the body, one of the effects of which is the deposition of urates in the affected parts whence they pass into the blood. This theory has not, however, as yet been extensively supported, and the weight of opinion remains on the whole in favour of the views of Dr Garrod. It must nevertheless be admitted that many points in the pathology of this disease still remain unexplained, for, as remarked by Trousseau, "the production in excess of uric acid and urates is a pathological phenomenon inherent like all others in the disease; and like all the others it is dominated by a specific cause, which we know only by its effects, and which we term the gouty diathesis." This subject of diathesis (habit, or organic predisposition of individuals), which is universally admitted as an essential element in the pathology of gout, naturally suggests the question as to whether, besides being inherited, such a peculiarity may also be acquired, and this leads to a consideration of the causes which are recognized as influential in favouring the occurrence of this disease.

It is beyond dispute that gout is in a marked degree hereditary, fully more than half the number of cases being, according to Sir C. Scudamore and Dr Garrod, of this character. But it is no less certain that there are habits and modes of life the observance of which may induce the disease even where no hereditary tendencies can be traced, and the avoidance of which may on the other hand go far towards weakening or neutralizing the influence of inherited liability. Gout is said to affect the sedentary more readily than the active, but this cannot be taken as a very constant rule. If, however, inadequate exercise be combined with a luxurious manner of living, with habitual over-indulgence in animal food and rich dishes, and especially in alcoholic beverages, then undoubtedly the chief factors in the production of the disease are present.

Much has been written upon the relative influence of various forms of alcoholic drinks in promoting the development of gout. It is generally stated that fermented are more injurious than distilled liquors, and that, in particular, the stronger wines, such as port, sherry, and madeira, are much more potent in their gout producing action than the lighter class of wines, such as hock, moselle, &c., while malt liquors are fully as hurtful as strong wines. If this alleged difference in their tendency to induce gout be correct, it cannot be said that any satisfactory explanation of it has been furnished; but indeed the point has not been clearly proved, and it may be fairly questioned whether, other things being equal, an individual in abandoning the use of wines and substituting that of spirits would improve his position in relation to this disease. It seems quite as probable that over-indulgence in any form of alcohol, when associated with the other conditions already adverted to, will have very much the same effect in developing gout. Even those who affirm the mischievous effects of fermented liquors in this way are obliged to admit that they are injurious in proportion to the amount of alcohol they contain. The comparative absence of gout in countries where spirituous liquors are chiefly used, such as Scotland, is cited as showing their relatively slight effect in encouraging that disease; but it is to be noticed that in such countries there is on the whole a less marked tendency to excess in the other pleasures of the table, which in no degree less than alcohol are chargeable with inducing the gouty habit. Gout is not a common disease among the poor and labouring classes, and when it does occur may often be connected even in them with errors in living. It is not very rare to meet gout in butlers, coachmen, &c., who are apt to live luxuriously while leading comparatively easy lives.

Gout, it must ever be borne in mind, may also affect persons who observe the strictest temperance in living, and whose only excesses are in the direction of over-work, either physical or intellectual. Many of the great names in history in all times have had their existence embittered by this malady, and have died from its effects. The influence of hereditary tendency may often be traced in such instances, and is doubtless called into activity by the depressing consequences of over-work. It may, notwithstanding, be affirmed as generally true that those who lead regular lives and are moderate in the use of animal food and alcoholic drinks, or still better abstain from the latter altogether, are little likely to be the victims of gout even where an undoubted inherited tendency exists.

Gout is more common in mature age than in the earlier years of life, the greatest number of cases in one decennial period being between the ages of thirty and forty, next between twenty and thirty, and thirdly between forty and fifty. It may occasionally affect very young persons, but such cases are generally in a marked degree hereditary. After middle life gout rarely appears for the first time. Women are much less the subjects of gout than men, apparently from their less exposure to the influences (excepting of course that of heredity) which tend to develop the disease, and doubtless also from the differing circumstances of their physical constitution. It most frequently appears in females after the cessation of the menses. Persons exposed to the influence of lead poisoning, such as plumbers, painters, &c., are apt to suffer from gout; and it would seem that impregnation of the system with this metal markedly interferes with the uric-acid-excreting function of the kidneys.

Attacks of gout are readily excited in those predisposed to the disease. Exposure to cold, disorders of digestion, fatigue, and irritation or injuries of particular joints will often precipitate the gouty paroxysm.

With respect to the treatment of gout the greatest variety of opinion has prevailed and practice been pursued, from the numerous quaint nostrums detailed by Lucian to the "expectant" or do-nothing system recommended by Sydenham and gravely advocated by a few among eminent modern physicians, who regard the disease as beyond the reach of remedies. But that gout, although, as has been shown, a malady of a most severe and intractable character, may nevertheless be successfully dealt with by appropriate medicinal and hygienic measures is a belief largely entertained, and one which happily guides the practice of the physician. The general plan of treatment can be here only briefly indicated. During the acute attack the affected part should be kept at perfect rest, and have applied to it warm opiate fomentations or poultices, or, what answers fully better, be enveloped in cotton wool covered in with oil silk. The diet of the patient should be light, without animal food or stimulants. The administration of some simple laxative will be of service, as well as the free use of alkaline diuretics, such as the bicarbonate or acetate of potash. The medicinal agent most to be relied on in the treatment of gout is colchicum, which manifestly exercises a powerful action on the disease. This drug (*Colchicum autumnale*), which is believed to correspond to the hermodactyl of the ancients, was introduced as a remedy for gout about a century ago, and has proved of such efficacy in modifying the attacks that, as observed by Dr Garrod, "we may safely assert that colchicum possesses as specific a control over the gouty inflammation as cinchona barks or their alkaloids over intermittent fever." The mode of action of colchicum in gout is by no means determined, since it would appear to have no certain effect upon the uric acid excreted from the system; and the general opinion seems to be that the drug has a special sedative effect on the gouty inflammation. It is usually administered in the form of the wine in doses of 10-30 drops every four or six hours, or in pill as the acetous extract (gr. ½–gr. i.). The effect of colchicum in subduing the pain of gout is generally so prompt and marked that it is unnecessary to have recourse to opiates; but its action requires to be carefully watched by the physician from its well-known nauseating and depressing consequences, which, should they appear, render the suspension of the drug necessary. Otherwise the remedy may be continued in gradually diminishing doses for some days after the disappearance of the gouty inflammation. The statements often made that colchicum tends to encourage the speedy return of the disease do not seem to be well founded. Should gout give evidence of its presence in an irregular form by attacking internal organs, besides the general treatment above mentioned, the use of frictions and mustard applications to the joints is indicated with the view of exciting its appearance there.

When gout has become chronic, colchicum, although of less service than in acute gout, is yet valuable, particularly when the inflammatory attacks recur. More benefit, however, appears to be derived from iodide of potassium, guaiacum, and more especially from the alkalies potash and lithia. The latter drug is strongly recommended by Dr Garrod from its supposed action upon the urates. It is usually administered in the form of the carbonate (gr. v., freely diluted).

The hygiene and regimen to be employed in the intervals of the gouty attacks are of the highest importance. These have reference for the most part to the habits and mode of life of the patient. Restriction must be laid upon the amount and quality of the food, and equally, or still more, upon the alcoholic stimulants. "The instances," says Sir Thomas Watson, "are not few of men of good sense, and masters of themselves, who, being wretchedly the victims of the gout, have thenceforward resolutely abstained from rich living and from wine and strong drinks of all kinds, and who have been rewarded for their prudence and self-denial by complete immunity from any return of the disease, or upon whom, at any rate, its future assaults have been few and feeble." The same eminent authority adds—"I am sure it is worth any *young* man's while, who has had the gout, to become a teetotaller." By those more advanced in life who, from long continued habit, are unable entirely to relinquish the use of stimulants, the strictest possible temperance must be observed. Regular but moderate exercise in the form of walking or riding, in the case of those who lead sedentary lives, is of great advantage, and all over-work, either physical or mental, should be avoided. Unfortunately the complete carrying out of such directions, even by those who feel their importance, is too often rendered difficult or impossible by circumstances of occupation and otherwise, and at most only an approximation can be made. The effect upon the gouty constitution of certain mineral waters and baths is well known. The particular place must in each case be determined by the physician, and special caution must be observed in recommending this plan of treatment in persons whose gout is complicated by organic disease of any kind. (J. O. A.)

GOUVION SAINT CYR, Laurent, Marquis de (1764-1830), a French marshal, was born at Toul, 13th April 1764. At the age of eighteen he went to Rome with the view of prosecuting the study of painting, but, although he continued his artistic studies after his return to Paris in 1784, he never definitely adopted the profession of a painter. In 1792 he was chosen a captain in the *chasseurs républicains*, and served on the staff of General Custine. His promotion rapidly followed, and in the course of two years he had become a general of division. In 1796 he commanded the centre division of Moreau's army in the campaign of the Rhine, and by coolness and sagacity greatly aided him in his brilliant defence against superior numbers, and in his subsequent celebrated retreat. In 1798 he was appointed to the command of the army of Italy, the officers of which had revolted against their general Massena, and he was speedily successful in obtaining the complete re-establishment of discipline. In the following year he commanded the left wing of Jourdan's army in Germany; but when Jourdan was succeeded by Massena, he joined the army of Moreau in Italy, where, in face of great difficulties, he was not only completely successful in his defensive tactics, but gained, on the 13th December, an important victory at Albano. When Moreau, in 1800, was appointed to the command of the army of the Rhine, Gouvion St Cyr was named his first lieutenant, and on the 9th May gained a victory over General Kray at Biberach. In 1801 he was sent to Spain to command the army intended for the invasion of Portugal, and was named grand officer of the legion of honour. When a treaty of peace was shortly afterwards concluded with Portugal, he succeeded Lucien Bonaparte as ambassador at Madrid. In 1803 he was appointed to the command of an army corps in Italy, and he gained in 1805 a victory over the Austrians at Castel Franco. He took part in the Prussian and Polish campaigns of 1807, and in 1808 he commanded an army corps with some success in Catalonia; but, not wishing to comply with certain orders he received from Paris, he resigned his command, and remained in disgrace till 1811. On the opening of the Russian campaign he received command of the 6th army corps, and on the 7th August 1812 obtained a victory over the Russians at Polosk, in recognition of which he was created a marshal of France. He distinguished himself at the battle of Dresden, 26th and 27th August 1813, but, after a stubborn resistance, capitulated there to the allies on the 11th November following, and remained for some time a prisoner in Hungary. On the restoration of the Bourbons he was created a peer of France, and in July 1815 was appointed war minister, but resigned his office in the November following. In June 1817 he was appointed minister of marine, and in September following again resumed the duties of war minister, which he continued to discharge till November 1819. He died 17th March 1830. Gouvion St Cyr was a prudent and cautious rather than a brilliant general, but he would doubtless have obtained better opportunities of acquiring distinction had he shown himself more blindly devoted to the interests of Napoleon.

He is the author of the following works.—*Journal des opérations de l'armée de Catalogne en* 1808 *et* 1809, Paris, 1821; *Mémoires sur les Campagnes des armées de Rhin et de Rhin-et-Moselle de* 1794 *à* 1797, Paris, 1829; and *Mémoires pour servir à l'histoire militaire sous le Directoire, le Consulat, et l'Empire*, 1831. See Gay de Vernon's *Vie de Gouvion Saint-Cyr*, 1857.

GOVERNMENT. Without attempting to discriminate by verbal definitions the various shades of meaning which this word assumes, we shall use it in this article in its widest sense—that of the ruling power in a political society. The conception of society which this use of the word implies may be illustrated by two well-known theories.

In John Austin's celebrated analysis of law, the first step is the proposition that a law is a command issued by a superior to a subject and enforced by a sanction or penalty. The laws of God with reference to the conduct of men, the laws of a private club or association of men with reference to the conduct of its members, and the laws of a political society, are all, according to Austin's definition, laws properly so called. The laws of nature are laws not properly so called. They are generalizations as to the uniform course of nature, and have no analogy to laws properly so called except in point of uniformity. Positive law, again, is distinguished from other laws, properly so called, as the command of the sovereign of an independent political community. A sovereign is a person, or a determinate body of persons, to whom the bulk of the community is habitually obedient. Every word in this definition has its precise meaning, which is developed by Austin with admirable clearness. The faculty "of untying knots" on which he prided himself is nowhere more conspicuously manifested than in the analysis which lays bare the real meaning of the common phrases used to describe the fundamental parts of society. It is not our purpose to examine the value of this analysis here, but simply to call attention to the assumption that in every society of men there is a determinate body (whether consisting of one individual, or a few or many individuals) whose commands the rest of the community obey. This sovereign body is what in more popular phrase is termed the Government of the country, and the varieties which may exist in its constitution are known as forms of government.

Mr Herbert Spencer, approaching the study of society under the influence of conceptions derived from the study of physical organisms, brings us to very much the same result. The union of men in society is itself an organic structure, having parts and functions corresponding to the parts and functions of an animal or a plant. Mr Spencer pursues this analogy so fully and minutely as to leave the impression that he believes it to be something more than an analogy,—that it is a general law from which true deductions regarding society may be drawn. The veins and arteries correspond to our railroads and highways; the nerves, communicating intelligence to the brain, are paralleled by the telegraph wires; the centralized action of society at the seat of government is the same thing as the regulative activity of the brain. Government is here represented by the regulative functions of a living organism, and forms of government are so many varieties in the structure. Austin, for the purposes of jurisprudence, finds it convenient to regard society as moulded by the will of a dominant body. Spencer exhibits the regulative parts of society as bound up with the rest in one organism. With both the existence of a government is necessary to the conception of society. In the one theory the element of command, in the other that of regulation, is conspicuous. If to these we add a third, that of simple agency, we shall have a tolerably complete view of the relations between Government and society. Besides commanding the conduct of individuals, besides regulating the relations of the various members of society, Government may be conceived of as merely the instrument of society. Where men are united in groups there arises from their union the necessity of action on behalf of the group. That part of society which attends to the business of the whole is the Government.

Two main lines of inquiry divide the subject. The first relates to varieties in the structure of the governing body—forms of government. The second relates to the functions of the governing body, the sphere of government, the things which fall within the province of state action. In both lines we have to deal with the ascertained facts of the past history and present condition of human societies. In both we have also to notice the speculative opinions of political thinkers. Notwithstanding the apparent confusion it will probably be found more convenient not to separate the historical from the speculative treatment of the subject. What is the best form of government?—is not quite the same question as What was the constitution of Athens or Rome? What are the proper limits of state interference?—is not the same question as What are the functions of the state in France or England? And yet the same answer may often serve for both sets of questions. Ideal constitutions have a suspicious resemblance to the constitutions with which their authors are most familiar. The political speculations of Plato and of Cicero are based on the state systems of Greece and Italy. Cicero's ideal code in the treatise *De Legibus* is simply an adaptation of the Twelve Tables. On the other hand, the form of political speculation is often determined by, and in turn determines, the practical politics of the time. The intimate connexion between speculation and practice in politics is strikingly illustrated in the period of controversy which culminated in the Revolution of 1688. The irreconcilable claims of crown and parliament threw the mind back on first principles. Never had theorists a better chance. Popular government and absolute government each sought to establish itself on a basis of reason and nature. Filmer founds kingly authority on the natural subjection of mankind and the lineal succession of the king to Adam, the first and divinely appointed head of mankind. Locke's general theories of civil government were, in his own opinion, sufficient "to establish the throne of our great restorer or present king, William, to make good his title in the consent of the people, which, *being the only one of all lawful governments*, he has more fully and clearly than any prince in Christendom." We all know how the political issue was decided. The practical was not more complete than the speculative victory. For two centuries the speculations invented to support the popular cause against absolutism have been the accepted commonplaces of Englishmen on the constitution of civil society. A more recent example may be given from modern politics. During the discussions which preceded the passing of the Reform Act of 1867, no question was more hotly disputed than that of the real nature of the franchise. Was it a right or was it a privilege? In form this is a scientific or, if we like, a metaphysical question. But the answer to it depended on another question altogether—whether you wished the franchise to be extended to a larger class or not.

Origin of Government.—A preliminary question, formerly of vast theoretical importance, would be, What is the origin of government? How did government come into existence? As a question of historical fact, it demands for its solution a knowledge of the whole past of the human race. It has been answered over and over again in times when historical knowledge could hardly be said to exist, and it has therefore been answered without any reference to history. The answers which have satisfied the minds of men may be distinguished broadly into three classes. The first class would comprehend the legendary accounts which nations have given in primitive times of their own forms of government. These are always attributed to the mind of a single lawgiver. The government of Sparta was the invention of Lycurgus. Solon, Moses, Numa, and Alfred in like manner shaped the government of their respective nations. There was no curiosity about the institutions of other nations,—about the origin of governments in general; and each nation was perfectly ready to accept the traditional [illegible] of any other.

The second may be called the logical or metaphysical account of the origin of government. It contained no overt reference to any particular form of government, whatever its covert references may have been. It answered the question, How government in general came into existence; and it answered it by a logical analysis of the elements of society. The phenomenon to be accounted for being government and laws, it abstracted government and laws, and contemplated mankind as existing without them. The characteristic feature of this kind of speculation is that it reflects how contemporary men would behave if all government were removed, and infers that men must have behaved so before government came into existence. Society without government resolves itself into a number of individuals each following his own aims, and therefore, in the days before government, each man followed his own aims. It is easy to see how this kind of reasoning should lead to very different views of the nature of the supposed original state. With Hobbes, it is a state of war, and government is the result of an agreement among men to keep the peace. With Locke, it is a state of liberty and equality,—it is not a state of war; it is governed by its own law,—the law of nature, which is the same thing as the law of reason. The state of nature is brought to an end by the voluntary agreement of individuals to surrender their natural liberty, and subject themselves to one supreme Government. In the words of Locke, "Men being by nature all free, equal, and independent, no one can be put out of this estate and subjected to the political power of another without his own consent. The only way whereby any one divests himself of his natural liberty, and puts on the *bonds of civil society*, is by agreeing with other men to join and unite into a community." (*On Civil Government*, c. viii.) Locke boldly defends his theory as founded on historical fact, and it is amusing to compare his demonstration of the [illegible] of Hobbes's speculations with the scanty and doubtful examples which he accepts as the foundations of his own. But in general the various forms of the hypothesis eliminate the question of time altogether. The original contract from which government sprang is [illegible] the continuing contract on which civil society continues to be based. The historical weakness of the theory was probably always perceived. Its logical inadequacy was conclusively demonstrated by Austin. But it still belongs to speculations on the principles of government.

The "social compact" is the most famous of the metaphysical explanations of government. It has had the longest history, the widest influence, and the most [illegible] development. To the same class belong the various forms of the theory that government exists by divine appointment. [illegible] [illegible] great deal more [illegible] [illegible] [illegible] [illegible] better than that [illegible] [illegible] because their rulers have been appointed by God. Like the social compact, the theory of divine appointment avoided the question of historical fact.

The application of the historical method to the phenomena of society has changed the aspect of the question and robbed it of its political interest. The student of the history of society has no formula to express the law by which government is born. All that he can do is to trace governmental forms through various stages of social development. The more complex and the larger the society, the more distinct is the separation between the governing part and the rest, and the more elaborate is the subdivision of functions in the government. The primitive type of ruler is king, judge, priest, and general. At the same time, his way of life differs little from that of his followers and subjects. The metaphysical theories were so far right in imputing greater equality of social conditions to more primitive times. Increase of bulk brings with it a more complex social organization. War tends to develop the strength of the governmental organization; peace relaxes it. All societies of men exhibit the germs of government; but there would appear to be races of men so low that they cannot be said to live together in society at all. Recent investigations have illustrated very fully the importance of the family in primitive societies, and the belief in a common descent has much to do with the social cohesion of a tribe. The government of a tribe resembles the government of a household; the head of the family is the ruler. But we cannot affirm that political government has its origin in family government, or that there may not have been states of society in which government of some sort existed while the family did not.

I. Forms of Government.

Three Standard Forms.—Political writers from the time of Aristotle have been singularly unanimous in their classification of the forms of government. There are three ways in which states may be governed. They may be governed by one man, or by a number of men, small in proportion to the whole number of men in the state, or by a number large in proportion to the whole number of men in the state. The government may be a monarchy, an aristocracy, or a democracy. The same terms are used by Austin as were used by Aristotle, and in very nearly the same sense. The determining quality in governments in both writers, and it may safely be said in all intermediate writers, is the numerical relation between the constituent members of the government and the population of the state. There were, of course, enormous differences between the state-systems present to the mind of the Greek philosopher and the English jurist. Aristotle was thinking of the small independent states of Greece, Austin of the great peoples of modern Europe. The unit of government in the one case was a city, in the other a nation. This difference is of itself enough to invalidate all generalization founded on the common terminology. But on one point there is a complete parallel between the politics of Aristotle and the politics of Austin. The Greek cities were to the rest of the world very much what European nations and European colonies are to the rest of the world now. They were the only communities in which the governed visibly took some share in the work of government. Outside the European system, as outside the Greek system, we have only the [illegible] uniformity of despotism, whether savage or civilized. The question of forms of government, therefore, [illegible] [illegible] to the European races. The virtues and defects of monarchy, aristocracy, and democracy are the [illegible] [illegible] [illegible] by the historical Governments of Europe. The generality of the language used by political writers should not blind us to the fact that they are thinking only of a comparatively small portion of mankind.

Greek Polities.—Aristotle divides governments according to two principles. In all states the governing power seeks either its own advantage or the advantage of the whole state, and the government is bad or good accordingly. In all states the governing power is one man, or a few men, or many men. Hence six varieties of government, three of which are bad and three good. Each excellent form has a corresponding depraved form, thus:—

The good government of one (Monarchy) corresponds to the depraved form (Tyranny).

The good government of few (Aristocracy) corresponds to the depraved form (Oligarchy).

The good government of many (Commonwealth) corresponds to the depraved form (Democracy).

The fault of the depraved forms is that the governors act unjustly where their own interests are concerned. The worst of the depraved forms is tyranny, the next oligarchy, and the least bad democracy.[1] Each of the three leading types exhibits a number of varieties. Thus in monarchy we have the heroic, the barbaric, the elective dictatorship, the Lacedemonian (hereditary generalship, στρατηγία), and absolute monarchy. So democracy and oligarchy exhibit four corresponding varieties. The best type of democracy is that of a community mainly agricultural, whose citizens, therefore, have not leisure for political affairs, and allow the law to rule. The best oligarchy is that in which a considerable number of small proprietors have the power; here, too, the laws prevail. The worst democracy consists of a larger citizen class having leisure for politics; and the worst oligarchy is that of a small number of very rich and influential men. In both the sphere of law is reduced to a minimum. A good government is one in which as much as possible is left to the laws, and as little as possible to the will of the governor.

The *Politics* of Aristotle, from which these principles are taken, presents a striking picture of the variety and activity of political life in the free communities of Greece. The king and council of heroic times had disappeared, and self-government in some form or other was the general rule. It is to be noticed, however, that the Governments of Greece were essentially unstable. The political philosophers could lay down the law of development by which one form of government gives birth to another. Aristotle devotes a large portion of his work to the consideration of the causes of revolutions. The dread of tyranny was kept alive by the facility with which an over-powerful and unscrupulous citizen could seize the whole machinery of government. Communities oscillated between some form of oligarchy and some form of democracy. The security of each was constantly imperilled by the conspiracies of the opposing factions. Hence, although political life exhibits that exuberant variety of form and expression which characterizes all the intellectual products of Greece, it lacks the quality of persistent progress. Then there was no approximation to a national government, even of the federal type. The varying confederacies and hegemonies are the nearest approach to anything of the kind. What kind of national government would ultimately have arisen if Greece had not been crushed it is needless to conjecture; the true interest of Greek politics lies in the fact that the free citizens were, in the strictest sense of the word, self-governed. Each citizen took his turn at the common business of the state. He spoke his own views in the agora, and from time to time in his own person acted as magistrate or judge. Citizenship in Athens was a liberal education, such as it never can be made under any representative system.

The Government of Rome.—During the whole period of freedom the government of Rome was, in theory at least, municipal self-government. Each citizen had a right to vote laws in his own person in the comitia of the centuries or the tribes. The administrative powers of government were, however, in the hands of a bureaucratic assembly, recruited from the holders of high public office. The senate represented capacity and experience rather than rank and wealth. Without some such instrument the city government of Rome could never have made the conquest of the world. The gradual extension of the citizenship to other Italians changed the character of Roman government. The distant citizens could not come to the voting booths; the device of representation was not discovered; and the comitia fell into the power of the town voters. In the last stage of the Roman republic, the inhabitants of one town wielded the resources of a world-wide empire. We can imagine what would be the effect of leaving to the people of London or Paris the supreme control of the British empire or of France,—irresistible temptation, inevitable corruption. The rabble of the capital learn to live on the rest of the empire.[2] The favour of the effeminate masters of the world is purchased by *panem et circenses.* That capable officers and victorious armies should long be content to serve such masters was impossible. A conspiracy of generals placed itself at the head of affairs, and the most capable of them made himself sole master. Under Cæsar, Augustus, and Tiberius, the Roman people became habituated to a new form of government, which is best described by the name of Cæsarism. The outward forms of republican government remained, but one man united in his own person all the leading offices, and used them to give a seemingly legal title to what was essentially military despotism. There is no more interesting constitutional study than the chapters in which Tacitus traces the growth of the new system under the subtle and dissimulating intellect of Tiberius. The new Roman empire was as full of fictions as the English constitution of the present day. The master of the world posed as the humble servant of a menial senate. Deprecating the outward symbols of sovereignty, he was satisfied with the modest powers of a consul or a tribunus plebis. The reign of Tiberius, little capable as he was by personal character of captivating the favour of the multitude, did more for imperialism than was done by his more famous predecessors. Henceforward free government all over the world lay crushed beneath the military despotism of Rome. Cæsarism remained true to the character imposed upon it by its origin. The Cæsar was an elective not an hereditary king. The real foundation of his power was the army, and the army in course of time openly assumed the right of nominating the sovereign. The characteristic weakness of the Roman empire was the uncertainty of the succession. The nomination of a Cæsar in the lifetime of the emperor was an ineffective remedy. Rival emperors were elected by different armies; and nothing less than the force of arms could decide the question between them.

Modern Governments—Feudalism.—The Roman empire bequeathed to modern Europe the theory of universal dominion. The nationalities which grew up after its fall arranged themselves on the basis of territorial sovereignty. Leaving out of account the free municipalities of the Middle Ages, the problem of government had now to be solved, not for small urban communities, but for large territorial nations. The medieval form of government was feudal. One common type pervaded all the relations of life. The relation of king and lord was like the relation between lord and vassal (see FEUDALISM). The bond between them was the tenure of land. In England there had been, before the Norman Conquest, an approximation to a feudal system. In the earlier English constitution, the most striking features were the power of the witan, and the common property of the nation in a large portion of the soil. The steady development of the power of the king kept pace with the aggregation of the English tribes under one king. The conception that the land belonged primarily to the people gave way to the conception that everything belonged primarily to the king.[1] The Norman Conquest imposed on England the already highly developed feudalism of France, and out of this feudalism the free governments of modern Europe have grown. One or two of the leading steps in this process may be indicated here. The first, and perhaps the most important, was the device of representation. For an account of its origin, and for instances of its use in England before its application to politics, we must be content to refer to Canon Stubbs's *Constitutional History*, vol. ii. The problem of combining a large area of sovereignty with some degree of self-government, which had proved fatal to ancient commonwealths, was henceforward solved. From that time some form of representation has been deemed essential to every constitution professing, however remotely, to be free.

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[1] Aristotle elsewhere speaks of the error of those who think that any one of the depraved forms is better than any other.

[2] None of the free states of Greece ever made extensive or permanent conquests; but the tribute sometimes paid by one state to another (as by the Ægeans to the Athenians) was a manifest source of corruption. Compare the remarks of Hume (*Essays*, part i. 3, *That Politics may be reduced to a Science*), "free governments are the most ruinous and oppressive for their provinces."

The connexion between representation and the feudal system of estates must be shortly noticed. The feudal theory gave the king a limited right to military service and to certain aids, both of which were utterly inadequate to meet the expenses of the government, especially in time of war. The king therefore had to get contributions from his people, and he consulted them in their respective orders. The three estates were simply the three natural divisions of the people, and Canon Stubbs has pointed out that, in the occasional treaties between a necessitous king and the order of merchants or lawyers, we have examples of inchoate estates or sub-estates of the realm. The right of representation was thus in its origin a right to consent to taxation. The pure theory of feudalism had from the beginning been broken by William the Conqueror exacting all freeholders to take an oath of direct allegiance to himself. The institution of parliaments, and the association of the king's smaller tenants in capite with other commoners, still further removed the government from the purely feudal type, in which the tenant-in-chief stands between the inferior vassal and the king.

Parliamentary Government.—The English System.—The right of the commons to share the power of the king and lords in legislation, the exclusive right of the commons to impose taxes, the disappearance of the clergy as a separate order, were all important steps in the movement towards popular government. The extinction of the old feudal nobility in the dynastic wars of the 15th century simplified the question by leaving the crown face to face with parliament. The immediate result was no doubt an increase in the power of the crown, which probably never stood higher than it did in the reigns of Henry VIII. and Elizabeth; but even these powerful monarchs were studious to maintain a formal regard for parliamentary constitutionalism. After a long period of speculative controversy and civil war, the settlement of 1688 established limited monarchy as the government of England. Since that time the external form of government has remained unchanged, and, so far as legal description goes, the constitution of William III. might be taken for the same system as that which still exists. The silent changes have, however, been enormous. The most striking of these, and that which has produced the most salient features of the English system, is the growth of cabinet government. Intimately connected with this is the rise of the two great historical parties of English politics. The normal state of government in England is that the cabinet of the day shall represent that which is, for the time, the stronger of the two. Before the Revolution the king's ministers had begun to act as a united body; but even after the Revolution the union was still feeble and fluctuating, and each individual minister was bound to the others only by the tie of common service to the king. Under the Hanoverian sovereigns the ministry became consolidated, the position of the cabinet became definite, and its dependence on parliament, and more particularly on the House of Commons, was established. Ministers were chosen exclusively from one house or the other, and they assumed complete responsibility for every act done in the name of the crown. The simplicity of English politics has divided parliament into two nearly equal parties, and the party in opposition has been steadied by the consciousness that it, too, has constitutional functions of high importance. Criticism is sobered by being made responsible. Along with this movement went the withdrawal of the personal action of the monarch in politics. No king has attempted to veto a bill since the Scotch Militia Bill was vetoed by Queen Anne. No ministry has been dismissed by the sovereign since 1834. Whatever the power of the monarch may be, it is unquestionably limited to his personal influence over his ministers. And it must be remembered that ministers are responsible ultimately, not to parliament, but to the House of Commons.

Apart, therefore, from the democratic changes of 1832 and 1867, we find that the House of Commons, as a body, had gradually made itself the centre of the government. Since the area of the constitution has been enlarged, it may be doubted whether the orthodox descriptions of the government any longer apply. The earlier constitutional writers, such as Blackstone and De Lolme, regard it as a wonderful compound of the three standard forms—monarchy, aristocracy, and democracy. Each has its place, and each acts as a check upon the others. Hume, discussing the question "Whether the British government inclines more to absolute monarchy or to a republic," decides in favour of the former alternative. "The tide has run long and with some rapidity to the side of popular government, and is just beginning to turn toward monarchy." And he gives it as his own opinion that absolute monarchy would be the easiest death, the true euthanasia, of the English constitution. These views of the English Government in the 18th century may be contrasted with Mr Bagehot's sketch of the modern government as a working instrument.[2]

Leading Features of Parliamentary Government.—The parliamentary government developed by England out of feudal materials has been deliberately accepted as the type of constitutional government all over the world. Nearly all the European states and nearly all the European colonies, dependent or independent, have adopted, more or less fully, the leading features of the English system,—that is to say, popular representation more or less extensive, a bicameral legislature, and a cabinet or consolidated ministry. In connexion with all of these, numberless questions of the highest practical importance have arisen, the bare enumeration of which would surpass the limits of our space. We shall confine ourselves to a few very general considerations.

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[1] [illegible]

[2] See Bagehot's *English Constitution*.

The Two Chambers.—First, as to the double chamber. This, which is perhaps more accidental than any other portion of the English system, has been the most widely imitated. In most European countries, in the English colonies, in the United States congress, and in the separate States of the Union,[1] there are two houses of legislature. This result has been brought about partly by natural imitation of the accepted type of free government, partly from a conviction that the second chamber will moderate the democratic tendencies of the first. The theoretical question would take too long to argue, but it is easy to show that the elements of the English original cannot be reproduced to order under different conditions.[2] There have, indeed, been a few attempts to imitate the special character of hereditary nobility attaching to the English House of Lords, and these few have failed. The complete solidarity existing between the English nobility and at least the politically privileged, if not the whole mass, of their countrymen, is a result not to be attempted by the framers of constitutions. The English system, too, after its own way, obviates any danger of collision between the Houses,—the standing and obvious danger of the bicameral system. In England there is no doubt where the real sovereignty lies. The actual ministers of the day must possess the confidence of the House of Commons; they need not—in fact they often do not—possess the confidence of the House of Lords. It is only in legislation that the Lower House really shares its powers with the Upper; and the constitution possesses, in the unlimited power of nominating peers, a well-understood last resource should the House of Lords persist in refusing important measures demanded by the representatives of the people. In all but measures of first-class importance, however, the House of Lords is a real second chamber, and in these there is little danger of a collision between the Houses. There is the widest possible difference between the English and any other second chamber. In the United States the senate (constituted on the system of equal representation of States) is the more important of the two Houses, and the only one whose control of the executive can be compared to that exercised by the British House of Commons. In the English colonies a dead-lock between the two Houses is a matter of frequent occurrence. In France, it is an anticipated if not an intended source of danger to the new republican constitution.

The real strength of popular government in England lies in the ultimate supremacy of the House of Commons. That supremacy had been acquired, perhaps to its full extent, before the extension of the suffrage made the constituencies democratic. Foreign imitators, it may be observed, have been more ready to accept a wide basis of representation than to confer real power on the representative body. In all the monarchical countries of Europe, however unrestricted the right of suffrage may be, the real victory of constitutional government has yet to be won. Where the suffrage means little or nothing, there is little or no reason for guarding it against abuse. The independence of the executive in the United States brings that country, from one point of view, more near to the Continental than to the English state system. The people make a more complete surrender of power to the Government than is done in England.

Cabinet Government.—The peculiar functions of the English cabinet are not easily matched in any foreign system. They are a mystery even to most educated Englishmen. The cabinet in England is much more than a body consisting of chiefs of departments. It is the inner council of the empire, the arbiter of national policy, foreign or domestic, the sovereign in commission. The whole power of the House of Commons is concentrated in its hands. At the same time, it has no place whatever in the legal constitution. Its numbers and its constitution are not fixed even by any rule of practice. It keeps no record of its proceedings. The relations of an individual minister to the cabinet, and of the cabinet to its head and creator, the premier, are things known only to the initiated.[3] With the doubtful exception of France, no other system of government presents us with anything like its equivalent. In the United States, as in the European monarchies, we have a council of ministers surrounding the chief of the state.

Change of Power in the English System.—One of the most difficult problems of government is how to provide for the devolution of political power, and perhaps no other question is so generally and justly applied as the test of a working constitution. If the transmission works smoothly, the constitution, whatever may be its other defects, may at least be pronounced stable. It would be tedious to enumerate all the contrivances which this problem has suggested to political societies. Here, as usual, Oriental despotism stands at the bottom of the scale. When sovereign power is imputed to one family, and the law of succession fails to designate exclusively the individual entitled to succeed, assassination becomes almost a necessary measure of precaution. The prince whom chance or intrigue has promoted to the throne of a father or an uncle, must make himself safe from his relatives and competitors. Hence the scenes which shock the European conscience when "Amurath an Amurath succeeds." Constantinople, Afghanistan, and Burmah have all recently illustrated the standing difficulty of the succession in Oriental despotisms. The strong monarchical governments of Europe have been saved from this evil by an indisputable law of succession, which marks out from his infancy the next successor to the throne. The king names his ministers, and the law names the king. In popular or constitutional governments far more elaborate precautions are required. It is one of the real merits of the English constitution that it has solved this problem—in a roundabout way perhaps, after its fashion—but with perfect success. The ostensible seat of power is the throne, and down to a time not long distant the demise of the crown suspended all the other powers of the state. In point of fact, however, the real change of power occurs on a change of ministry. The constitutional practice of this century has settled, beyond the reach of controversy, the occasions on which a ministry is bound to retire. It must resign or dissolve when it is defeated in the House of Commons, and if after a dissolution it is beaten again, it must resign without alternative. It may resign if it thinks its majority in the House of Commons not sufficiently large. The dormant functions of the crown now come into existence. It receives back political power from the old ministry in order to transmit it to the new. When the new ministry is to be formed, and how it is to be formed, is also clearly settled by established practice. The out-going premier names his successor by recommending the king to consult him; and that successor must be the recognized leader of his successful rivals. All this is a matter of custom, not of law; and it is doubtful if any two authorities could agree in describing the custom in language of precision. It is certain that the intervention of the crown [illegible] the transfer of power from one party to another, by giving it the appearance of a mere change of servants. The real disturbance is that caused by the appeal to the electors. A general election is always a struggle between the two great political parties for the possession of the powers of government. It may be noted that recent practice goes far to establish the rule that a ministry beaten at the hustings should resign at once without waiting for a formal defeat in the House of Commons.

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[1] The double government in the last case was founded, says Sir G. C. Lewis, on the English municipal system, and corresponded to the difference between aldermen and common-council men.

[2] Sweden, a few years since, reduced her four mediæval estates to two houses, and is more like Great Britain in the composition of the new parliament than any other state in Europe.

[3] See Bagehot's *English Constitution*, which exhibits a working view of this and other parts of the constitution as they appear to an outsider. Mr Gladstone's political essays, in the collection entitled *Gleanings of Past Years*, contain much valuable information at first hand.

The English system makes the ministry dependent on the will of the House of Commons, and, on the other hand, the House of Commons itself is dependent on the will of the ministry. In the last result both depend on the will of the constituencies, as expressed at the general election. There is no fixity in either direction in the tenure of a ministry. It may be challenged at any moment, and it lasts until it is challenged and beaten. And that there should be a ministry and a House of Commons in harmony with each other but out of harmony with the people is rendered all but impossible by the law and the practice as to the duration of parliaments.

Change of Power in the United States.—The United States offers a very different solution of the problem. The American president is at once king and prime minister; and there is no titular superior to act as a conduit-pipe between him and his successor. His crown is rigidly fixed; unshakable for four years, after four years he ceases to reign. No hostile vote can affect his power as the head of the administration, and it is difficult to resist his will even in legislation. But the day of his demise is known from the first day of his government; and almost before he begins to reign the political forces of the country are shaping out a new struggle for the succession. Further, a change of government in America means a change of the entire administrative staff. The commotion caused by a presidential election in the United States is thus infinitely greater than that caused by a general election in England. A change of power in England affects comparatively few personal interests, and absorbs the attention of the country for a comparatively short space of time. In the United States it is long foreseen and elaborately prepared for, and when it comes it involves the personal fortunes of large numbers of citizens. And yet the English constitution is more democratic than the American, in the sense that the popular will can more speedily be brought to bear upon the government.

Change of Power in France.—The established practice of England and America may be compared with the recent constitution of France. Here the problem presents different conditions. The head of the state is neither a sovereign of the English, nor a president of the American type. He is served by a prime minister and a cabinet, who, like an English ministry, hold office on the condition of parliamentary confidence; but he holds office [illegible] and is, in fact, a minister like the others. [illegible] the transmission of power from cabinet to cabinet [illegible] he discharges the functions of an English king. But the transmission of power between himself and his successor is [illegible] by no constitutional [illegible] experience would seem to show [illegible]. Of course it is [illegible] practice in France, but [illegible] rearrangement of the [illegible] of the president and the cabinet would soon take place. It seems [illegible] to distinguish between a parliamentary president and a parliamentary ministry, or to see why they should not [illegible]. And yet the new French constitution has not had time to exhibit that which is a marked feature of the English constitution, viz., a government headed by the chief of the dominant political party. When that time comes the office of premier ought, one would suppose, to merge in the office of president. Possibly the existence of numerous political parties, and the open disloyalty to the existing constitution professed by some of them, may retard the simplification of the French governmental system. Other European countries professing constitutional government appear to follow the English practice. The Swiss republic is so peculiarly situated that it is hardly fair to compare it with any other. But it is interesting to note that, while the rulers of the states are elected annually, the same persons are generally re-elected.

Representation.—The questions connected with representation are too numerous to be discussed with advantage here. Two recent changes of great importance may be noticed in the English system,—the vote by ballot, and the partial introduction of what is called the minority vote. By the latter, in a constituency returning three members, each elector has only two votes, and a minority exceeding one-third can thus elect at least one of the three. The representation of minorities is a device of political theorists, and the chief result of its partial application has been to weaken the influence of the large constituencies. The chief anomalies of the English system are the inequality of electoral districts and the multiplicity of votes. A town of 200 electors returns as many candidates as a constituency of ten times that number. On the other hand, while one man has a single vote only, his neighbour, by various qualifications, may be an elector in several constituencies. In each case there is a revolution of the only theory on which the representative system as a whole can be founded —the equality of the voters. The first of these anomalies is admittedly waiting the convenience of political parties. The second has been recently aggravated by the creation of new university constituencies, consisting almost entirely of persons who had already the right of voting under the ordinary qualification. The anomaly becomes a gross abuse in the practice of creating what are known as faggot votes. The simple remedy would be to require that each elector should be registered in one constituency only.

The Relation between Government and Laws.—It might be supposed that, if any general proposition could be established about government, it would be one establishing some constant relation between the form of a government and the character of the laws which it enforces. The technical language of the English school of jurists is certainly of a kind to encourage such a supposition. The entire body of law in force in a country at any moment is regarded as existing solely by the fiat of the governing power. There is no maxim more entirely in the spirit of this jurisprudence than the following:—"The real legislator is not he by whom the law was first ordained, but he by whose will it continues to be law." The whole of the vast repertory of rules which make up the law of England—the rules of practice in the courts, the local customs of a county or a manor, the principles formulated by the sagacity of generations of judges, equally with the statutes for the year, are conceived of by the school of Austin as created by the will of the sovereign and the two Houses of Parliament, or so much of them as would now satisfy the definition of sovereignty. It would be out of place to examine here the difficulties which embarrass this definition, but the statement we have made carries on its face a demonstration of its own falsity in fact. There is probably no government in the world of which it could be said that it might change at will the substantive laws of the country and still remain a government. However useful it may be, for the purposes of analytical jurisprudence, to define a law as a command set by a sovereign to a subject, we must not forget that this is only a definition, and that the assumption it rests upon is, to the student of society, anything but a universal fact. From his point of view the cause of a particular law is not one but many, and of the many the deliberate will of a legislator may not be one. Sir Henry Maine has illustrated this point by the case of the great tax-gathering empires of the East, in which the absolute master of millions of men never dreams of making anything in the nature of a law at all. This view is no doubt as strange to the English statesman as to the English jurist. The most conspicuous work of government in his view is that of parliamentary legislation. For a large portion of the year the attention of the whole people is bent on the operations of a body of men who are constantly engaged in making new laws. It is natural for us, therefore, to think of law as a factitious thing, made and unmade by the people who happen for the time being to constitute parliament. We forget how small a proportion the laws actually devised by parliament are of the law actually prevailing in the land. No European country has undergone so many changes in the form of government as France. Republic, constitutional monarchy, and empire have there succeeded each other again and again in the course of a century. It is surprising how little effect these political revolutions have had on the body of French law. The change from empire to republic is not marked by greater legislative effects than the change from a Conservative to a Liberal ministry in England would be.

These reflexions should make us cautious in accepting any general proposition about forms of government and the spirit of their laws. We must remember, also, that the classification of governments according to the numerical proportion between governors and governed supplies but a small basis for generalization. What parallel can be drawn between a small town, in which half the population are slaves, and every freeman has a direct voice in the government, and a great modern state, in which there is not a single slave, while freemen exercise their sovereign powers at long intervals, and through the action of delegates and representatives? Propositions as vague as those of Montesquieu may indeed be asserted with more or less plausibility. But to take any leading head of positive law, and to say that monarchies treat it in one way, aristocracies and democracies in another, is a different matter. Laws affecting trade might be expected to depend on the more or less popular character of the government. Yet would it be safe to say that monarchy discourages, that democracy encourages, free trade? France under the empire was more free-trading than France under the republic. If there is any difference at all between Great Britain and her colonies it is that the latter are generally supposed to be more democratic than the mother country. Yet protection rules the young democracies, while free trade reigns at home. The principle has indeed been broadly laid down that oligarchical governments interfere more actively and more extensively in the affairs of their subjects than popular governments. We shall have occasion to show directly that the popularization of government in England has up to this time been attended by a striking increase in the sphere of state action.

II. Sphere of Government.

We may now ask, What is the appropriate sphere of government? What kind of business does it undertake, and what kind of business ought it to undertake? By what limits is its action to be restricted? Here too the field is occupied by disputed theories and diversified practice. And the sphere assigned to state action in different ages and countries varies as widely as the form of government.

The action of the state, or sovereign power, or government in a civilized community shapes itself into the threefold functions of legislation, judicature, and administration. The two first are perfectly well-defined, and the last includes all the kinds of state action not included in the other two. It is with reference to legislation and administration that the line of permissible state-action requires to be drawn. There is no doubt about the province of the judicature, and that function of government may therefore be dismissed with a very few observations.

The complete separation of the three functions marks a high point of social organization. In simple societies the same officers discharge all the duties which we divide between the legislator, the administrator, and the judge. The acts themselves are not consciously recognized as being of different kinds. The evolution of all the parts of a highly complex government from one original is illustrated in a striking way by the history of English institutions. All the conspicuous parts of the modern government, however little they may resemble each other now, can be followed back without a break to their common origin. Parliament, the cabinet, the privy council, the courts of law, all carry us back to the same *nidus* in the council of the feudal king.

Judicature.—The business of judicature, requiring as it does the possession of a high degree of technical skill and knowledge, is generally entrusted by the sovereign body or people to a separate and independent class of functionaries. In England, the appellate jurisdiction of the House of Lords still maintains in theory the connexion between the supreme legislative and the supreme judicial functions. It is only recently that the important subject of divorce passed from the legislative chambers to the courts of law. In some of the States of the American Union the judicial functions of the upper house are still maintained after the example of the English constitution as it existed when these States were founded. In England there is also still a considerable amount of judicial work in which the people takes its share. The inferior magistracies, except in populous places, are in the hands of private persons. And by the jury system the ascertainment of fact has been committed in very large measure to persons selected indiscriminately from the mass of the people, subject to a small property qualification. But the higher functions of the judicature are exercised by persons whom the law has jealously fenced off from external interference and control. The independence of the bench distinguishes the English system from every other. It was established in principle as a barrier against monarchical power, and hence has become one of the traditional ensigns of popular government. In many of the American States, the spirit of democracy has demanded the subjection of the judiciary to popular control. The judges are elected directly by the people, and hold office for a short term, instead of being appointed, as in England, by the responsible executive, and removable only by a vote of the two Houses. There is not the smallest sign that democratic opinion in England is tending in this direction.[1] At the same time the constitution of the United States has assigned to the supreme court of the Union a perfectly unique position, standing in singular contrast to the depraved condition of many of the State judicatories. The supreme court is the guardian of the constitution. It has to judge whether a measure passed by the legislative powers is not void by reason of being unconstitutional, and it may therefore have to veto the deliberate resolutions of both Houses of Congress and the president. It is admitted that this singular experiment in government has been completely justified by its success.

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[1] It is worth noting that direct election to offices—supposed to be characteristic of the democratic spirit—has no place in English political ideas. The few instances in which it occurs are regarded with indifference. The election of the coroner by the freeholders is universally condemned. In the few parishes where the clergyman may be appointed by the parishioners, the right is often left to be exercised by the bishop.

Limits of State Interference in Legislation and Administration.—The question of the limits of state action does not arise with reference to the judiciary. The enforcement of the laws is a duty which the sovereign power must of absolute necessity take upon itself. But to what conduct of the citizens the laws shall extend is the most perplexing of all political questions. The correlative question with regard to the executive would be what works of public convenience should the state undertake through its own servants. The whole question of the sphere of government may be stated in these two questions:—What should the state do for its citizens? and How far should the state interfere with the action of its citizens? These questions are the direct outcome of modern popular government; they are equally unknown to the small democracies of ancient times and to despotic governments at all times. Accordingly ancient political philosophy, rich as it is in all kinds of suggestions, has very little to say that has any bearing on the sphere of government. The conception that the power of the state can be and ought to be limited belongs to the times of "government by discussion," to use Mr Bagehot's expression,—to the time when the sovereign number is divided by class interests, and when the action of the majority has to be carried out in the face of strong minorities, capable of making themselves heard. Aristotle does indeed dwell on one aspect of the question. He would limit the action of the government in the sense of leaving as little as possible to the personal will of the governors, whether one or many. His maxim is that the law should reign. But that the sphere of law itself should be restricted, otherwise than by general principles of morality, is a consideration wholly foreign to ancient philosophy. The state is conceived as acting like a just man, and justice in the state is the same thing as justice in the individual. The Greek institutions which the philosophers are unanimous in commending are precisely those which the most state-ridden nations of modern times would agree in repudiating.

Importance of this Question in English Politics.—Limitation, then, being a principle known only to free governments, we naturally look to English political history for its elucidation; and the speculative and practical treatment of this question is perhaps the most valuable contribution made by England to political science. From the time of the Revolution, the principle that there is a limit to the permissible action of government has been tacitly admitted. The theories which restricted the powers of the constitutional king by founding them on popular consent tended also to the restriction of the sphere of government in general. The connexion between the two may be seen very clearly in Locke. Government was created by the voluntary union of men in political society, and the object for which they agreed to unite was the preservation of their property. The scope of government is therefore limited by this its original object. "Though men, when they enter into society, give up the liberty, equality, and executive power they had in the state of nature into the hands of society, to be so far disposed of by the legislature as the good of society shall require, yet, it being only with an intention in every one the better to *preserve himself, his liberty, and property*, . . . the power of the society or legislature constituted by them can never be supposed to extend further than the common good." The practical application of these principles is to be found in his essay on *Toleration*. The business of the state being the protection of body and goods, it has no right to interfere with the religious worship or opinions of its citizens. The existence of religious dissent on a large scale kept up the practical importance of this theory. Even in the extreme absolutism of the partisans of monarchy, the current doctrine of passive obedience recognizes the same principle. Although the will of the sovereign ought never to be resisted, there is a line of action beyond which he ought never to pass.

Another historical fact of some importance is the long-continued alienation of the aristocratic classes from the reigning family during the post-Revolution period. In the 18th century the natural champions of monarchical power were in opposition. Their vast local influence, which might otherwise have gone to aggrandize the influence of the crown, was really employed to thwart it. There thus sprang up in the most conservative classes of society a strong feeling of jealousy for local independence, and a standing dislike of Government interference. Squire Western, in *Tom Jones*, may be taken as the type of the country party of the period. His idea of intellectual conversation is abusing the Government over a bottle. Nothing in the new-fangled notions of his sister disgusts him more than her affected sympathy with the politicians then in power. The sullen disaffection of the most powerful section of society was a most effectual bulwark against any extension of the central power. It has been remarked by an acute observer[1] that the weakness of government in the 18th century suffered even public institutions to assert their local independence. Corporations of every kind enjoyed the most complete liberty of action, and, freed from state control, became the private patrimony of their members. The same sort of resistance to state action has been repeated in the 19th century. The natural adherents of the crown, and the leaders of provincial society, the aristocracy, the county gentry, and the clergy, have generally been in opposition to ministers. It is a fact not without significance that the first constitutional question of this reign was raised by Sir Robert Peel, the leader of the Conservative party.

Again, the exhaustive discussion of all political measures, which for two centuries has been a fixed habit of English public life, has of itself established the principle that there are assignable limits to the action of the state. Not that the limits ever have been assigned in terms, but popular sentiment has more or less vaguely fenced off departments of conduct as sacred from the interference of the law. Phrases like "the liberty of the subject," the "sanctity of private property," "an Englishman's house is his castle," "the rights of conscience," are the commonplaces of political discussion, and tell the state, "Thus far shalt thou go and no further."

State and Church.—The side on which the legitimate province of government has been most debated is that on which it comes in contact with religion. High ecclesiastical theories draw the lines of restriction as clearly as voluntaryism, but what they exclude is state control and not state support. The Roman Catholics, the High Church party in England, and the Free Church in Scotland, all unite in protesting against the intrusion of the secular government into spiritual affairs. This assertion of a spiritual domain lying beyond the sphere of government, and sacred from its interference, unfortunately implies that there is another authority from which, on religious matters, the Government ought to take its instructions. The duty of a national recognition of religion—implying compulsion of the most personal character—is strongly asserted by the very persons who denounce state control as illegitimate and tyrannical. The exclusion of the state from the spiritual domain is, in fact, not founded on any reasoned theory of the functions of government at all, but on the belief in a divinely appointed order for spiritual things, which it is the duty of the state to enforce. An attempt to base this position on general principles has, indeed, been made by Mr Gladstone in his work on *Church and State*. Holding that the state is a moral person, he argues that its action must be regulated by conscience, and that its religious obligations are the same as those of the individual man. It must therefore recognise and practise a religion, and the true religion is that of the Christian Church, of which the English Establishment is a branch. That religion, with its divinely organized system of Episcopacy, the state should enforce in every way short of physical persecution It should exclude heretics from office and privilege, but it should not put them in prison. Mr Gladstone's book was the occasion of a controversy which doubtless had some effect on subsequent political events. Macaulay[1] stated the Whig view of the subject—holding that while the state may justifiably endow an established church, it may not persecute for dissent in any way whatever. Government has principally to deal with the material wants of society, and with the protection of life and property. While this is the main end of government, it may pursue such secondary ends as the promotion of education and religion, the encouragment of arts, &c., but the primary end must not be sacrificed to the secondary end. The state is therefore not a moral person at all, any more than a railway company or a hospital; and government is certainly not an institution for the promotion of religion; but, if it finds it expedient, it may justly support Presbyterianism in Scotland, Protestant Episcopacy in England, and Roman Catholicism in Ireland. It is needless to say that Macaulay makes no attempt to define the limits within which the government may thus provide for the good of society. These may be said to have been the views of Liberal politicians and latitudinarian churchmen. On the other hand, the religious theory of government, as expounded in Dr Arnold's Oxford *Lectures on History*, is based on the conception that the ideal church and state are one. Here there can be no bounds to the legitimate action of the state except its conformity with religious truth. And Dr Arnold does not hesitate to forecast an ideal state of society in which disbelief in the Christian religion shall so outrage the moral sense of the community that it may fittingly be put down by the strong arm of the law. The weakness of all theological speculations about government is that they are fitted only for local use. The theory of government cannot well be discussed to much purpose with a disputant who requires a series of theological propositions to be taken for granted.

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[1] Mr Mark Pattison in *Essays and Reviews*.

The Laissez-faire Theory.—Mill.—A more profitable line of inquiry has been followed by writers of the economical school. The most important of these is John Stuart Mill, whose essay on *Liberty*, together with the concluding chapters of his treatise on *Political Economy*, gives a tolerably complete view of the principles of government. The leaning of political economists is towards what is called the *laissez-faire* or non-interference doctrine. There is a general presumption against the interference of Government, which is only to be overcome by very strong evidence of necessity. Governmental action is generally less effective than voluntary action. The necessary duties of Government are so burdensome, that to increase them destroys its efficiency. Its powers are already so great that individual freedom is constantly in danger. As a general rule, nothing which can be done by the voluntary agency of individuals should be left to the state. Each man is the best judge of his own interests. But, on the other hand, when the thing itself is admitted to be useful or necessary, and it cannot be effected by voluntary agency, or when it is of such a nature that the consumer cannot be considered capable of judging of the quality supplied, then Mr Mill would allow the state to interpose. Thus the education of children, and even of adults, would fairly come within the province of the state. Mr Mill even goes so far as to admit that, where a restriction of the hours of labour, or the establishment of a periodical holiday, is proved to be beneficial to labourers as a class, but cannot be carried out voluntarily on account of the refusal of individuals to co-operate, Government may justifiably compel them to co-operate. Still further, Mr Mill would desire to see some control exercised by the Government over the operations of those voluntary associations which, consisting of large numbers of shareholders, necessarily leave their affairs in the hands of one or a few persons. In short, Mr Mill's general rule against state action admits of many important exceptions, founded on no principle less vague than that of public expediency. The essay on *Liberty* is mainly concerned with freedom of individual character, and its arguments apply to control exercised, not only by the state, but by society in the form of public opinion. The leading principle is that of Humboldt, "the absolute and essential importance of human development in its richest diversity." Humboldt broadly excluded education, religion, and morals from the action, direct and indirect, of the state. Mill, as we have seen, conceives education to be within the province of the state, but he would confine its action to compelling parents to educate their children.

Herbert Spencer.—The most thoroughgoing opponent of state action, however, is Mr Herbert Spencer In his *Social Statics*, published in 1850, he holds it to be the essential duty of Government to *protect*—to maintain men's rights to life, to personal liberty, and to property; and the theory that the Government ought to undertake other offices besides that of protector he regards as an untenable theory. Each man has a right to the fullest exercise of all his faculties, compatible with the same right in others. This is the fundamental law of equal freedom, which it is the duty and the only duty of the state to enforce. If the state goes beyond this duty, it becomes, not a protector, but an aggressor. Thus all state regulations of commerce, all religious establishments, all Government relief of the poor, all state systems of education and of sanitary superintendence, even the state currency and the post-office, stand condemned, not only as ineffective for their respective purposes, but as involving violations of man's natural liberty. Many of the principles enunciated in this book are not reconcilable with the later views of the author, but he would still appear to maintain his theory of government to the fullest extent. Thus, in the *Principles of Sociology*, published in 1877, he distinguishes between the militant type of society and the industrial type. The former is framed on the principle of compulsory co-operation, while the latter is framed on the principle of voluntary co-operation He vaguely indicates "a possible future social type, differing as much from the industrial as this does from the militant,—a type which, having a sustaining system more fully developed than any one known at present, will use the products of industry neither for maintaining a militant organization nor exclusively for material aggrandizement, but will devote them to the carrying on of higher activities." Of the two actually existing types, the militant is distinguished by a strong and the industrial by a feeble Governmental system. Reversing the analogy suggested by individual organisms, he holds the latter to be a higher and better type than the former.[2] And he maintains that military activity in a state distinguished by a high degree of industrial development produces a recurrence to the militant type of institutions generally. Thus, in Germany, the dealings of Bismarck with the ecclesiastical powers, and the measures taken for centralizing the state control of railways, are instances of a more coercive *régime* established by war. In England, the peaceful period from 1815 to 1850 is contrasted with the militant period since 1850. The latter has been marked by the usurpations of military officialism, by sanitary dictation, by coercive philanthropy, by compulsory education, by an unhesitating faith in state-judgment, and by a general disregard of the principles of free government, even on the side of the party which in the previous period effected changes in the direction of freedom.

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[1] *Critical and Historical Essays*, vol. i.

[2] *Principles of Sociology*, vol. i., London, 1877. In a postscript to part ii. Mr Spencer explains the "origin of this seeming incongruity." Individual organisms, high or low, have to maintain their lives by offensive or defensive activities or both; social organisms, except during the militant stage of their evolution, have not.

Tendency of recent Legislation.—Turning from political theory to political practice, let us see how the legislation of the last fifty years in England has drawn the line between legitimate and illegitimate state action. The period that has elapsed since the passing of the Reform Act of 1832 has been one of great legislative activity. In no former period has legislation been so completely under the control of public opinion, or so directly affected by open discussion of the principles of projected measures. It will be of some interest, therefore, to inquire how the most enlightened political community in the world has, during the period of its fullest freedom, defined the business of government.

Reduction of State Action.—Religion.—The cases in which Government interference has been abolished or greatly limited during this period are mainly two—in matters of opinion (especially religious opinion), and in matters of contract. The principle that the state ought to maintain some form of religion has been surrendered by the disestablishment of the Irish Church. The disqualifications, political and civil, of dissenters, have, with a very few and not very important exceptions, been removed. The last remnant of the old rule, making witnesses incompetent on religious grounds, was removed by the Act enabling persons to give evidence without an oath. A few statutes making various forms of irreligion punishable still remain, but they are never enforced, and any attempt to enforce them would almost certainly end in their formal repeal. State prosecutions for expression of opinion have almost entirely ceased, and practically the only instrument of control now left is the law of libel. Under the influence of the judges, that law has, during the period in question, been uniformly interpreted in a sense favourable to the freedom of discussion. One of the few remaining restrictions on religious freedom is the principle, acted on in several recent cases, that a contract may be broken if its object is to facilitate the expression of irreligious opinions.[1]

At the same time there appears to be a tendency to distinguish between merely irreligious opinions and opinions pronounced to be immoral. Convictions have lately been obtained for publishing and selling books advocating opinions on certain moral and social questions which appeared to a jury to be calculated to deprave the morals of the people. But here again the distinction has been authoritatively drawn between such views when presented in a scientific form, and adapted to a scientific audience, and the same views offered openly to the unscientific public. Untenable as such distinctions are, they manifest a tendency on the part of the courts to confine the prosecution of opinion within the principle of the law against indecent publications. It may further be added that, with one notable exception,—the Public Worship Regulation Act,—the dealings of the state with the church have been confined within a very narrow compass. The endowment of new sees, for instance, although sanctioned by the state, is left to the voluntary contributions of the public.

Contract.—Freedom of contract, in general, has been greatly advanced by the success of the free trade agitation in 1846, which was [illegible] a protest against state regulation as a demand for a cheap supply of food. Since that time, the principle that the state should leave men to make what bargains they please, without attempting to encourage any particular industry or to favour any special class, has taken rank as a maxim of universal application. One class of contracts—those between master and servant—long remained an exception to the general rule. Breach of such contracts by the servant was treated as a criminal offence, and the combination of servants to obtain a rise of wages as a conspiracy. A series of statutes, the last of which was passed a few years ago, has abolished the criminal character of the breach of the contract of service, except in a few cases. The abolition of the laws against usury in 1857 is another instance; the authorization of trading companies with limited liability is another. The last great legislative measure before parliament (the Criminal Code Bill of 1879) proposes to do away with the old offences of maintenance and champerty. Besides the classes regarded by law as under disability to contract (infants, lunatics, and married women), a few doubtful instances of protected persons might still be named. Thus expectant heirs are treated in the spirit of the old laws against usury. Seamen are not allowed to make a charge upon their wages. In certain employments specified in the Truck Act wages are not allowed to be paid otherwise than in coin. The principle of free trade is outraged in its own name by the legal rule which vitiates contracts made "in restraint of trade."

Increase of State Action.—The enumeration of new restrictive measures, and instances of increased state interference within the same period, would occupy a much more formidable list. A rough classification only will be here attempted. We shall take first, interference for the protection of definite classes of persons.

Education of Children.—This is perhaps the most conspicuous, as it is certainly the most beneficial and the least disputed, of the recent encroachments of the state. The progress of opinion and legislation on this subject has been singularly rapid. Beginning with Government grants in aid of education, strenuously resisted on grounds going to the very root of the question of legitimate state interference, the system has now culminated in a net-work of state-supported and state-administered schools spread over the whole country. That the state should compel parents to educate their children would only be a slight departure, if any, from the general principle imposing duties on parents and disabilities on children. Under the present system the state not only compels the parent to educate, but itself provides, and in great measure pays for, the education. A generation of discussion has, however, drawn very distinctly the line beyond which this advance of state authority must not proceed. Compulsory state education is for children only, and may be justified by the general argument which justifies state protection to the helpless; it is elementary only; and it is secular only.

Regulation of the Labour of Children and Women.—The long series of Factory Acts is the best example of the steady and persistent advance of Government control in this direction. Here the line of protection is considerably advanced, but is again carefully drawn under male adults, although these of necessity share in the benefits of the protection in all employments where their work requires the co-operation of women and children. See FACTORY ACTS.

Regulation of Dangerous Employments.—Of these the Mines Regulation Acts are perhaps the best example. Here the Government actually lays down the rules under which alone these employments are suffered to be carried on. Here the principle that adults are capable of looking after themselves is overruled by the dangerous character of the employment.

In all these cases the action of the state is defended on the ground that the persons protected are unable sufficiently to protect themselves; and the principle adopted is that of prevention instead of mere punishment for breach of duty. Hence an enormous army of inspectors is required for the work of control.

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[1] [illegible] a lecture advocating atheistic principles.

Another class of interferences is justified on the ground of *public health*, and these, in respect of the amount of state supervision required, stand next to the protective measures already enumerated. The common law of nuisance recognizes the principle that any source of contagion or discomfort set up by an individual is an injury to those who may be affected by it, which they may call upon the state to suppress. The Sanitary Acts interpose the remedy at an earlier stage, and by the usual apparatus of Government inspectors and detectives. The largest measure on this subject is the Public Health Act, and the most extreme development of the principle is the lending of money by the Government to municipalities for the erection of healthy dwelling houses for labourers. Personal freedom is more directly affected by measures like the Vaccination Act, for which, however, the double ground of the helplessness of the subjects and the prevention of danger amounting to nuisance may be taken. The least defensible of all the measures of this class are those relating to the adulteration of various kinds of food. The fraudulent or negligent supply of food injurious to health is an injury which may be appropriately punished by awarding compensation to the person injured, and inflicting punishment on the delinquent. But under the last Act (Sale of Food and Drugs Act, 1875) it is a criminal offence to sell goods of a quality not asked for, and the usual staff of analysts and inspectors is established to facilitate detection. The mighty engine of Government determines the exact percentage of water which the dairyman may put in his milk and the publican in his gin.

Next come the cases in which the Government either aids or itself undertakes works of *public convenience*. The state monopoly of the post-office is the most conspicuous example, and we have recently seen it extended by the acquisition of the telegraphs. Less directly the state has acquired control of the locomotive system, by granting compulsory powers of various sorts and a partial monopoly to railway companies, and by imposing certain regulations on them. This department of state activity has been greatly increased by the operations of the Public Works Loans Commission, which lends money to local bodies for such purposes as the erection of baths and wash-houses, improving rivers, harbours, and towns, building lighthouses and public libraries, and the like.

The assertion of state control over *endowments* is another marked feature of the period. Except in this way, Government has not, in England at least, interfered with the higher sort of education to any great extent. But most of the endowed schools and the universities have been subjected to inquiry, and remodelled according to what are understood to be the demands of the age. Almost every kind of corporation has been revised in the same way, the most notable and scandalous exception being the numerous and wealthy corporations of the city of London. The history of these reforms reveals a perfectly clear *rationale* of the relations existing between an endowed institution and the state. All endowments are privileges created by the state in the way of exception to the universal rule of law against perpetuities—the rule which limits the operation of dead men's wills, and makes each generation master of its existing resources. When the purposes of an institution cease to be useful, or its organization is seen to be defective, it is the right and duty of the state to withdraw the privilege altogether, or continue it under new conditions. All endowments become, in virtue of this rule, the property of the state; and how it shall deal with them becomes a question of statesmanship, not of interference with private interests. Under the name of "vested interests," all existing rights of individuals are stringently preserved. These two correlative principles—the right of the state to revise all endowments, and the obligation to respect vested interests in any such revision—have ceased to be disputable in English politics.

A similar extension of state control is to be seen in the organization of the *professions*—*i.e.*, persons licensed to practise particular arts. The church, like the army, is not, properly speaking, a profession, and its regulations belong to the same class as those of the army or the civil service. The true professions are the various grades of lawyers and medical men. They have an exclusive monopoly of the arts which they profess. The protection of this monopoly was long the only connexion between them and the Government. They were left to the management of self-governing societies or corporations. Within our own generation there has been, not only a marked increase of state control over the professions, but a marked tendency to extend it to occupations hitherto uncontrolled. The system of medical licentiation is year by year becoming more stringent and more centralized. A recent Act provides for the more efficient testing of the qualifications of solicitors. The bar, which has hitherto with immense practical wisdom governed itself by means of voluntary societies, is threatened with a parliamentary constitution, settling the conditions of admission, examination, discipline, and dismissal. The free professions are demanding the like recognition and supervision by the state. A bill is now (1879) before parliament for organizing the professions of schoolmasters in the higher class of schools; and elementary schoolmasters are claiming to be included in its scope. The business of buying and selling stocks and shares has narrowly escaped, if it has escaped, the rules and regulations of an act of parliament. A commission was actually appointed a few years ago to investigate the practices of brokers and jobbers, and one of its recommendations was that the Stock Exchange should forthwith become a corporation. The last interference of this sort was the appointment of a committee of the House of Commons, at the instance of the London retail traders, to inquire into the working of what are called co-operative stores. Inquiry does not of course imply interference, and a committee or a commission is often a convenient way of stopping the mouths of agitators whom it might not be convenient to ignore altogether. Futile as the remedy may be, the first thought of every aggrieved class is to lay its wrongs before parliament.

Protection of things from Excessive Consumption.—Another class of interferences may be described, in the most general terms, as measures taken for the protection of things which would otherwise perish, or greatly diminish, by reason of excessive use. Statutes of this sort have greatly multiplied during the last fifty years. There is hardly any kind of animal, which men think worth catching or eating, without its statutory close-time. The ostensible reason for this kind of legislation is that salmon, let us say, or oysters, are a very important article of food, and unless men are restrained from pursuing them to excess, the whole breed would ultimately be extinguished, or so reduced in number as to be of little use. Another and less avowed reason is that animals of the protected order are necessary for the recreation of a certain class of gentlemen, who, in the interest of their own pleasures, must be restrained from carrying them to excess. Thus no gun must be lifted against grouse before the 12th of August, or against partridges before the 1st of September, so that next year there may still be grouse and partridges in the land. The great majority of these enactments belong in spirit to the game-laws, but many of them are genuinely intended for the perpetuation of perishable supplies of food. Some of them, like the Sea-birds Protection Act, or the Small Bird's Protection Act, are dictated by some sentimental fear of the extinction of such animals. As a whole, they are among the least defensible of the modern extensions of state power.

Coercion for Moral Purposes.—The measures hitherto noticed may in general be justified either on the ground of the inability of the persons protected to help themselves, or on the ground that some good to society as a whole, or to large portions of it, is secured thereby. Another class of measures openly aims at the moral improvement of the individuals affected by them, and in this class there has been an amazing and alarming increase. The laws against gaming are one of the best examples. At common law a wager was a contract, enforceable by the tribunals like any other. Not content with declining to enforce wagers, the state went further, and tried to put them down altogether. It made lotteries illegal. It visited with heavy penalties the keeping of betting-houses, all betting in public places, the publication of betting lists, &c. Games which lead to betting are put under the restraint of a licensing system, and in some parts of the provinces the state orders its citizens not to play billiards after eleven o'clock at night. To this class belongs the severe code regulating what is called the liquor traffic. Through the agency of licensing magistrates, the state first of all limits the number of public-houses; then it dictates directly the hours during which liquor may be bought and sold; and in Scotland and Ireland it goes further, and prohibits altogether the sale of liquor on Sunday. A committee of the House of Lords has touched the highest point of government control in proposing to empower local authorities to buy up all the public houses in their districts, and carry on the business for themselves. There is a simultaneously increasing tendency to interfere with people's amusements: fairs are being put down as immoral, music and dancing require licences very charily granted, the grip of the lord chamberlain over the London theatres is tightened, and so on. The course of moral legislation, in fact, threatens to sweep away every barrier to the encroachments of the state. The extended range of Government interference in other things has been accompanied, as we have seen, by a very distinct recognition of limits, either in the rights of the individual conscience, or in the capacity of adult manhood to manage its own affairs. But Acts of Parliament for improving the moral characters of men seem to recognize no limit at all. And it is a singular fact that, while this kind of legislation, under existing social arrangements, fails to affect the well-to-do classes, and presses chiefly on the comparatively poor, it is becoming more and more identified with the popular party in politics, and gathers strength with every addition to the popular element in government.

We have hitherto confined our attention to simple as opposed to compound forms of government, and to the supreme as opposed to the subordinate functions of government. The complete treatment of the subject would require us to take some notice of the (1) association of several communities, with separate governments under one sovereignty, and (2) of the subordinate organizations for carrying on the government of localities, under the supreme government.

1. *Federal Government.*—As this is the subject of a separate article (vol. ix. p. 61), we need only notice here the case in which one of the associated Governments is the ultimate seat of sovereign power, the others being its colonies or dependencies. England is, of course, by far the most illustrious example of a country so situated, and her relations with the subordinate communities exhibit much variety of form. One leading distinction may be drawn,—namely, between the communities which are allowed to govern themselves and those which, either as being unfit for self-government, like India and Fiji, or on account of the military necessities of the situation, as Malta and Gibraltar, are governed by the officers of the English Government. In the subject dependencies, as the latter may be called, the government is usually carried on by a governor and council, nominated by the crown, and holding office for various terms of years. The council, as a general rule, consists of the higher officers of the dependency, such as the chief-justice or the attorney-general. The governor and council are strictly the delegates of the home Government and have no legal or constitutional status of their own. The recently acquired island of Cyprus occupies an anomalous position in the British state system. The English Government holds it, not as sovereign, but as lieutenant-general of the sovereign, the sultan of Turkey. The government of the island is vested in a commissioner who takes his orders, not from the colonial, but from the foreign office. As a general rule the relations between the mother country and her dependencies are under the charge of a special department of state—the colonial office.

In free dependencies the alternative is between some kind of confederation with the mother country, whereby the dependency shall have a representative voice in the supreme government, and the practical independence of the dependency in all but international affairs. In the French system the deputies of Algiers and other colonies sit in the supreme legislature along with the other representatives of France. In the English system distance alone would render such a scheme impracticable; and, even where distance would be little or no hindrance, there has been no desire on either side for any such connexion. Dependencies like the Isle of Man and the Channel Islands are as completely separated from England as New Zealand and Canada. The free dependencies have local constitutions framed on the model of the home Government—two chambers of legislature, a governor nominated by the crown, and a ministry dependent on parliament. The governor is supposed to stand to the ministry and parliament as the crown to the ministry and parliament at home; but it is to be remembered that the governor is, properly speaking, the representative not of the English crown but of the English Government. It is from the colonial secretary that the governor takes his instructions, and the colonial secretary and his colleagues take their instructions from the House of Commons. And, just as the practice of the constitution has made it impossible for the monarch to resist the wishes of parliament, so it is established that the governor, as representing England, shall not veto enactments of the colonial legislature. Just as in England the House of Commons invariably determines the fate of a ministry, so does the lower or popular house in a colonial legislature. It is needless to say that this is a very great advance on the old theory of colonial relations. Beginning in special grants or charters granted to individuals or corporations, the English colonies in North America held their liberties by the grace of the crown. The successful revolt of the colonies taught the mother country the folly of supposing that Englishmen in America would consent to be governed by Englishmen at home.

Although colonial institutions are modelled as nearly as may be after the original type, they are not entirely free from questions of fundamental difficulty. The central question of government—Whose will is to prevail?—has at the present time (1879) been agitating two of the greatest of the colonies, a deadlock between the council and the assembly in Victoria being referred to England, and the governor-general of Canada refusing to dismiss a lieutenant-governor on the advice of his responsible ministry.

The subjection of colonies to the home Government is still retained in two important cases. The colonies have no voice whatever in determining the nature of their relations with other communities; the question of peace or war is decided for them by the home Government. Again, all the colonies, whatever may be their powers of local self-government, seek justice in the last resort from the sovereign in council.

2. *Local Government.*—As the business or society at large must be undertaken by the supreme government, so the local business of the subdivisions of society must be undertaken by local sub-governments. Local government repeats on a small scale the features of the supreme government, but its business is chiefly judicial and administrative. The most marked distinction here is between rural and urban communities—between the county and the borough. Self-government or representative government is the rule in the latter, the exception in the former. In England, since the Municipal Corporations Act, the affairs of all urban communities, except the city of London and a few unimportant boroughs, are managed by the direct representatives of the inhabitants. In the counties the control of affairs rests with the justices of the peace, who are nominated by the crown exclusively from the class of gentry.

The degree of control exercised by the supreme government over local governments is a point of first-rate importance in the constitution of a country. Among free countries England and France stand at opposite ends of the scale,—England being characterized by great local independence, France by strict central control. Thus it is said that, even under the republic, the minister of education can say that at a given hour all the children in all the schools of France are learning the same lesson. The habitual dependence of the French people upon the action of the state has been described as a survival from the times of imperial despotism which may be expected to disappear gradually under the influence of freedom. A step in this direction has certainly been taken in the proposal to allow communes to elect their own *maire*; and the abuse of the prefectoral system by a recent ministry ought to lead to some diminution of its enormous powers. On the other hand the increased activity of the state, which, as we have already seen, has accompanied the establishment of popular government on a wide basis in England, has shown itself also in increased centralization. The new functions—educational, sanitary, and other—imposed on local bodies are controlled by the supreme government through central boards. In 1871 the local government board was constituted to take over the powers of control over local boards hitherto exercised by various high officers of state, the poor law board, and the privy council. More recently the Prisons Act of 1877 has transferred to the secretary of state the powers hitherto exercised by the local prison authorities, and has made the cost of maintaining local prisons a burden on the public funds

As we have already said, the work of local governments generally embraces very little that can properly be called legislation. They have a power of making bye-laws for carrying out within their district the purposes of a general law, and over that power the courts of justice exercise a vigilant control. Parliament in England has hitherto looked with great distrust on subordinate legislatures, and it is a common saying that the jealousy of the House of Commons is one of the reasons why the metropolis remains without municipal government. But it would now be generally admitted that the legislation demanded of parliament every year is greatly beyond its effective powers. There are indications of an approach to something that may be described as home rule—a name which inspires more distrust than the reality. Parliament makes no pretence of consistency in legislating separately for England, Scotland, and Ireland. To take only notorious examples,—the Irish Land Act, the Disestablishment Act, and the Sunday Liquor Act of Ireland, and the Forbes Mackenzie Act of Scotland are instances of legislation according to the supposed wishes of the people specially affected. Irish and Scotch business tends in the House of Commons more and more to fall into the hands of Irish and Scotch members, and the interference of others is not unfrequently resented as an intrusion. Again, private bill legislation, regulated as it is by ascertained general principles, has come to be in fact, as in form, a purely judicial proceeding, which might well be relegated, as it no doubt one day will be relegated, to local tribunals. Another indication of the same tendency is to be found in what is called permissive legislation, which leaves to local authorities the responsibility of deciding how far a given principle shall be applied. (E. R.)

GOWER, JOHN (1325?–1408), one of the best of the English minor poets, was born in or about the year 1325; but the date is not exactly known. It has been conclusively shown by Sir Harris Nicolas that he belonged to the county of Kent. His family was wealthy; and he seems to have had various country houses. So far as we know he did not marry till 1397, when he was united to Agnes Groundolf. He was an intimate friend of Chaucer; but there is no evidence to prove that they were fellow-students. A few years after his marriage, Gower became blind, and had to give up writing. He spent his declining years in the priory of St Mary Overies, or, as it is now called, St Saviour's, in Southwark, where his monument is still to be seen.

Near the close of the *Confessio Amantis*, Gower puts the following compliment to Chaucer into the mouth of Venus:—

> "And greet weel Chaucer when ye meet,
> As my disciple and my poet;
> For in the floures of his youth,
> In sundry wise, as he well couth
> Of ditties and of songes glade,
> The which he for my sake made,
> The land fulfilled is over all;" &c.

In these lines he was merely requiting a compliment that had been paid him some years before by his brother-poet, who, in dedicating to him his *Troilus and Cressida*, addressed him as "O moral Gower," an epithet which, though not remarkably happy, has stuck to him. Gower died in 1408. In his will he leaves a number of religious legacies to various ecclesiastical persons and institutions, and £100, along with the rents of his manors, to his wife Agnes. The beautiful church in which Gower lies was rebuilt in great part at his expense, and proves, among other things, that he must have been exempt from one of the usual misfortunes of poets—poverty.

Gower's poetical works are four in number—*Balades and other Poems*, in French, printed in 1818 for the Roxburghe Club; the *Speculum Meditantis*, a treatise on the duties of married life, written in French verse, and divided into ten books; *Vox Clamantis*, a narrative in Latin elegiacs, of the insurrection of the commons in the reign of Richard II.; and the *Confessio Amantis*. The second of these works is believed to have perished; of the third there is a good edition by the Rev. H. O. Coxe, printed for the Roxburghe Club in 1850; and the fourth was first printed by Caxton in 1483. The *Confessio Amantis*, or Lover's Confession, is a huge miscellaneous collection of physical, metaphysical, and moral reflexions, and of stories culled from the common repertories of the Middle Ages. A kind of unity is given to these apparently incongruous materials by the form of the poem, which is a dialogue between a lover and his confessor, who is a priest of Venus, and is called Genius. In the moral part of his theme, Gower is confessedly wise, impressive, and sometimes almost sublime. But, as Ellis, in his *Specimens of the Early English Poets*, observes, "His narrative is often quite petrifying; and when we read in his works the tales with which we have been familiarized in the poems of Ovid, we feel a mixture of surprise and despair at the perverse industry employed in removing every detail on which the imagination had been accustomed to fasten. The author of the *Metamorphoses* was a poet, and at least sufficiently fond of ornament. Gower considers him as a mere annalist, scrupulously preserves his facts, relates them with great perspicuity, and is fully satisfied when he has extracted from them as much morality as they can reasonably be expected to furnish." As Professor Lowell has well remarked, Gower "has positively raised tediousness to the precision of a science." Though his descriptions are often extremely agreeable, and his diction easy and smooth, his prolixity, and the prosaic feebleness of the conceptions, will prevent the *Lover's Confession* from ever rivalling the writings of Chaucer, or even approximating them in popularity.

See Todd's *Illustrations of the Lives and Writings of Gower and Chaucer*; Ellis's *Specimens of the Early English Poets*; Craik's *Hist. Lit.*; Warton's *Hist. Eng. Poetry*; Godwin's *Life of Chaucer*; Morley's *English Writers*; Sir Harris Nicolas's *Life of Chaucer*; Mrs Mason's *Three Centuries of English Poetry*; *Retrospective Review* for 1828, where Sir Harris Nicolas throws fresh light on the subject; *Observations on the Language of Chaucer's Canterbury Tales, and Gower's Confessio Amantis*, by F. J. Child; Minto's *Characteristics of English Poets*; and, above all, Dr Reinhold Pauli's scholarly edition of the *Confessio Amantis* (London, 1857), which contains a notice of Gower, and an account of the MSS and editions of the poem.

GOYA, a town of the Argentine Republic, in the province of Corrientes, near the junction of a small stream with the Paraná, about 100 miles S. of Corrientes. The streets are about 60 feet wide, and the houses, built of brick, are often two stories high. One side of the handsome plaza is occupied by a large church erected by local subscription, and in the centre there is a pyramid 50 feet high. Hides, wool, cheese, and oranges are the principal articles of trade, the cheese especially finding a good market at Buenos Ayres and elsewhere. The town was founded in 1807 by the national Government, and is said to have derived its name from Goya or Gregoria, the wife of the Portuguese cattle-farmer who was formerly settled on the spot. The population, which includes a large foreign element,—Italians, Basques, and French,—amounted to 10,907 in 1869. See Mulhall's *Handbook of the River Plate*.

GOYANNA, a city of Brazil, in the province of Pernambuco, on a river of its own name, about 10 miles from the sea. It is a well-built place, and carries on a trade in cotton, sugar, rum, hides, timber, dye-stuffs, oils, and other products of the fertile region in which it lies. Most of its exports are sent to Recife for shipment, its own port being only deep enough for the larger class of coasting vessels. The population is about 12,000.

GOYA Y LUCIENTES, Francisco (1746-1829), Spanish painter, was born in 1746 at Fuendetodos, a small Aragonese village near Saragossa. At an early age he commenced his artistic career under the direction of José Luzan Martinez, who had studied painting at Naples under Mastroleo. It is clear that the accuracy in drawing Luzan is said to have acquired by diligent study of the best Italian masters did not much influence his erratic pupil. Goya, a true son of his province, was bold, capricious, headstrong, and obstinate. He took a prominent part on more than one occasion in those rival religious processions at Saragossa which often ended in unseemly frays, and his friends were led in consequence to despatch him in his nineteenth year to Madrid, where, prior to his departure for Rome, his mode of life appears to have been anything but that of a quiet and orderly citizen. Being a good musician, and gifted with a voice, he sallied forth nightly, serenading the caged beauties of the capital, with whom he seems to have been a very general favourite.

Lacking the necessary royal patronage, and probably scandalizing by his mode of life the sedate court officials, he did not receive—perhaps did not seek—the usual honorarium accorded to those students who visited Rome for the purpose of study. Finding it convenient to retire for a time from Madrid, he decided to visit Rome at his own cost; and being without resources he joined a "quadrilla" of bull-fighters, passing from town to town until he reached the shores of the Mediterranean. We next hear of him reaching Rome, broken in health and financially bankrupt. In 1772 he was awarded the second prize in a competition initiated by the academy of Parma, styling himself "pupil to Bayeu, painter to the king of Spain." Compelled to quit Rome somewhat suddenly, he appears again in Madrid in 1775, the husband of Bayeu's daughter, and father of a son. About this time he appears to have visited his parents at Fuendetodos, no doubt noting much which later on he utilized in his genre works. On returning to Madrid he commenced painting canvasses for the tapestry factory of Santa Barbara, in which the king took much interest. Between 1776 and 1780 he appears to have supplied thirty examples, receiving about £1200 for them. Soon after the revolution of 1868, an official was appointed to take an inventory of all works of art belonging to the nation, and in one of the cellars of the Madrid palace were discovered forty-three of these works of Goya on rolls forgotten and neglected (see *Los Tapices de Goya; por Cruzada Villaamil*, Madrid, 1870).

His originality and talent were soon recognized by Mengs, the king's painter, and royal favour naturally followed. His career now becomes intimately connected with the court life of his time. He was commissioned by the king to design a series of frescos for the church of St Anthony of Florida, Madrid, and he also produced works for Saragossa, Valencia, and Toledo. Ecclesiastical art was not his forte, and although he cannot be said to have failed in any of his work, his fame was not enhanced by his religious subjects.

In portraiture, without doubt, Goya excelled: his portraits are evidently life-like and unexaggerated, and he disdained flattery. He worked rapidly, and during his long stay at Madrid painted, amongst many others, the portraits of four sovereigns of Spain—Charles III. and IV., Ferdinand VII., and "King Joseph." The duke of Wellington also sat to him; but on his making some remark which raised the artist's choler, Goya seized a plaster cast and hurled it at the head of the duke. There are extant two pencil sketches of Wellington, one in the British Museum, the other in a private collection. One of his best portraits is that of the lovely Andalusian duchess of Alva. He now became the spoiled child of fortune, and acquired, at any rate externally, much of the polish of court manners. He still worked industriously upon his own lines, and, while there is a stiffness almost ungainly in the pose of some of his portraits, the stern individuality is always preserved.

Including the designs for tapestry, Goya's genre works are numerous and varied, both in style and feeling, from his Watteau-like Al Fresco Breakfast, Romeria de San Isidro, to the Curate feeding the Devil's Lamp, the [illegible], and the painfully realistic massacre of the Dos de Mayo (1808). Goya's versatility is proverbial; in his hands the pencil, brush, and graver are equally powerful. Some of his crayon sketches of scenes in the bull ring are full of force and character, slight but full of meaning. He was in his thirty-second year when he commenced his etchings from Velazquez, whose influence may, however, be traced in his work at an earlier date. A careful examination of some of the drawings made for these etchings indicates a steadiness of purpose not usually discovered in Goya's craft as draughtsman. He is much more widely known by his etchings than his oils; the latter necessarily must be sought in public and private collections principally in Spain, while the former are known and prized in every capital of Europe. The etched collections by which Goya is best known include Los Caprichos, which have a satirical meaning known only to the few; they are bold, weird, and full of force. Los Proverbios are also supposed to have some hidden intention. Los Desastres de la Guerra may fairly claim to depict Spain during the French invasion. In the bull fight series, Goya is evidently at home; he was a skilled master of the barbarous art, and no doubt every sketch is true to nature, and from life.

Goya retired from Madrid, desiring probably during his latter years to escape the trying climate of that capital. He died at Bordeaux in his eighty-third year, and a monument has been erected there over his remains. Whether his influence produced the art of Fortuny and the modern Spanish school may be matter of discussion; but, from the deaths of Velasquez and Murillo to the advent of Fortuny, Goya's name is the only important one found in the history of Spanish art. Paul Lefort and Yriarte may be consulted for fuller details of his life and works.

GOYAZ, or, as it was formerly called, Villa Bõa de Goyaz, the chief town of the province of Goyaz in Brazil, in the valley of the auriferous Velmelho, a right-hand tributary of the Araguaia. It lies about 650 miles N.W. of Rio de Janeiro, and 700 miles S.W. of San Salvador. As a bishop's see, the seat of the provincial assembly, and the residence of a civil president and a military governor, it is a place of considerable importance; and with its broad streets, wide squares, and well-built houses it ranks as one of the most attractive towns of Brazil. The public buildings comprise the legislative chambers, a court house, a hospital, a prison, an institution for the assaying of gold, and a municipal slaughter-house. Goyaz was founded in 1736 under the name of Santa Anna, and it received its present designation about three years later when it was raised to the rank of a city. The population is about 8000.

GOYEN, Jan Josephszoon van (1596–1656), was born at Leyden on the 13th of January 1596, learned painting under several masters at Leyden and Haarlem, married in 1618, and settled at the Hague about 1631. One of the few Dutch painters who failed to captivate English taste, his influence was great on Dutch art; and he was one of the first to emancipate himself from the traditions of minute imitation embodied in the works of Breughel and Savery. Though he preserved the dun scale of tone peculiar to those painters, he studied atmospheric effects in black and white with considerable skill. He formed Solomon Ruysdael and Pieter Potter, forced attention from Rembrandt, and bequeathed some of his precepts to Pieter de Molyn, Coelenbier, Saftleven, Van der Kabel, and even Berghem. His life at the Hague for twenty-five years was very prosperous, and he rose in 1640 to be president of his guild. A friend of Van Dyck and Bartholomew van der Helst, he sat to both these artists for his likeness. His daughter Margaret married Jan Steen, and he had steady patrons in the stadtholder Frederick Henry, and the chiefs of the municipality of the Hague. He died at the Hague in 1656, possessed of land and houses to the amount of 15,000 florins.

Between 1610 and 1616 Van Goyen wandered from one school to the other. He was first apprenticed to Isaak Swanenburgh; he then passed through the workshops of De Man, Kluk, and De Hoorn. In 1616 he took a decisive step and joined Esaias van der Velde at Harlem; amongst his earlier pictures, some of 1621 (Berlin Museum) and 1623 (Brunswick Gallery) show the influence of Esaias very perceptibly. The landscape is minute. Details of branching and foliage are given, and the figures are important in relation to the distances. After 1625 these peculiarities gradually disappear. Atmospheric effect in landscapes of cool tints varying from grey green to pearl or brown and yellow dun is the principal object which Van Goyen holds in view, and he succeeds admirably in light skies with drifting misty cloud, and downs with cottages and scanty shrubbery or stunted trees. Neglecting all detail of foliage he now works in a thin diluted medium, laying on rubbings as of sepia or Indian ink, and finishing without loss of transparence or lucidity. Throwing his foreground into darkness, he casts alternate light and shade upon the more distant planes, and realizes most pleasing views of large expanse. In buildings and water, with shipping near the banks, he sometimes has the strength if not the colour of Albert Cuyp. The defect of his work is chiefly want of solidity. But even this had its charm for Van Goyen's contemporaries, and some time elapsed before Cuyp, who imitated him, restricted his method of transparent tinting to the foliage of foreground trees.

Van Goyen's pictures are comparatively rare in English collections. Unrepresented in the national galleries, he is seen to advantage abroad, and chiefly at the Louvre, and in Berlin, Gotha, Vienna, Munich, and Augsburg. Twenty-eight of his works were exhibited together at Vienna in 1873. His panels fell in value during the 17th century, when they fetched prices as low as 10 and seldom as high as 100 florins. Now they are worth ten times more than in 1700. Though he visited France once or twice, Van Goyen chiefly confined himself to the scenery of Holland and the Rhine. Nine times from 1633 to 1655 he painted views of Dordrecht. Nimeguen was one of his favourite resorts. But he was also fond of Haarlem and Amsterdam, and he did not neglect Arnheim or Utrecht. One of his largest pieces is a view of the Hague, executed in 1651 for the municipality, and now in the town collection of that city. Most of his panels represent reaches of the Rhine, the Waal, and the Maese. But he sometimes sketched the downs of Scheveningen, or the sea at the mouth of the Rhine and Scheldt; and he liked to depict the calm inshore, and rarely ventured upon seas stirred by more than a curling breeze or the swell of a coming squall. He often painted winter scenes, with ice and skaters and sledges, in the style familiar to Isaac van Ostade. There are numerous varieties of these subjects in the master's works from 1621 to 1653. One historical picture has been assigned to Van Goyen—the embarkation of Charles II. in the Bute collection. But this canvas was executed after Van Goyen's death. When he tried this form of art he properly mistrusted his own powers. But he produced little in partnership with his contemporaries, and we can only except the Watering-place in the gallery of Vienna, where the landscape is enlivened with horses and cattle by Philip Wouvermans. Even Jan Steen, who was his son-in-law, only painted figures for one of his pictures, and it is probable that this piece was completed after Van Goyen's death. More than 250 of Van Goyen's pictures are known and accessible. Of this number little more than 70 are undated. None exist without the full name or monogram, and yet there is no painter whose hand it is easier to trace without the help of these adjuncts. An etcher, but a poor one, Van Goyen has only bequeathed to us two very rare plates.

GOZLAN, Leon, a French novelist and play writer, was born at Marseilles in 1803, and died in 1866. When he was still a boy, his father, who had made a large fortune as a ship-broker, met with adverse circumstances, and Léon, before completing his education, had to go to sea in order to earn a living. He went several trading voyages to Algiers and to Senegal, without, it would seem, much profit. In the meantime his literary tastes gradually developed, and he abandoned mercantile pursuits for the modest employment of a teacher in Marseilles. He, however, did not remain long there, and in 1828 we find him in Paris, determined to run the risks of literary life. His townsman, Joseph Méry, who was then making himself famous by his political satires, smoothed his way, and introduced him to several newspapers. But Gozlan did not sacrifice literature to politics. Though he contributed many essays to the reviews, it is as a fertile and ingenious author of novels and plays that he is best known. His first novel was *Les Mémoires d'un Apothicaire* (1828), and this was followed by numberless others, among which may be mentioned *Le Notaire de Chantilly*, *Aristide Froissart* (one of the most curious and celebrated of his productions), *Les Nuits du Père-Lachaise*, *Le Tapis Vert*, *Georges III.*, *La Folle du logis*, *La famille Lambert*, *Les Émotions de Polydore Marasquin*, &c. His principal works for the theatre are—*La Goutte de Lait*, *La Pluie et le beau temps*, *Le Lion empaillé*, *Pied-de-Fer*, *Louise de Nanteuil*, *Le Gâteau des Reines*, *Les Paniers de la Comtesse*, *Le Diamant et le Verre*, and adaptations of several of his own novels to the stage. Gozlan also wrote a romantic and picturesque description of the old manors and mansions of his country, entitled *Les Châteaux de France*, 4 vols. (1844), and a biographical essay on the great novelist Balzac (1861). He was made a member of the legion of honour in 1846, and in 1859 an officer of that order. Louis Huart has published a sketch of his life.

Of the many novels which uninterruptedly dropped, as it were, from Gozlan's pen during a period of thirty-eight years, very few have the qualities which commend a work of fiction to posterity; but nearly all are pleasant to read, and some will no doubt survive as an interesting and lively picture of French manners during the first half of this century. He holds an honourable place in the second rank of French novelists.

GOZO. See MALTA.

GOZZI, CARLO, COUNT (1722–1806), an Italian dramatist, was descended from an old Venetian family, and was born in March 1722. Compelled by the embarrassed condition of his father's affairs to procure the means of self-support, he, at the age of sixteen, joined the army in Dalmatia; but three years afterwards he returned to Venice, where he soon made a reputation for himself as the wittiest member of the Granelleschi society, to which the publication of several satirical poems had gained him admission. This society, nominally devoted to conviviality and wit, had also serious literary aims, and was especially zealous to preserve the Tuscan literature pure and untainted by foreign influence. The displacement of the old Italian comedy by the dramas of Chiari and Goldoni founded on French models threatened defeat to all their efforts, and in 1757 Gozzi came to the rescue by publishing a satirical poem, *Tartana degli influssi per l'anno bisestile*, and in 1761 by his comedy, *Fiaba dell'amore delle tre melarancie*, a parody of the manner of the two obnoxious poets, founded on a fairy tale. For its representation he obtained the services of the Sacchi company of players, who, on account of the popularity of the comedies of Chiari and Goldoni—which afforded no scope for the display of their peculiar talents—had been left without employment; and as their satirical powers were thus sharpened by personal enmity, the play met with enormous success. Struck by the effect produced on the public by the introduction of the supernatural or mythological element, which he had merely used as a convenient medium for his satirical purposes, Gozzi now produced a series of dramatic pieces based on fairy tales, which for a time obtained great popularity, but after the breaking up of the Sacchi company were completely disregarded. They have, however, obtained high praise from Goethe, Schlegel, Madame de Staël, and Sismondi; and one of them, *Re Turandote*, was translated by Schiller. In his later years Gozzi set himself to the production of tragedies in which the comic element was largely introduced, but as this innovation proved unacceptable to the critics, he had recourse to the Spanish drama, from which he obtained models for various pieces which, however, met with only equivocal success. He died 4th April 1806.

His collected works were published under his own superintendence, at Venice, in 1792, in 14 volumes; and his dramatic works, translated into German by Werthes, were published at Bern in 1795. See Gozzi's work, *Memorie inutili della vita di Carlo Gozzi*, 3 vols., Venice, 1797, translated into French by Paul de Musset, Paris, 1848; F. Horn, *Ueber Gozzis dramatische Poesie*, Venice, 1803; Gherardini, *Vita di Gasp. Gozzi*, 1821; "Charles Gozzi," by Paul de Musset, in the *Revue des Deux Mondes* for 15th November 1844; and Magrini, *Carlo Gozzi e la fiabe: saggi storici, biografici, e critici*, Cremona, 1876.

GOZZI, GASPARO, COUNT (1713–1786), eldest brother of Carlo Gozzi, was born 4th December 1713. In 1739 he married the poetess Luise Bergalli, and she undertook the management of the theatre of San Angelo, Venice, he supplying the performers with dramas chiefly translated from the French. The speculation proved unfortunate, but meantime he had attained a high reputation for his contributions to the *Gazzetta Veneta*, and he soon came to be known as one of the ablest critics and purest and most elegant stylists in Italy. For a considerable period he was censor of the press in Venice, and in 1774 he was appointed to reorganize the university system at Padua. He died at Padua, 26th December 1786.

His principal writings are *Osservatore Veneto Periodico*, on the model of the English *Spectator*, and distinguished by its high moral tone and its light and pleasant satire; *Lettere famigliari*, a collection of short racy pieces in prose and verse, on subjects of general interest; *Sermoni*, poems in blank verse after the manner of Horace; *Il mondo morale*, a personification of human passions with inwoven dialogues in the style of Lucian; and *Giudizio degli antichi poeti sopra la moderna censura di Dante*, a defence of the great poet against the attacks of Bettinelli. He also translated various works from the French and English, including Marmontel's *Tales* and Pope's *Essay on Criticism*. His collected works were published at Venice, 1794-98, in 12 volumes, and several editions have appeared since.

GOZZOLI, BENOZZO, an eminent painter, was born in Florence in 1424, or perhaps 1420, and in the early part of his career assisted Fra Angelico, whom he followed to Rome, and worked with at Orvieto. While in Rome, he executed, in the Cappella at Araceli, a fresco of St Anthony and Two Angels. In 1449 he left Angelico, and went to Montefalco, near Foligno in Umbria. In S. Fortunato, near Montefalco, he painted a Madonna and Child with Saints and Angels, and three other works. One of these, the altar-piece representing St Thomas receiving the Girdle of the Virgin, is now in the Lateran Museum, and shows the affinity of Gozzoli's early style to Angelico's. He next painted in the monastery of St Francis, Montefalco, filling the choir with a triple course of subjects from the life of the saint, with various accessories, including heads of Dante, Petrarch, and Giotto. This work was completed in 1452, and is still marked by the style of Angelico, crossed here and there with a more distinctly Giottesque influence. In the same church, in the chapel of St Jerome, is a fresco by Gozzoli of the Virgin and Saints, the Crucifixion, and other subjects. He remained at Montefalco probably till 1456, employing Mesastris as assistant. Thence he went to Perugia, and painted in a church a Virgin and Saints, now in the local academy, and soon afterwards to his native Florence, the headquarters of art. By the end of 1459 he had nearly finished his important labour in the chapel of the Palazzo Riccardi, the Journey of the Magi to Bethlehem, and, in the tribune of this chapel, a composition of Angels in a Paradise. His picture in the London National Gallery, a Virgin and Child with Saints, 1461, belongs also to the period of his Florentine sojourn. Another small picture in the same gallery, the Rape of Helen, is of dubious authenticity. In 1464 Gozzoli left Florence for S. Gemignano, where he executed some extensive works; in the church of St Augustine, a composition of St Sebastian protecting the City from the Plague of this same year, 1464; over the entire choir of the church, a triple course of scenes from the legends of St Augustine, from the time of his entering the school of Tegaste on to his burial, seventeen chief subjects, with some accessories; in the Pieve di S. Gemignano, the Martyrdom of Sebastian, and other subjects, and some further works in the city and its vicinity. Here his style combined something of Lippo Lippi with its original elements, and he received co-operation from Giusto d'Andrea. He stayed in this city till 1467, and then began, in the Campo Santo of Pisa, from 1469, the vast series of mural paintings with which his name is specially identified. These are twenty-four subjects from the Old Testament, from the Invention of Wine by Noah to the Visit of the Queen of Sheba to Solomon. He contracted to paint three subjects per year, for about ten ducats each—a sum which may be regarded as equivalent to £100 at the present day. It appears, however, that this contract was not strictly adhered to, for the actual rate of painting was only three pictures in two years. Perhaps the great multitude of figures and accessories was accepted as a set-off against the slower rate of production. By January 1470 he had executed the fresco of Noah and his Family,—followed by the Curse of Ham, the Building of the Tower of Babel (which contains portraits of Cosmo de' Medici, the young Lorenzo, Poliziano, and others), the Destruction of Sodom, the Victory of Abraham, the Marriages of Rebecca and of Rachel, the Life of Moses, &c. In the Cappella Ammannati, facing a gate of the Campo Santo, he painted also an Adoration of the Magi, wherein appears a portrait of himself. All this enormous mass of work, in which Gozzoli was probably assisted by Zanobi Macchiavelli, was performed, in addition to several other pictures during his stay in Pisa (we need only specify the Glory of St Thomas Aquinas, now in the Louvre), in sixteen years, lasting up to 1485. This is the latest date which can with certainty be assigned to any work from his hand, although he is known to have been alive up to 1496, if not afterwards. In 1478 the Pisan authorities had given him, as a token of their regard, a tomb in the Campo Santo. He had likewise a house of his own in Pisa, and houses and land in Florence. In rectitude of life he is said to have been worthy of his first master, Fra Angelico.

The art of Gozzoli does not rival that of his greatest contemporaries either in elevation or in strength, but is preeminently attractive by its sense of what is rich, winning, lively, and abundant, in the aspects of men and things. His landscapes, thronged with birds and quadrupeds, especially dogs, are more varied, circumstantial, and alluring than those of any predecessor; his compositions are crowded with figures, more characteristically true when happily and gracefully occupied than when the demands of the subject require tragic or dramatic intensity, or turmoil of action; his colour is bright, vivacious, and festive. Gozzoli's genius was, on the whole, more versatile and assimilative than vigorously original; his drawing not free from considerable imperfections, especially in the extremities and articulations, and in the perspective of his gorgeously-schemed buildings. In fresco-painting he used the methods of tempera, and the decay of his works has been severe in proportion. Of his untiring industry the recital of his labours, and the number of works produced, are the most forcible attestation.

GRAAL. See GRAIL.

GRABE, JOHANN ERNST (1666-1711), a learned divine of the Anglican Church, was born July 10, 1666, at Konigsberg, where his father, the author of some treatises now forgotten, was professor of theology and history. In the course of his theological studies Grabe succeeded in persuading himself of the schismatical character of the Reformation of the 16th century, and accordingly presented to the consistory at Samland a memorial in which he compared the position of the evangelical Protestant churches with that of the Simonians, Novatians, and other ancient schismatics. Hardly, however, had he resolved to join the Church of Rome, when his peace was again disturbed by Spener and others, who had pointed out some flaws in his written argument, and called his attention to the English Church as apparently possessing that apostolic succession, and manifesting that fidelity to ancient institutions, which he desired. In 1697, accordingly, he removed to London, and received priest's orders, attaching himself to the nonjuring party. The learned labours to which the remainder of his life was devoted were rewarded with an Oxford degree and a royal pension. He died on the 3d of November 1711, and in 1726 a monument was erected to him by Lord Oxford in Westminster Abbey.

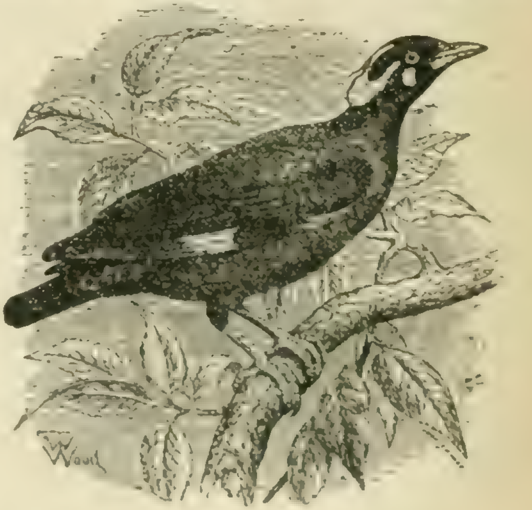
Some account of Grabe's life is given by Dr Hickes in a discourse prefixed to the pamphlet against Whiston's *Collection of Testimonies against the True Deity of the Son and of the Holy Ghost*. His works, which show him to have been learned and laborious but somewhat deficient in critical acumen, include a *Spicilegium SS. Patrum et Hæreticorum* (1698-99), which was designed to cover the first three centuries of the Christian church, but never was continued beyond the close of the second; editions of Justin's *Apologia Prima* (1700), of Irenæus, *Adversus omnes Hæreses* (1702), and of the Septuagint (*Vet. Test. juxta LXX. interpretes*, 4 vols. fol., 1707-1720); also some polemical pieces now of little importance.

GRABOW, a town of Pomerania, Prussia, government district of Stettin and circle of Randow, is situated on the Oder below Stettin, and closely adjoining its suburbs. Shipbuilding and the manufacture of machinery are the principal industries, and there is also a considerable shipping trade. Grabow did not acquire the rank of a town till 1855. The population in 1875 was 10,238.

GRACCHUS is the name of a family of the Gens Sempronia. To this family there attaches a remarkably sweet and lovable nature, which, combined with their high character and ability, makes their history the most charming page in the Roman annals. Tiberius Sempronius Gracchus was appointed magister equitum after the battle of Cannæ, and held the consulship in 215 and 213 B.C. During the great weakness that followed the defeat at Cannæ the resolute and judicious generalship by which he ably seconded Fabius did much to maintain a courageous attitude at Rome. He raised some legions of slaves; and his generous conduct kept them together and made them important in the war. After several successes he was betrayed by a Lucanian into the hands of Mago, and having fallen in the battle that ensued, he was honoured with a magnificent burial by Hannibal. Another Tiberius, born about 210, married Cornelia, the daughter of Scipio Africanus, who is famous as the highest type of Roman matron. As prætor and proprætor, Gracchus governed Hither Spain from 181 to 178. He conquered the Celtiberi, and by his magnanimous and kindly treatment of the Spaniards made a lasting impression on them. He was consul in 177 and 163. In 169, as censor, his review of the senate and equites was very strict; but though his colleague became unpopular, Gracchus remained as much esteemed as ever. He enjoyed a high reputation for his power of calming down internal seditions and conciliating foreign enemies of the state. One of his daughters became the wife of Scipio Africanus the younger; while his two sons, Tiberius and Gaius, famous besides for having determined the history of Rome at a critical point, are as remarkable for the charm of their personal character and for the careful education given them by their widowed mother. Tiberius served as quæstor in Spain in 137; and the respect still entertained by the Spaniards for his father's name enabled him to save the Roman army from utter ruin after its defeat by the Numantines. See ROMAN HISTORY.

GRACES is the name generally given to the Greek goddesses Charites. The chief seat of their worship was the ancient Bœotian city Orchomenus. They were three in number, but their names were not known; and stones fallen from heaven stood in their temple as symbols of the goddesses (Paus., ix. 35). Their worship was instituted by a king Eteocles, whose three daughters fell into a well while dancing in honour of the Charites (Westermann, *Myth. Gr.*, p. 387). In no Greek legend is the pre-Greek Indo-Germanic character more strongly marked. Eteocles, he whose glory is real, is the Vedic Satyaçravas, the sun; and his genealogy consists of a string of epithets for sun and dawn. Charis (Skt. *hari*, bright), is an old adjective, originally an epithet of the light-illumined clouds which seem to escort the dawn, often applied in the Rig-Veda to the horses of the dawn or of the sun, and at last growing into a distinct deity who preserves the character of the ancient dawn-goddess (see Müller, *Lect. Lang.*, ii.; Sonne in Kuhn, *Zft.*, x.). The burning bright *vasas* (Ushas, ἠώς, Aurora, with a different suffix Ostara, Easter)—who restores the blessings lost during the night, who lights up what was dark and reveals the hidden wrong, who gives active labour and wealth to men, growth and fertility to plants—had been from the earliest time the centre of a great worship. To appearance these religious ceremonies have been lost in Greece; and in a people so retentive of all that relates to religion, this implies merely that the worship of the dawn has been changed in outward form. Eos is of slight importance; but Charis, Hebe, Aphrodite (in so far as the genuine Greek goddess has not given way to the Oriental deity) preserve and develop the original idea. Charis then was the goddess of the freshness and vigour of life, of fertility and growth; like Aphrodite, she closely resembles Persephone (see Gerhard, *Venus Proserpina*), and in later art the Graces often hold corn ears in their hands; like Hebe, she is often associated with Hera (see Welcker, *Gr. Gött.*, iii. 174). The single goddess grew into a triad, as occurs often in Greek mythology; in Sparta, however, and in Athens only two Charites were known. Rites of peculiar antique character belong to the worship of the Charites: in Orchomenus nightly dances took place in their honour (compare the legend of Eteocles's daughters, who obviously are bye forms of the goddesses); in Paros their worship was celebrated without music or garlands; in Messene they were worshipped along with the Eumenides; in Athens their rites secret from the vulgar were held at the entrance of the Acropolis; one swore by the Charites as one did by the deities of the lower world (Pollux, viii. 106). Far as these characteristics seem removed from the nature of a dawn-goddess we find a similar double character in many other cases, such as Artemis Hecate. They are thus brought into the cycle of older more purely nature worship, which we find in Greece alongside of the more moral religion of the Olympian deities, and which has in mythology its counterpart in the older generation of Titans destroyed by the younger gods. The Charites were received into the Olympian Pantheon only in a subordinate character. In Homer we have a transitional stage; they appear sometimes as distinct independent beings, one being wife of Hephæstus, another of Sleep (*Il.*, xviii. 382, xiv. 231); often they are a set of nymphs attending on Aphrodite, herself then wife of Hephæstus (*Od.*, viii. 364, &c.). The dawn is naturally the wife of Hephæstus, the fire of the sun in heaven and of the morning sacrifice on earth. In later literature this second form prevails. Obviously the noun *charis* and the connected verbs and substantives, which existed alongside of the mythological name, exercised a continually growing influence on it. The Charites become then the impersonation of the bloom of all sensuous appearance, of grace and cheerfulness, both in nature and in moral action. They form part of the train attendant on the greater gods, especially Aphrodite and Apollo. Their names, Aglaia, Euphrosyne, and Thalia, occur first in Hesiod (*Theog.*, 907). Pindar, however, following the Bœotian belief, celebrates them (*Ol.*, xiv.) as the queens of glittering Orchomenus and as the guardian goddesses of the ancient Minyæ. In art they were represented in earlier time as draped goddesses with varying attributes; gradually the one well-known conception predominated of the three beautiful nude figures gracefully intertwined. Jacobi (*Wörterb. d. Myth.*) gives a very complete list of ancient authorities.

GRACKLE (Latin, *Graculus* or *Graculus*), a word which has been much used in ornithology, but generally in a vague sense, though restricted to members of the families *Sturnidæ* belonging to the Old World, and *Icteridæ* belonging to the New. Of the former those to which it has been most commonly applied are the species variously known as Mynas, Mainas, and Minors of India and the adjacent countries, and especially the *Gracula religiosa* of Linnæus, who, according to Jerdon and others, was very probably led to confer this epithet upon it by confounding it with the *Sturnus* or *Acridotheres tristis*,[1] which is regarded by the Hindus as sacred to Ram Deo, one of their deities, while the true *Gracula religiosa* does not seem to be anywhere held in veneration. This last is about 10 inches in length, clothed in a plumage of glossy black, with purple and green reflexions, and a conspicuous patch of white on the quill-feathers of the wings. The bill is orange and the legs yellow, but the bird's most characteristic feature is afforded by the curious wattles of bright yellow, which, beginning behind the eyes, run backwards in form of a lappet on each side, and then return in a narrow stripe to the top of the head. Beneath each eye also is a bare patch of the same colour. This species is common in southern India, and is represented further to the north in Ceylon, Burmah, and some of the



Gracula religiosa.

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[1] By some writers the birds of the genera *Acridotheres* and *Temenuchus* are considered to be the true Mynas, and the species of *Gracula* are called "Hill Mynas" by way of distinction.

Malay Islands by cognate forms. They are all frugivorous, and, being easily tamed and learning to pronounce words very distinctly, are favourite cage birds.[1]

In the New World the name Grackle has been applied to several species of the genera *Scolecophagus* and *Quiscalus*, though these are more commonly called in the United States and Canada "Blackbirds," and some of them "Boat-tails." They all belong to the family *Icteridæ*. The best known of these are the Rusty Grackle, *S. ferrugineus*, which pervades almost the whole of North America, and *Q. purpureus*, the Purple Grackle or Crow-Blackbird, of more limited range, for though abundant enough in most parts to the east of the Rocky Mountains, it seems not to appear on the Pacific side. There is also Brewer's or the Blue-headed Grackle, *S. cyanocephalus*, which has a more western range, not occurring to the eastward of Kansas and Minnesota. A fourth species, *Q. major*, is also found to inhabit the Atlantic States as far as North Carolina. All these birds are of exceedingly omnivorous habit, and though undoubtedly destroying large numbers of pernicious insects are in many places held in bad repute from the mischief they do to the corn crops. (A. N.)

GRACIAN, BALTAZAR (1584-1658), one of the principal "cultistas" or Spanish prose writers of the school of Gongora, was born at Calatayud, Aragon, in 1584. Little is known of his personal history except that on attaining to manhood he entered the Society of Jesus, and that ultimately he became rector of the Jesuit College at Tarragona, where he died in 1658. His principal works are *El Héroe* (1630), written in short compact sentences, which has been described as a sort of recipe for making a hero; *La Agudeza, y Arte de Ingenio* (1648), a sort of art of poetry or system of rhetoric in which the principles of "Gongorism" are inculcated; *Criticon* (1650-53), an allegory in which, under the imagery of the seasons of the year, the course of human life is described; *El Discreto*, a delineation of the typical character of a courtier; *Oraculo Manual*, a system of rules for the conduct of life. His works, which have been often reprinted in Spanish under the name of his brother Lorenzo, have also for the most part been translated into French and Italian. The *Oraculo Manual* has been translated into German by A. Schopenhauer (1862), and into English anonymously (*Courtier's Manual Oracle*, 1684). The *Hero* also occurs in English (from the French, 1726). Gracian's merits as a writer have been very differently estimated by his critics, and it is probable that from none of them has he received strict justice. If his style is hardly so bombastic, involved, and obscure as his enemies represent it, neither can he in fairness receive all that credit for depth and originality of thought which is claimed for him by his friends. As examples of the widely differing appreciations which have been passed upon him, see Ticknor's *Spanish Literature*, vol. iii., and Mr Grant Duff's *Miscellanies* (1878).

GRADISCA, a town of Austria, in the principality of Görz and Gradisca, situated about 10 miles S.W. of Görz, on the right bank of the Isonzo. It was formerly a strongly fortified place, but its citadel is now occupied as a prison. The inhabitants of the commune, who numbered in 1869 rather more than 3000, are engaged in silk-spinning. Between 1471 and 1481 Gradisca was fortified by the Venetians, but in 1511 they surrendered it to the imperial forces. In 1647 Gradisca and its territory, including Aquileia and forty-three smaller places, was erected into a prince-countship in favour of the prince of Eggenberg. It lapsed in 1717 to the imperial crown, and in 1754 was completely incorporated with Görz. The name was revived by the constitution of 1861, which established the crown-land of the countship of Görz and Gradisca. See GÖRZ.

GRADUATION is the name given to the art of dividing straight scales, circular arcs, or whole circumferences into any required number of equal parts. It is the most important and difficult part of the work of the mathematical instrument maker, and is required in the construction of most physical, astronomical, nautical, and surveying instruments, such as thermometer scales, linear measuring instruments, quadrants, sextants, mural circles, theodolites, &c.

The art was, undoubtedly, first practised by clockmakers for cutting the teeth of their wheels at regular intervals; but so long as it was confined to them, no particular delicacy or accurate nicety in its performance was required. This only arose when astronomy began to be seriously studied, and the exact position of the heavenly bodies to be determined, which created the necessity for strictly accurate means of measuring linear and angular magnitude. Then graduation began to be looked upon as an art which required special talents and training, and hence we find that all the best artists have spent their best efforts on the perfecting of astronomical instruments. Of these may be named Abraham Sharp, Bird, Smeaton, Ramsden, the Duc de Chaulnes, John and Edward Troughton, Simms, and Ross.

It is obvious that the first graduated instrument must have been done by the hand and eye alone, whether it was in the form of a straight-edge with equal divisions, or a screw, or a divided plate; but, once in the possession of one such divided instrument, it was a comparatively easy matter to employ it as a standard, and copy its divisions on any other article that might be desired. Hence graduation naturally divides itself into two distinct branches, *original graduation* and *copying*, which latter may be done either by the hand or by a machine called a dividing engine. We may thus speak of graduation under the three heads of *original graduation*, *copying*, and *machine graduation*.

Original Graduation.—This is by far the most difficult part of the art—so difficult, indeed, and requiring such accuracy of hand and eye, that but few in any generation have been completely competent for the task. The earlier astronomers graduated their own instruments, and, from the examples that have come down to us, it must have been very roughly done as compared with modern work.

In regard to the graduation of straight scales, we have, by elementary geometry, the means, theoretically, of dividing a straight line into any number of equal parts; but the practical carrying out of the geometrical construction is so beset with difficulties as to render the method untrustworthy. This method, which employs the common diagonal scale, was used in dividing a quadrant of 3 feet radius, which belonged to Napier of Merchiston, and which only read to minutes—a result, say Thomson and Tait (*Nat. Phil.*), "giving no greater accuracy than is now attainable by the pocket sextants of Troughton and Simms, the radius of whose arc is little more than an inch."

The original graduation of a straight line is, in practice, done either by the method of continual bisection or by stepping. In continual bisection the entire length of the line is first laid down. Then, as nearly as possible, half that distance is taken in the beam-compass and marked off by faint arcs from each end of the line. Should these marks coincide the exact middle point of the line is obtained. If not, as will almost always be the case, the distance between the marks is carefully bisected by hand with the aid of a magnifying glass. The same process is again applied to the halves thus obtained, and so on in succession, dividing the line into parts represented by 2, 4, 8, 16, &c., till the desired divisions are reached. In the method of stepping the smallest division required is first taken, as accurately as possible, by spring dividers, and that distance is then laid off, by successive steps, from one end of the line. It is evident that, in this method, any error at starting will be multiplied at each division by the number of that division. Errors so made are usually adjusted by the dots being put either back or forward a little by means of the dividing punch guided by a magnifying glass. This is an extremely tedious process, as the dots, when so altered several times, are apt to get insufferably large and shapeless.

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[1] For a valuable monograph on the various species of *Gracula* and its allies see Prof. Schlegel's *Bydrage tot de Kennis van het Geslacht Beo* (*Nederlandsch Tijdschrift voor de Dierkunde*, i. pp. 1-9).

The division of circular arcs is essentially the same in principle as the graduation of straight lines, and of this we shall now give some examples.

The first example of note is the 8-feet mural circle which was graduated by Graham for the National Observatory in 1725. In this two concentric arcs of radii of 95 and 96 inches respectively were first described by the beam-compass. On the inner of these the arc of 90° was to be divided into degrees and 12th parts of a degree, while the same on the outer was to be divided into 96 equal parts, and these again into 16th parts. The reason for adopting the latter was that, 96 and 16 being both powers of 2, the divisions could be got at by continual bisection alone, which, in Graham's opinion, who first employed it, is the only accurate method, and which thus served as a check upon the accuracy of the divisions of the outer arc. With the same distance on the beam-compass as was used to describe the inner arc, laid off from 0°, the point 60° was at once determined. With the points 0° and 60° as centres respectively, and a distance on the beam-compass very nearly bisecting the arc of 60°, two slight marks were made on the arc; the distance between these marks was carefully divided by the hand aided by a lens and this gave the point 30°. The chord of 60° laid off from the point 30° gave the point 90°, and the quadrant was now divided into three equal parts. Each of these parts was similarly bisected, and the resulting divisions again trisected, giving 18 parts of 5° each. Each of these quinquesected gave degrees, the 12th parts of which were arrived at by bisecting and trisecting as before. The outer arc was divided by continual bisection alone, and a table was constructed by which the readings of the one arc could be converted into those of the other. After the dots indicating the required divisions were obtained, either straight strokes all directed towards the centre were drawn through them by the dividing knife, or sometimes small arcs were drawn through them by the beam-compass having its fixed point somewhere on the line which was a tangent to the quadrantal arc at the point where a division was to be marked.

The next important example of graduation was done by Bird in 1767. His quadrant, which was also 8 feet radius, was divided into degrees and 12th parts of a degree. He employed the method of continual bisection aided by chords taken from an exact scale of equal parts, which could read to ·001 of an inch, and which he had previously graduated by continual bisections. With the beam-compass an arc of radius 95·938 inches was first drawn. From this [illegible] the chords of 30°, 15°, 10° 20′, 4° 40′, and 42° 40′ were computed, and each of them by means of the scale of equal parts laid off on a separate beam-compass to be ready. The radius laid off from 0° gave the point 60°; by the chord of 30° the arc of 60° was bisected; from the point 30° the radius laid off gave the point 90°; the chord of 15° laid off backwards from 90° gave the point 75°; from 75° was laid off forwards the chord of 10° 20′; and from 90° was laid off backwards the chord of 4° 40′, and these were found to [illegible] the point 85° 20′. Now 85° 20′ being = 5′ × 1024 = 5′ × 2¹⁰, [illegible] of 85° 20′ were found by continual bisections. For the remainder of the quadrant beyond 85° 20′, containing 56 divisions of 5′ each, the chord of 64 such divisions was laid off from the point 85° 20′, and the corresponding arc divided by continual bisection. There was thus a [illegible] check upon the accuracy of the points already found, viz., 15°, 30°, 60°, 75°, 90°, which, however, were found to coincide with the corresponding points obtained by continual bisections. The short lines through the dots were drawn in the way already mentioned.

The most eminent artists in original graduation are the brothers John and Edward Troughton. The former was the first to devise a means of dividing the quadrant by continual bisection without the aid of [illegible] scale of equal parts as was used by Bird. His method was as follows.—The radius of the quadrant laid off from 0° gave the point 60°. This arc bisected and the half laid off from 60° gave the point 90°. The arc between 60° and 90° bisected gave 75°, the arc between 75° and 90° bisected gave the point 82° 30′, and the arc between 82° 30′ and 90° bisected gave the point 86° 15′. Further, the arc between 82° 30′ and 86° 15′ [illegible] trisected, and two [illegible] 82° 30′, gave the point 85°, while the arc between 85° and 86° 15′ was trisected, and one-third part laid off beyond 85° gave the point 85° 25′. Lastly, the arc between 85° and 85° 25′ was quinquesected, and four-fifths taken beyond 85°, gave 85° 20′, which as before is = 5′ × 2¹⁰, and so can be finally divided by continual bisection.

Edward Troughton's Method.—The method of original graduation discovered by Edward Troughton, and described in the *Philosophical Transactions* for 1809, was employed by himself to divide a meridian circle of 4 feet radius. The circle was first accurately turned both on its face and its inner and outer edges. A roller was next provided, of such diameter that it revolved 16 times on its own axis while made to roll once round the outer edge of the circle. This roller, made movable on pivots, was attached to a frame-work, which could be slid freely, yet tightly, along the circle, the roller meanwhile revolving, by means of frictional contact, on the outer edge. The roller was also, after having been properly adjusted as to size, divided as accurately as possible into 16 equal parts by lines parallel to its axis. While the frame carrying the roller was moved once round along the circle, the points of contact of the roller divisions with the circle were accurately observed by two microscopes attached to the frame, one of which (which we shall call H) commanded the ring on the circle near its edge, which was to receive the divisions, and the other viewed the roller-divisions. The exact points of contact thus ascertained were marked with faint dots, and the meridian circle thereby divided into 256 very nearly equal parts.

The next part of the operation was to find out and tabulate the errors of these dots, which are called *apparent errors*, in consequence of the error of each dot being ascertained on the supposition of its neighbours being all correct. For this purpose two microscopes (which we shall call A and B) were taken, with cross wires and micrometer adjustments, consisting of a screw and head divided into 100 divisions, 50 of which read in the one and 50 in the opposite direction. These microscopes, A and B, were fixed so that their cross-wires respectively bisected the dots 0 and 128, which were supposed to be diametrically opposite. The circle was now turned half-way round on its axis, so that dot 128 coincided with the wire of A, and, should dot 0 be found to coincide with B, then the two dots were sure to be 180° apart. If not, the cross wire of B was moved till it coincided with dot 0, and the number of divisions of the micrometer head noted. Half this number gave clearly the error of dot 128, and it was tabulated + or − according as the arcual distance between 0 and 128 was found to exceed or fall short of the remaining part of the circumference. The microscope B was now shifted, A remaining opposite dot 0 as before, till its wire bisected dot 64, and, by giving the circle one quarter of a turn on its axis, the difference of the arcs between dots 0 and 64 and between 64 and 128 was obtained. The half of this difference gave the apparent error of dot 64, which was tabulated with its proper sign. With the microscope A still in the same position the error of dot 192 was obtained, and in the same way by shifting B to dot 32 the errors of dots 32, 96, 160, and 224 were successively ascertained. By proceeding in this way the apparent errors of all the 256 dots were tabulated.

From this table of apparent errors a table of real errors was drawn up by employing the following formula:—

$$\tfrac{1}{2}(x_a + x_c) + z = \text{the real error of dot } b,$$

where x_a is the real error of dot a, x_c the real error of dot c, and z the apparent error of dot b midway between a and c. Thus having got the real errors of any two dots, the table of apparent errors gives the means of finding the real errors of all the other dots.

The above formula is easily derived as follows:—

Let a and c be the number of micrometer divisions from 0 to dots a and c respectively; and let b be the number of similar divisions from 0 to the point b, supposed to be midway between a and c. Also let x_a and x_c be the real errors of dots a and c, and z the apparent error of b. Then we have

$$z = b - a - \tfrac{1}{2}(c - a) = b - \tfrac{1}{2}(a + c).$$

Now the real positions of a and c are $a - x_a$ and $c - x_c$ respectively.

Therefore the real position of b, the point midway between a and c, is

$$= a - x_a + \tfrac{1}{2}\{c - x_c - (a - x_a)\}$$

$$= \tfrac{1}{2}(a + c) - \tfrac{1}{2}(x_a + x_c).$$

Therefore the real error of b

$$= b - \text{real position of } b$$

$$= b - \tfrac{1}{2}(a + c) + \tfrac{1}{2}(x_a + x_c) = z + \tfrac{1}{2}(x_a + x_c).$$

Having obtained the 256 dots and their real errors, the third and last part of Troughton's process was to employ them to cut the final divisions of the circle, which were to be spaces of 5′ each. Now the mean interval between any two dots is $\frac{360^\circ}{256} = 5' \times 16\tfrac{7}{8}$,

and hence, in the final division, this interval must be divided into 16⅞ equal parts. In order to accomplish this a small instrument, [illegible] was provided. It was formed of [illegible] and had a radius about four times that of the roller, but made [illegible] adjustable as to length. The sector was placed [illegible] on the axis, and rested on the upper end of the roller. It turned by [illegible] along with the roller, but at the same time was [illegible] to allow of its being moved back by hand to any position without affecting the roller. Now it is evident that, when the roller passes over an angular space equal to the mean interval between two dots, any point of the sector must pass over 16 times that interval, that is to say, over an angle represented by $\frac{360^\circ}{256} \times 16 = 22^\circ\ 30'$. This interval was therefore divided by $16\frac{1}{8}$, and a space equal to 16 of the parts taken. This was laid off on the arc of the sector and carefully divided into 16 equal parts, each equal to 1° 20′, and in order to provide for the necessary ⅛ths of a division, there was laid off at each end of the sector, and beyond the 16 equal parts, two of these parts each subdivided into 8 equal parts. A microscope with cross wires, which we shall call I was placed on the main frame, so as to command a view of the sector divisions, just as the microscope H viewed the final divisions of the circle. Before the first or zero mark was cut, the zero of the sector was brought under I and then the division cut at the point on the circle indicated by H, which also coincided with the dot 0. The frame was then slipped along the circle by the slow screw motion provided for the purpose till the first sector division, by the action of the roller, was brought under I. The second mark was then cut on the circle at the point indicated by H. That the marks thus obtained are 5′ apart, as they should be, is evident when we reflect that the distance between them must be $\frac{1}{16}$th of a division on the section which by construction is 1° 20′. By proceeding in this way the first 16 divisions were cut; but before cutting the 17th it was necessary to adjust the micrometer wires of H to the real error of dot 1, as indicated by the table, and bring back the sector, not to zero, but to ⅛th short of zero. Starting from this position the divisions between dots 1 and 2 were next filled in, and then H was adjusted to the real error of dot 2, and the sector brought back to its proper division before commencing the third course. By proceeding in this manner through the whole circle, the microscope H was finally found with its wire at zero, and the sector with its 16th division under its microscope indicating that the circle had been accurately divided.

Copying.—In graduation by copying the first requisite is a pattern, which must be either an accurately divided straight scale, or an accurately divided circle, commonly called a *dividing plate.*

In copying a straight scale the pattern and scale to be divided, usually called the work, are first fixed side by side, with their upper faces in the same plane. The dividing square, which closely resembles an ordinary joiner's square, is then laid across both, and the point of the dividing knife dropped into the zero division of the pattern. The square is now moved up close to the point of the knife; and, while it is held firmly in this position by the left hand, the first division on the work is made by drawing the knife along the edge of the square with the right hand. Great care must be taken that the knife is held exactly in the same position in cutting the division and in setting the square.

It frequently happens that the divisions required on a scale are either greater or less than those on the pattern. To meet this case, and still use the same pattern, the work must be fixed at a certain angle of inclination with the pattern. This angle is easily found in the following way. Take the exact ratio of a division on the pattern to the required division on the scale. Call this ratio a. Then, if the required divisions are longer than those of the pattern, the angle is $\cos^{-1}a$, but, if shorter, the angle is $\sec^{-1}a$. In the former case two operations are required before the divisions are cut: first, the square is laid on the pattern, and the corresponding divisions merely notched very faintly on the edge of the work; and, secondly, the square is applied to the work and the final divisions drawn opposite each faint notch. In the second case, that is, when the angle is $\sec^{-1}a$, the dividing square is applied to the work, and the divisions cut when the edge of the square coincides with the end of each division on the pattern.

In copying circles use is made of the dividing plate. This is a circular plate of brass, of 36 inches or more in diameter, carefully graduated near its outer edge. It is turned quite flat, and has a steel pin fixed exactly in its centre, and at right angles to its plane. For guiding the dividing knife an instrument called an index is employed. This consists of a straight bar of thin steel of length equal to the radius of the plate. A piece of metal, having a V notch with its angle a right angle, is riveted to one end of the bar in such a position that the vertex of the notch is exactly in a line with the edge of the steel bar. In this way, when the index is laid on the plate, with the notch grasping the central pin, the straight edge of the steel bar lies exactly along a radius. The work to be graduated is laid flat on the dividing plate, and fixed by two clamps in a position exactly concentric with it. The index is now laid on, with its edge coinciding with any required division on the dividing plate, and the corresponding division on the work is cut by drawing the dividing knife along the straight edge of the index.

Machine Graduation.—The first dividing engine was probably that of Henry Hindley of York, constructed in 1740, and used for the most part by him for cutting the teeth of clock wheels. This was followed shortly after by an engine devised by the Duc de Chaulnes; but the first engine which obtained distinct notoriety was that made by Ramsden, of which an account was published by the Board of Longitude in 1777. He was rewarded by that board with a sum of £300, and a further sum of £315 was given to him on condition that he would divide, at a certain fixed rate, the instruments of other makers. The essential principles of Ramsden's machine have been repeated in almost all succeeding engines for dividing circles, and it will be well, therefore, to give a brief description of it.

It consisted of a large brass plate 45 inches in diameter, carefully turned, and movable on a vertical axis. The edge of the plate was ratched with 2160 teeth, into which a tangent screw worked, by means of which the plate could be made to turn through any required angle. Thus six turns of the screw moved the plate through 1°, and $\frac{1}{60}$th of a turn through $\frac{1}{360}$th of a degree. On the axis of the tangent screw was placed a cylinder having a spiral groove cut on its surface. A ratchet-wheel containing 60 teeth was attached to this cylinder, and was so arranged that, when the cylinder moved in one direction, it carried the tangent screw with it, and so turned the plate, but when it moved in the opposite direction, it left the tangent screw, and with it the plate, stationary. Round the spiral groove of the cylinder a catgut band was wound, one end of which was attached to a treadle and the other to a counterpoise weight. When the treadle was depressed the tangent screw turned round, and when the pressure was removed it returned, in obedience to the weight, to its former position without affecting the screw. Provision was also made whereby certain stops could be placed in the way of the screw, which only allowed it the requisite amount of turning according to the graduation required. The work to be divided was firmly fixed on the plate, and made concentric with it. The divisions were cut, while the screw was stationary, by means of a dividing knife attached to a swing frame, which allowed it to have only a radial motion. In this way the artist could divide very rapidly by alternately depressing the treadle and working the dividing knife.

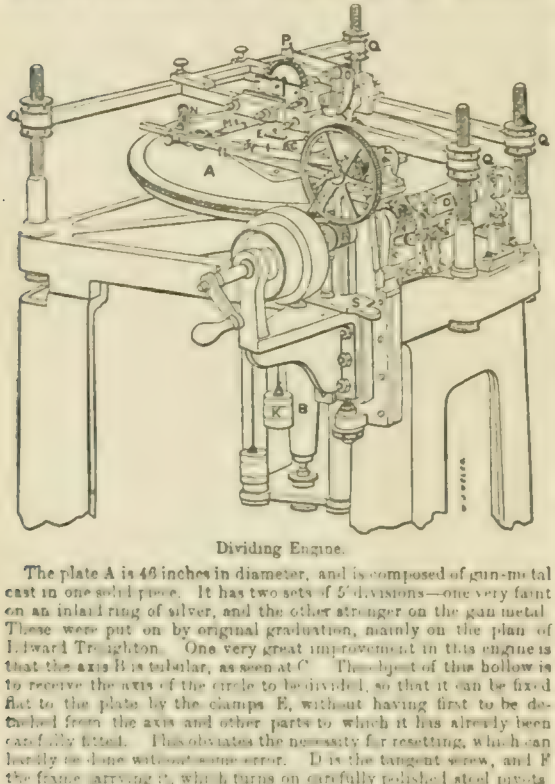
Ramsden also constructed a linear dividing engine on essentially the same principle. If we imagine the rim of the circular plate with its notches stretched out into a straight line and made movable in a straight slot, the screw, treadle, &c., remaining as before, we shall get a very good idea of the linear engine.

In 1793 Edward Troughton finished a circular dividing engine, of which the plate was smaller than in Ramsden's, and which differed considerably otherwise in simplifying matters of detail. The plate was originally divided by Troughton's own ingenious method, already described, and the divisions so obtained were employed to ratch the edge of the plate for receiving the tangent screw with great accuracy.

In the *Transactions of the Society of Arts* for 1830-31 there is a full description, with illustrative figures, of a dividing engine, constructed by Andrew Ross, which differs considerably from those of Ramsden and Troughton.

The essential point of difference is that, in Ross's engine, the tangent screw does not turn the engine plate; that is done by an independent apparatus, and the function of the tangent screw is only to stop the plate after it has passed through the required angular interval between two divisions on the work to be graduated. Round the circumference of the plate are fixed 48 projections which just look as if the circumference had been divided into as many deep and somewhat peculiarly shaped notches or teeth. Through each of these teeth a hole is bored parallel to the plane of the plate and also to a tangent to its circumference. Into these holes are screwed steel screws with capstan heads and flat ends. The tangent screw consists only of a single turn of a large square thread which works in the teeth or notches of the plate. This thread is pierced by [illegible] equally distant holes, all parallel to the axis of the screw, and at the same distance from it. Into each of these holes is inserted a steel screw exactly similar to those in the teeth, but with its end rounded. It is the rounded and flat ends of these sets of screws coming together that stop the engine plate at the desired position, and the exact point can be nicely adjusted by suitably turning the screws.

In the *Memoirs of the Astronomical Society*, of date June 1843, a description is given of a dividing engine made by William Simms. From experience he became convinced that to copy upon smaller circles the divisions which had been put upon a large plate with very great accuracy was not only more expeditious but better than original graduation, and hence he determined to construct a machine which would do this work as perfectly as possible. That machine involved essentially the same principle as Troughton's, and, with some slight modifications, is at present to be seen at work in the workshop of the eminent firm of Troughton & Simms at Charlton near London. The accompanying figure is taken by permission from a photograph of that instrument.



Dividing Engine.

The plate A is 46 inches in diameter, and is composed of gun-metal cast in one solid piece. It has two sets of 5′ divisions—one very faint on an inlaid ring of silver, and the other stronger on the gun metal. These were put on by original graduation, mainly on the plan of Edward Troughton. One very great improvement in this engine is that the axis B is tubular, as seen at C. The object of this hollow is to receive the axis of the circle to be divided, so that it can be fixed flat to the plate by the clamps E, without having first to be detached from the axis and other parts to which it has already been carefully fitted. This obviates the necessity for resetting, which can hardly be done without some error. D is the tangent screw, and F the frame carrying it, which turns on carefully polished steel pivots. The screw is pressed against the edge of the plate by a spiral spring acting under the end of the lever G, and by screwing the lever down the screw can be altogether removed from contact with the plate. The edge of the plate is ratched by 4320 teeth which were cut upon the original division by a circular cutter attached to the screw frame. H is the spiral barrel round which the catgut band is wound, one end of which is attached to the crank L on the end of the axis J and the other to a counterpoise weight not seen. On the other end of J is another crank inclined to L and carrying a [illegible] weight seen at K. The object of this weight is to balance the frame and give [illegible] to the [illegible]. On the axis J there are a pair of bevelled wheels which move the rod I, which, by another pair of bevelled wheels attached to the box N, gives motion to the axis M, [illegible] lever O, which [illegible] the cutter. [illegible] which long divisions, at [illegible] intervals, can be cut. It will be seen that the cutting apparatus is supported upon the two parallel rails which can be elevated or depressed at pleasure by the nuts Q. Also the cutting apparatus can be moved forward or backward upon these rails to suit circles of different diameters. The box N is movable upon the bar R, and the rod I is also adjustable as to length by having a kind of telescope joint. The engine is quite self-acting, and can be driven either by hand or by a steam-engine or other motive power. When driven by the latter it can be thrown in or out of gear at once by a handle seen at S. Mr Simms has also provided an ingenious arrangement whereby that is done automatically directly any piece of work was finished.

Space permits of but the mere mention of Donkin's linear dividing engine, in which the principle employed is a compensating arrangement whereby great accuracy is obtained notwithstanding the inequalities of the screw used to advance the cutting tool. Dividing engines have also been made by Reichenbach and others in Germany, and Gambey in Paris.

In addition to those already mentioned, the following references may be given:—Bird, *Method of dividing Astronomical Instruments*, London, 1767; Duc de Chaulnes, *Nouvelle Methode pour diviser les Instruments de Mathematique et d'Astronomie*, 1768; Ramsden, *Description of an Engine for dividing Mathematical Instruments*, London, 1777; Troughton's memoir, *Phil. Trans.*, 1809; *Memoirs of the Royal Astronomical Society*, vol. v. p. 325, vol. viii. p. 141, vol. ix. pp. 17 and 35; Holtzapffel, *Turning and Mechanical Manipulation*, pp. 951-955. (J. BL.)

GRÆCIA, MAGNA (ἡ μεγάλη Ἑλλάς), was the name given to the Greek cities along the coast of South Italy, while the people were called Italiotes (Ἰταλιῶται). Like most Greek colonies, they were established first as trading stations, which grew into independent cities. At a very early time a trade in copper was carried on between Greece and the Terinæan Gulf (Homer, *Od.*, i. 181). The trade for long lay chiefly in the hands of the Eubœans; and Cyme in Campania was founded far back in the pre-historic time, when the Eubœan Cyme was still a great city. To strengthen the connexion with the far off Cyme, the Chalcidians, who became early the leaders of Eubœan enterprise, established Rhegium (about 730 B.C.). After this the energy of Chalcis went onward to Sicily, and the states of the Corinthian Gulf carried out the colonization of Italy. Sybaris (720) and Crotona (710) were Achæan settlements; Locri Epizephyrii (about 710) was settled by Ozolian Locrians, and when (about 708) the Spartans wished to get rid of a band of unruly citizens, the connexion formed by the trade in purple that was common to the shores of Laconia and Tarentum directed their colony thither. Ionian Greeks fleeing from foreign invasion founded Siris and, much later, Elea (540).

The Italian colonies were planted among friendly, almost kindred, races (comp. the legend in Herod., vii. 183), and grew much more rapidly than the Sicilian Greek states, which had to contend against the power of Carthage. After the Achæan cities had combined to destroy the Ionic Siris, and had founded Metapontum as a counterpoise to the Dorian Tarentum, there seems to have been little strife among the Italiotes. An amphictyonic league, meeting in common rites at the temple of Hera on the Lacinian promontory, fostered a feeling of unity among them. In the 7th and 6th centuries B.C., they reached such a pitch of wealth and power as to justify the name Great Greece in contrast to the poor and weak mother country. The Pythagorean and Eleatic systems of philosophy had their chief seat in Magna Græcia. Other departments of literature do not seem to have been so much cultivated among them. The poet Ibycus, though a native of Rhegium, led a very wandering life. They maintained some social intercourse with Greece proper (Herod., iii. 131) and sent competitors to the Olympic games (among them the famous Milo); but politically they appear to have generally kept themselves separate. One ship of Crotona, however, fought at [illegible], though it is not recorded that Greece asked the Italiotes for help when it sent ambassadors to Gelon of

Syracuse. Mutual discord first sapped the prosperity of Magna Græcia. In 510 Crotona, having defeated the Sybarites in a great battle, totally destroyed their city. Crotona maintained alone the leading position which had belonged jointly to the Achæan cities (Diod., xiv. 103); but from that time Magna Græcia steadily declined. Foreign enemies pressed heavily on it. The Lucanians and Bruttians on the north captured one town after another. Dionysius of Syracuse attacked them from the south; and after he defeated the Crotoniate league (389 B.C.), Tarentum remained the only powerful city. Henceforth the history of Magna Græcia is only a record of the vicissitudes of Tarentum (see TARENTUM). Repeated expeditions from Sparta and Epirus tried in vain to prop up the decaying Greek states against the Lucanians and Bruttians; and when in 282 the Romans appeared in the Tarentine Gulf the end was close at hand. The aid which Pyrrhus brought did little good to the Tarentines, and his final departure in 274 left them defenceless. During these constant wars the Greek cities had been steadily decaying; and in the second Punic war, when most of them seized the opportunity of revolting from Rome, their very existence was in some cases annihilated. Malaria, which never affects a well-peopled city, increased in strength as the population diminished. We are told by Cicero (*De Am.*, 4), "Magna Græcia nunc quidem deleta est." Many of the cities completely disappeared; some, like Tarentum, maintained a feeble existence into modern times.

GRÆVIUS (1632–1703). Johann Georg Gräfe, Greffe, or Grævius, one of the great classical scholars of the 17th century, was born at Naumburg, Saxony, 29th January 1632, and after receiving the usual school education at the gymnasium of Pforta became a student of law in the university of Leipsic. During a casual visit to Deventer in his eighteenth year, he became acquainted with Gronovius; and this circumstance greatly stimulated a taste for pure scholarship which he had already begun to display somewhat to the detriment of his professional prospects. Finally abandoning jurisprudence shortly afterwards, he studied philology for two years under Gronovius, and subsequently sat under Heinsius at Leyden, and under Morus and Blondel at Amsterdam. During his residence in the last-named city he abandoned Lutheranism and joined the Reformed Church; and in 1656 he was called by the elector of Brandenburg to the chair of belles lettres in the university of Duisburg. Two years afterwards he was, on the recommendation of Gronovius, chosen to succeed that scholar at Deventer; and in 1662 he was translated to the university of Utrecht, where he occupied first the chair of rhetoric, and afterwards from 1667 until his death (January 11, 1703) that of history and politics. During the later years of his life he enjoyed a great and European reputation, and repeated attempts, which, however, he steadfastly resisted, were made to induce him to transfer his services to other universities and Governments. His lecture-room was crowded by pupils, many of them of distinguished rank, from all parts of the civilized world; and by Louis XIV., as well as by other sovereigns, he was now and again honoured with special recognition.

Of his works the two most important are the *Thesaurus Antiquitatum Romanarum*, published in 12 volumes at Utrecht (1694–1699), and the *Thesaurus Antiquitatum et Historiarum Italiæ*, published after his death, and continued by Burmann (1704–1725). His editions of the classics, although at the time of their appearance they marked a distinct advance in scholarship, are now for the most part superseded. They include *Hesiodi Ascræi quæ extant Opera* (1667), *Luciani Pseudosophista* (1668), *Justini Historiæ Philippicæ* (1669), *Suetonius* (1672), *Catullus, Tibullus, et Propertius* (1680), and several of the works of Cicero. The *Oratio Funebris* by P. Burmann (Utrecht, 1703) contains an exhaustive list of the works of this scholar.

GRÄFE, ALBRECHT VON (1828–1870), German oculist, son of Karl Ferdinand von Gräfe, noticed below, was born at Berlin in May 1828. At an early age he manifested a preference for the study of mathematics, but this was gradually superseded by an interest in natural science, which led him ultimately to the study of medicine. After obtaining Government licence at Berlin, he prosecuted his studies at Vienna, Prague, and Paris, devoting special attention to ophthalmology. In 1850 he began practice as an oculist in Berlin, where he founded a private institution for the treatment of the eyes, which became the model of many similar ones in Germany and Switzerland. In 1853 he was appointed teacher of ophthalmology in Berlin university, in 1856 extraordinary professor, and in 1866 ordinary professor. Von Gräfe contributed largely to the perfection of the science of ophthalmology, especially by the establishment in 1855 of his *Archiv für Ophthalmologie*, in which he had Arlt and Donders as collaborateurs. Perhaps his two most important discoveries are his method of treatment for *glaucoma*, until then deemed incurable, and his new method of operation for the extraction of cataract, by which the danger of the operation became minimized. He was also regarded as an authority in diseases of the nerves and brain. He died at Berlin 20th August 1870. See Alfred Gräfe, *Ein Wort zur Erinnerung an Albrecht von Gräfe*, Halle, 1870.

GRÄFE, HEINRICH (1802–1868), educationist, was born at Buttstädt in Weimar, 3d May 1802, studied mathematics and theology at Jena, and in 1823 obtained a curacy in the stadtkirche of Weimar. Thence he was transferred to Jena as rector of the town school in 1825; in 1840 he was also appointed extraordinary professor of the science of education (Pädagogik) in that university; and in 1842 he became head of the bürgerschule in Cassel. After reorganizing the schools of the town, he became director of the new realschule in 1843; and, devoting himself with great zeal and energy to the interests of educational reform in electoral Hesse, he became in 1849 a member of the school commission, and also entered the house of representatives, where he attached himself to the democratic party and made himself somewhat formidable as an agitator. In 1852 for having been implicated in the September riots and in the movement against the unpopular minister Hassenpflug (who had dissolved the school commission) he was condemned to three years' imprisonment, a sentence which was afterwards reduced to one of twelve months. On his release he withdrew to Geneva, where he engaged in educational work till 1855, when he was appointed director of the school of industry at Bremen. He died in that city 21st July 1868.

Besides being the author of many text-books and occasional papers on educational subjects, he wrote *Das Rechtsverhaltniss der Volksschule von innen u. aussen* (1829); *Die Schulreform* (1834); *Schule u. Unterricht* (1839); *Allgemeine Pädagogik* (1845); *Die Deutsche Volkschule* (1847). Along with Naumann, he also edited the *Archiv für das praktische Volkschulwesen* (1828–35).

GRÄFE, KARL FERDINAND VON (1787–1840), German surgeon, was born at Warsaw, 8th March 1787. He studied medicine at Halle and Leipsic, and after obtaining licence from the latter university, he was in 1807 appointed private physician to Duke Alexius of Anhalt-Bernburg. In 1811 he became professor of surgery at Berlin, and during the war with Napoleon he was superintendent of the military hospitals. When peace was concluded in 1815, he resumed his professorial duties. He was also appointed to the medical staff of the army, and he became a director of the Frederick-William Institute, and of the Medico-Chirurgical Academy. He died suddenly, 4th July 1840, at Hanover, whither he had been called to operate on the eyes of the crown-prince. Von Gräfe did much to advance the practice of surgery in Germany, especially in the case of wounds, both by the invention of new instruments and the discovery of new methods of treatment. He improved the rhinoplastic process, and its revival was chiefly due to him. His lectures at the university of Berlin attracted students from all parts of Europe.

The following are his principal works:—*Normen für die Ablösung grösserer Gliedmassen*, Berlin, 1812; *Rhinoplastik*, 1818; *Neue Beiträge zur Kunst Theile des Angesichts organisch zu ersetzen*, 1821; *Die epidemisch-kontagiöse Augenblennorrhöe Ægyptens in den europäischen Befreiungsheeren*, 1824; *Jahresberichte über das klinische chirurgisch-augenärztliche Institut der Universität zu Berlin*, 1817-34. He also edited, along with Ph. von Walther, the *Journal für Chirurgie und Augenheilkunde*.

GRAFRATH, a town of Rhenish Prussia, government district of Düsseldorf, circle of Solingen, situated on the small river Itter, 14 miles E. of Düsseldorf. It has iron foundries, and manufactures of steel wares, chemicals, cotton, and ribbons. The population in 1875 was 5604.

GRAGNANO, a town of Italy, in the province of Naples and circle of Castellamare, about 2½ miles E. of Castellamare. It is the seat of a bishop and has a collegiate church, manufactures cloth and maccaroni, and exports an excellent red wine which is well known at Naples. In earlier times it was surrounded with walls and defended by a castle. Population (1871) of town 7321, of commune 12,278.

GRAHAM, SIR JAMES GEORGE ROBERT, Bart. (1792–1861), a well-known British statesman, was born at Naworth, Cumberland, 1st June 1792. From Westminster school he duly passed to Queen's College, Cambridge; and shortly after quitting the university, while making the "grand tour" abroad, he became private secretary to the British minister in Sicily, in which capacity he not only acquired much useful experience but also rendered some important services. Shortly after his return to England he, in 1818, after a contest of extraordinary keenness, was returned to parliament as member for Hull in the Whig interest; but he was unseated at the election of 1820. In 1824 he succeeded to the baronetcy on his father's death; and in 1826 he again entered parliament as representative for Carlisle. In the same year he published a pamphlet entitled *Corn and Currency*, which brought him into considerable prominence in the political world as a man of advanced Liberal opinions; and having been returned in 1830 for the county of Cumberland, he became one of the most energetic advocates in parliament of the Reform Bill. On the formation of Earl Grey's administration he received the post of first lord of the admiralty, with a seat in the cabinet. From 1832 to 1837 he sat for the eastern division of the county of Cumberland; but dissensions on the Irish Church question led to his withdrawal from the ministry in 1834, and ultimately to his joining the Conservative party. Rejected by his former constituents in 1837, he was in 1838 elected for Pembroke, and in 1841 for Dorchester. In the latter year he took office under Sir Robert Peel as secretary of state for the home department, and this post he retained until 1846. As home secretary he incurred considerable odium, in Scotland at least, by his unconciliating policy on the church question prior to the "disruption" of 1843; and in 1844 the detention and opening of letters at the post-office by his warrant raised a storm of public indignation, which was hardly allayed by the favourable report of a parliamentary committee of investigation. From 1846 to 1852 he was out of office; but in the latter year he joined Lord Aberdeen's cabinet as first lord of the admiralty, in which capacity he acted also for a short time in the Palmerston ministry of 1855, until the appointment of a select committee of inquiry into the conduct of the Russian war put him upon his defence, and ultimately led to his withdrawal from official life. He continued, however, as a private member to exercise a considerable influence on parliamentary opinion until his death, which occurred at Netherby, Cumberland, 26th October 1861.

GRAHAM, THOMAS (1804–1869), born at Glasgow on the 21st of December 1804, was the son of a merchant of that city. In 1819 he entered the university of Glasgow, and graduated in 1824. At this time the chair of chemistry was held by Dr Thomas Thomson, whose researches bearing on the atomic theory cannot fail to have had much influence in turning Graham's thoughts to the study of molecular physics to which he so patiently devoted his life. The beginning of his career appears to have been much embittered by his father's opposition, who wished him to become a minister of the Established Church. His own views, however, prevailed, and he worked for two years in the laboratory of Dr Hope of Edinburgh before returning to Glasgow, where he taught mathematics, and subsequently chemistry, until the year 1829, when he was appointed lecturer in the Mechanics' Institute. In 1830 he succeeded Dr Ure as professor of chemistry in the Andersonian Institution, and, on the death of Dr Edward Turner, he was transferred to the chair of chemistry in University College, London. He presided over the chemical section of the British Association at the Birmingham meeting in 1839, and in 1841 was chosen as the first president of the Chemical Society of London. He resigned his professorship on being appointed to succeed Sir John Herschel as Master of the Mint, a post he held until his death in September 1869. This appointment was doubtless offered to him by Government in recognition of his scientific services, but the onerous duties of the important office severely tried his energies; and it is unfortunate that, in quitting a purely scientific career, he should have been subjected to the cares of official life for which he was by temperament singularly unfit. The researches, however, which he conducted between 1861 and 1869 were as brilliant as any of those in which he engaged. Graham was elected a fellow of the Royal Society in 1837, a corresponding member of the Institute of France in 1847, and doctor of civil law in 1855. The presidency of the Royal Society was offered him towards the close of his life, but his failing health caused him to shrink from accepting the honour.

The persistency with which he traced and developed the laws of atomic motion was remarkable. It is interesting therefore to remember that his future work must have been indicated in no small measure by the researches of the illustrious Black, who, at the beginning of the century, rejected the definitions of chemistry proposed by Stahl, Boerhaave, and Fourcroy, and lectured "on the effects produced by heat and mixture in all bodies or mixtures of bodies natural or artificial." Graham communicated papers to the Philosophical Society of Glasgow before the work of that society was recorded in *Transactions*, but his first published paper, "On the Absorption of Gases by Liquids," appeared in the *Annals of Philosophy* for 1826, and is of special interest, as in it he speaks of the liquefaction of gases in much the same terms as those employed in the last paper he wrote. The subject with which his name will always be most prominently associated is the molecular mobility of gases. Priestley observed in 1799 that hydrogen escaped from a fissured glass jar in exchange for external air which "had nothing inflammable in it," and Dalton proved in 1806 that gases confined in glass phials, connected by glass tubes, intermix even against the action of gravity. Graham in his first paper on this subject (1829) thus summarizes the knowledge experiment had afforded as to the laws which regulate the movement of gases. "Fruitful as the miscibility of gases has been in interesting speculations, the experimental information we possess on the subject amounts to little more than the well-established fact that gases of a different nature, when brought into contact, do not arrange themselves according to their density, but they spontaneously diffuse through each other so as to remain in an intimate state of mixture for any length of time." For the fissured jar of Priestley and Dobereiner he substituted a glass tube closed by a plug of plaster of Paris, and with this simple appliance he developed his now well known law "that the diffusion rate of gases is inversely as the square root of their density."

With regard to the special importance of Graham's law to the chemist and physicist, it may be sufficient to point out that a great number of chemical as well as physical facts are co-ordinated by the assumption that all substances in the state of gas have the same molecular volume or contain the same number of molecules in a given space (Avogadro's law); and, in the second place, it has become evident that the phenomena of heat are simply the manifestations of molecular motion. According to this view the absolute temperature of a gas is proportional to the *vis viva* of its molecules; and since all molecules at a given temperature have the same *vis viva*, it follows that the molecules must move with velocities which are inversely proportional to the square roots of the molecular weights. Moreover, since the molecular volumes are equal, and the molecular weights are therefore proportional to the densities of the aeriform bodies in which the molecules are active units, it also follows that the average velocities of the molecules in any two gases are inversely proportional to the square roots of their respective densities. Thus the simple numerical relations first observed in the phenomena of diffusion are the direct result of molecular motion, and it is now seen that Graham's empirical law is included under the fundamental law of motion

Graham also studied the passage of gases by transpiration through fine tubes, and by effusion through a minute hole in a platinum disc, and was enabled to show that gas may enter a vacuum in three different ways: (1) by the molecular movement of diffusion, in virtue of which a gas penetrates through the pores of a disc of compressed graphite; (2) by effusion through an orifice of sensible dimensions in a platinum disc (the relative times of the effusion of gases in mass being similar to those of the molecular diffusion, although a gas is usually carried by the former kind of impulse with a velocity many thousand times as great as is demonstrable by the latter); and (3) by the peculiar rate of passage due to transpiration through fine tubes, in which the ratios appear to be in direct relation with no other known property of the same gases,—thus hydrogen has exactly double the transpiration rate of nitrogen, the relation of those gases as to density being as 1 : 14.

He subsequently examined the passage of gases through septa or partitions of india-rubber, and plates of non-crystalline metals such as palladium, and proved that gases pass through these septa neither by diffusion, effusion, nor transpiration, but in virtue of a selective absorption which the septa appear to exert on the gases in contact with them. By this means he was enabled partially to separate oxygen from air, and to calculate the density of metallic hydrogen from the remarkable expansion which attends the absorption of hydrogen by palladium. The experiments led him to believe that palladium with its occluded hydrogen was an alloy, a view that has been greatly strengthened by the recent experiments of MM. Cailletet and Pictet.

His early work on the movements of gases led him to examine the spontaneous movements of liquids, and as a result of the experiments he divided bodies into two classes,—crystalloids, such as common salt, and colloids, of which gum-arabic is a type,—the former having high and the latter low diffusibility. He also proved, by a series of beautiful experiments, that the process of liquid diffusion actually causes partial decomposition of certain chemical compounds, the sulphate of potash, for instance, being separated from the sulphate of alumina in alum by the higher diffusibility of the former salt.

He also extended his work on the transpiration of gases to liquids, adopting the method of manipulation devised by Poiseuille. He found that dilution with water does not effect proportionate alteration in the transpiration velocities of different liquids, and a certain determinable degree of dilution retards the transpiration velocity. Thus in the case of alcohol the greatest retardation is with six equivalents of water, nitric acid with three, and acetone with as much as twelve equivalents.

It is only possible here to indicate the prominent features of Graham's more purely chemical labours. In 1833 he showed that the various compounds of phosphoric acid and water constitute distinct salts, in each of which the hydrogen may be displaced by other metals. He was the first, therefore, to establish the existence of polybasic compounds, in each of which one or more equivalents of hydrogen are replaceable by certain metals, and he further showed that by heating biphosphate of soda a metaphosphate is formed, and from this he obtained a corresponding hydrated acid. In 1824 he demonstrated that the spontaneous inflammability of one variety of phosphuretted hydrogen is due to its admixture with a very small proportion of an oxide of nitrogen, probably nitrous acid. In 1835 he published the results of an examination of the properties of water as a constituent of salts. Not the least interesting part of this inquiry was the discovery of certain definite salts with alcohol analogous to hydrates, to which the name of alcoholates was given. A brief paper entitled *Speculative Ideas on the Constitution of Matter* deserves notice as possessing special interest in connexion with work done since Graham's death. In it he expressed the view that the various kinds of matter now recognized as different elementary substances may possess one and the same ultimate or atomic molecule in different conditions of movement.

Graham's work, viewed as a whole, is remarkable alike for its originality and for the singular simplicity of the methods employed in obtaining most important results.

Biographical notices of Graham will be found in the *Proceedings of the Royal Society*, xviii., 1870, p. xviii.; *Proceedings of the Royal Society of Edinburgh*, vii., 1872, p. 15; *Proceedings of the Royal Institution*, vi., 1872, p. 15; *Deutsch. Chem. Gesellschaft*, Berlin, ii., 1869, p. 753; *Munchen Akad. Sitzungsb.*, 1870, i., p. 408; *American Journal of Science*, i., 1871, p. 115; *Smithsonian Reports*, 1871, p. 177; *Proceedings of American Academy*, viii., 1870, p. 230. His works have been collected and printed by Dr James Young and Dr Angus Smith, the latter contributing to the volume a valuable preface and analysis of its contents. (W. C. R.)

GRAHAME, James (1765–1811), author of *The Sabbath* and other poems, was born at Glasgow, April 22, 1765. His father was a successful lawyer, and, by a very common error, he conceived that no other profession could be so suitable or so advantageous for his son. James, dutiful, and shrinking from opposition, as he did all through life, obeyed the parental wish, and after completing his literary course at the university of his native city, went in 1784 to Edinburgh where he studied law, first to qualify himself for the business of writer to the signet, and subsequently for the Scottish bar, of which he was elected a member in 1795. His inclinations, however, were all for retirement and literature; and finally, when he had reached the mature age of forty-four, he took orders in the English Church, and became curate first at Shipton, Gloucestershire, and then at Sedgefield in the county of Durham. He did not long enjoy an office which he adorned by his pious and eloquent ministrations. Ill health compelled him to try the renovating effects of his native air, but he died shortly after his return, September 14, 1811. The works of Grahame consist of a dramatic poem *Mary Queen of Scots* (published in 1801), *The Sabbath* (1804), *British Georgics* (1804), *The Birds of Scotland* (1806), and *Poems on the Abolition of the Slave Trade* (1810). His principal work is *The Sabbath*—a sacred and descriptive poem in blank verse, characterized by a fine vein of tender and devotional feeling, and by the happy delineation of Scottish scenery. He is the Cowper of Scotland, but wants Cowper's mastery of versification and easy idiomatic vigour of style. The blank verse of Grahame is often hard and constrained, though at times it swells out into periods of striking imagery and prophet-like earnestness. His description of the solemn stillness and unbroken calm of "the hallowed day" in the rural districts of Scotland, and of the Scottish Sabbath preachings among the hills in times of persecution, when

> "The scattered few would meet in some deep dell
> By rocks o'er-canopied,"

are finished pictures that will never fade from our poetry. In his *Georgics* he tried the wider field of rural occupations and manners, and produced some pleasing daguerreotypes of nature,—for he was a careful as well as loving student,—but descended too much into minute and undignified detail. In the notes to his poems he expresses manly and enlightened views on popular education, the criminal law, and other public questions. He was emphatically a friend of humanity—a philanthropist as well as a poet.

GRAHAM'S TOWN, the metropolis of the eastern districts of the Cape Colony, South Africa, is situated in the division of Albany, 80 miles inland from Algoa Bay, 40 miles inland from Port Alfred, and 600 miles from Cape Town. In 1812 the site of the town was first chosen as the headquarters of the British troops engaged in protecting the frontier of the colony from the inroads of the Kaffre tribes, and it was named after Colonel Graham, then commanding the forces. In 1819 an attempt was made by the Kaffres to surprise the place, and a body of 10,000 men attacked it, but were gallantly repulsed by the garrison, which numbered not more than 320 men, infantry and artillery, under Colonel Willshire. From 1820 Graham's Town was the centre of what was termed the "Albany Settlement," and it soon became the chief emporium of frontier trade. The town is built in a basin of the grassy hills forming the spurs of the Zuurberg mountain range, 1760 feet above sea-level. It is a pleasant place of residence, and is regarded as the most English-like town in the colony. The streets are broad, and most of them lined with trees. The principal thoroughfare is the High Street, where stand St George's English Cathedral, built from designs by Sir Gilbert Scott, and Commemoration Chapel, the chief place of worship of the Wesleyans, erected by the British emigrants of 1820. There are no fewer than twelve churches and chapels in Graham's Town—Church of England, Roman Catholic, Wesleyan, Presbyterian, Baptist, and Independent. It is the seat of the Eastern Districts' Court, presided over by a chief judge and two puisne judges. Among the institutions of the town are an excellent public hospital, a lunatic asylum, colleges and grammar schools, a museum and natural history society, a public library, a club, and masonic, templar, and other societies. There is also a botanic garden, in which there is a memorial of Colonel Fordyce of the 74th regiment, who fell in the Kaffre war of 1851. The population of Graham's Town, according to the last census, is 7066. It is the centre of trade for an extensive pastoral and agricultural country, and has easy communication both with Port Alfred, at the mouth of the Kowie River, and with Port Elizabeth on Algoa Bay.

GRAIL, or GRAAL, THE HOLY (Saint Graal, Seynt Greal, Sangreal, Sank Ryal), the name given to the legendary wonder-working vessel said to have been brought by Joseph of Arimathea to Britain. The correct spelling is "Graal." In the present article the subject will be considered under the following four heads:—(1) the meaning of the Graal conception; (2) the authorship of the conception; (3) the meaning of the word; (4) the spread of the conception from the land of its origin to other countries.

1. The "Saint Graal" was the name given—if not originally, yet very soon after the conception was started—to the dish, or shallow bowl (in French, *escuelle*), from which Jesus Christ was said to have eaten the paschal lamb on the evening of the Last Supper with his disciples. In the French prose romance of the *Saint Graal*, it is said that Joseph of Arimathea, having obtained leave from Pilate to take down the body of Jesus from the cross, proceeded first to the upper room where the supper was held and found there this vessel; then, as he took down the Lord's dead body, he received into the vessel many drops of blood which issued from the still open wounds in his feet, hands, and side. This last feature, which Tennyson in his beautiful idyll *The Holy Grail* has overlooked, is obviously of the essence of the conception. According to Catholic theology, where the body or the blood of Christ is, there, by virtue of the hypostatic union, are His soul and His divinity. That the Graal, such being its contents, should be marvellous—divine—mysterious, was but logical and natural. The Graal was "the commencement of all bold emprise, the occasion of all prowess and heroic deeds, the investigation of all the sciences, . . . the demonstration of great wonders, the end of all bounty and goodness, the marvel of all other marvels." Nasciens, taking off the paten which covered the Graal, comprehends innumerable marvels, but is struck blind. By the Graal Joseph's life is sustained in prison during forty-two years without food, while as an oracle it instructs him in heavenly knowledge. Nothing could be more fantastic and extravagant than all this, were the Graal conceived of merely as a relic, however venerable; but all is altered when it is brought into close relations, according to the design of its inventors, with the mystery of the eucharist.

2. The authorship of the conception involves one of the most difficult of literary questions. Mr Price, in the able and eloquent dissertation prefixed to vol. i. of Warton's *History of English Poetry*, seems to maintain the view that it can be attributed to no individual, but was the spontaneous outgrowth of a group of widely prevalent superstitions, in all which a magical cup or divining bowl was the central object. Others, as Fauriel, Simrock, and Schulz, find the original home of the legend in Provence. M. Paulin Paris, who has been engaged for nearly forty years in the study of Arthurian romance, and whose latest speculations (*Romans de la Table Ronde*, v. 352) bear the recent date of 1876, is of opinion that the original conception came from some Welsh monk or hermit who lived early in the 8th century; that its guiding and essential import was an assertion for the British Church of an independent derivation of its Christianity direct from Palestine, and not through Rome; that the conception was embodied in a book, called *Liber Gradalis* or *De Gradali*; that this book was kept in abeyance by the British clergy for more than 300 years, from a fear lest it should bring them into collision with the hierarchy and make their orthodoxy suspected; that it came to be known and read in the second half of the 12th century; that a French poet, Robert de Boron, who probably had not seen the book, but received information about it, was the first to embody the conception in a vernacular literary form by writing his poem of *Joseph d'Arimathie*; and that, after Boron, Walter Map and others came into the field. Lastly, it is maintained, by French writers generally, that the conception arose certainly on French ground, but in the 12th century, not in the 8th; that it was introduced by some master-hand, probably that of Walter Map, into every branch of Arthurian

romance; and that if Map was not the author of the conception, as seems highly probable, he first, by writing the French romances of the *Saint Graal*, the second part of *Lancelot*, and *Mort Artur*, invested it in literary form.

These theories cannot be discussed here; but it may be remarked that, in order to pave the way for any rational theory, it is indispensable to have a clear view of the condition of romance literature at and before the time when the conception arose. The legend of Arthur, which barely rises to the surface in the narrative of Gildas, had in the time of Nennius (9th century) attained to considerable consistency, and through the appearance of the *Historia Britonum* of Geoffrey of Monmouth, which everywhere excited an extraordinary sensation, had become European. To the Norman and French poets it had become known, long before the appearance of Geoffrey's book, through the Breton lays; and the mysticism, the tender depths of sentiment, the wild flights of imagination and fancy which were found in these lays, had so captivated and dazzled them as to induce them almost to desert their own rough *Chansons de Geste*, of which Charlemagne was the chief figure, for this new field. A succession of startling incidents, in which giants, knights, dwarfs, fairies, and goblins were actors, and a nature in mystic sympathy with man was the background, appealed to the feelings of wonder and awe; the instinct of revenge and the lust of war were gratified by battle-recitals innumerable, while around the chief characters of the legends there floated the rapture and the hyperbole of amorous passion. In the *Brut* of Wace, founded on Geoffrey's work, we find the story of Arthur in ample proportions, and the "Round Table" appears for the first time—

> "Fist reis Ertur la Runde Table,
> Dunt Bretun dient meinte fable."

The exuberance of invention here attributed to the Bretons was faithfully imitated by the poets of northern France. Chrestien of Troyes, born near the middle of the 12th century, besides versifying many tales from Ovid, reproduced parts of the Arthur legend in his poem on *King Mark and Yseult the Blonde*, and the *Chevalier au Lion*. In these, however, there is no mention of the Graal. Suddenly a narrative, possibly in Latin but more probably in French prose, makes its appearance, containing the story of the commission of the Holy Graal to Joseph of Arimathea, as given above, of his subsequent adventures in Syria and elsewhere, and of the ultimate arrival of his son, his brother-in-law, and others of his kindred, in Britain, where they settle in the island of Avallon. The birth of Arthur is prophesied in this narrative, but otherwise he is scarcely mentioned. About the same time, the prose romances of *Lancelot* (part i.) and *Tristan*, containing rich developments of the Arthurian legend, made their appearance and were warmly welcomed. The first is ascribed in the MSS. to Walter Map, and the second to Luc or Luces de Gast; but both statements, in the opinion of M. Paulin Paris, are extremely doubtful. At any rate, if Map wrote the first part of *Lancelot*, he continued and finished it in a totally different spirit. The first part is mere love and chivalry, "the most secular," says M. Paulin Paris, "of all romances"; while the second part is the most mystical of all. The first part contains no allusion to the Graal; in the second it is an element of overpowering interest. Lancelot joins in the quest for the Graal, fails to see it or only half sees it, repents, becomes a holy hermit, and dies. *Tristan* in its original form was the legend of a favourite Breton hero; it was then connected with the cycle of Arthur; lastly, perhaps by the same powerful hand that transmuted *Lancelot*, it was brought within the sweep of the Graal conception.

But who invented the story of Joseph of Arimathea? or rather, who connected that story with the Graal legend, and both with Arthur? The importance of a work of William of Malmesbury in assisting us to answer this question has been somewhat overlooked. In his treatise *De Antiquitate Glastoniensis Ecclesiæ*, written probably soon after Henry of Blois, abbot of Glastonbury, to whom it is dedicated, was raised to the see of Winchester (1129), Malmesbury records with considerable detail the legend which brought Joseph to Glastonbury, and made him the first preacher of Christianity to the Britons. Everything connected with Glastonbury had a duodenary character; Joseph was sent to Britain by St Philip the evangelist as the chief among twelve missioners; the holy men who afterwards tenanted the abbey always sought to maintain the number of twelve; Glasteing, from whom the place was named, was one of twelve brothers; the chief estate of the abbey was called "the Twelve Hides," &c. This same feature distinctly reappears in the Graal legend, where Bron, the brother-in-law of Joseph, has twelve sons, who are all sent to Britain, but one among them, Alain, who renounces marriage, is set over the rest. Again, we read in Malmesbury that Avallon is another name for Glastonbury; and in the Graal legend we read that Joseph's kindred are directed by a divine voice to seek, in the far west, the "valleys of Avaron." Lastly, in the strange story about the altar called "sapphirus," which angels brought from Palestine to St David, and which after a long disappearance was rediscovered in Malmesbury's own day, we seem to lay our finger, as it were, on the origin, the rudimentary suggestion, of the Graal conception.

Now if we accept the general testimony of the MSS., and assume without further proof that Map composed, whether in Latin or in French, the original book of the *Saint Graal*, the genesis of the work seems not difficult to trace. In early life Map was a canon of Salisbury (see Wright's preface to the *De Nugis Curialium*); either afterwards or at the same time he was parish priest of Westbury near Bristol. Gloucestershire and Wiltshire are both neighbouring counties to Somersetshire, in which Glastonbury was the most sacred and celebrated spot. Visiting that ancient abbey, Map would have become acquainted with the legend of Joseph of Arimathea in all its details; and he would have seen the altar said to have been transported by angels from Palestine, and which, long hidden from mortal sight on account of the wickedness of the times, had lately been revealed and reinstated. His versatile and capacious mind would, as a matter of course, have been familiar with the whole Arthur legend as it then (1170–1180) existed, if for no other reason, because he lived in the very part of England which was studded with Arthurian sites. He fully answers to the description of the "great clerks" who, according to Robert de Boron first made and told the history of the Graal. He seems to have conceived the vast design of steeping the Arthurian legend, and through it the whole imaginative literature of the age, in the doctrine of the Christian sacrifice. He is generally credited in the MSS. with the composition of the *Saint Graal* (containing the legend of Joseph of Arimathea), of the *Quest of the Saint Graal*, of *Lancelot* in whole or in part, and of the *Mort Artur*. But it appears that no MS. of any of these romances now exists of an earlier date than 1274, and it is certain that a set of "arrangers" and continuators (like the rhapsodists and cyclic poets of the Homeric epos) commenced their confusing operations on the legend at an early period. Hence it seems impossible now to recover the exact order in which the different romances were composed.

3. On the origin of the word Graal, the opinion of M. Paulin Paris seems to be satisfactory. He thinks that graal is a corruption of gradale, or graduale, the Latin name for a liturgical collection of psalms and texts of scripture, so called "quod in gradibus canitur" as the priest is passing

from the epistle to the gospel side of the altar. The author of the Graal conception meant by graal, or gradale, not the sacred dish (escuelle), but the mysterious book revealed to the supposed hermit of 717, in which he finds the history of the escuelle. Robert de Boron, mistaking this, transfers the name to the dish, and connects it with *grè* (gratus, gratia) on account of the inward solace connected with it (see *Romans de la T. R.*, i. 143). The word rapidly became popular in the sense of bowl, or shallow cup, so that Hélinand (1204) could say, "Dicitur vulgari nomine *graalz*, quia grata et acceptabilis est in ea comedenti." This etymology is the same as Boron's. The older French word *gréel*, meaning service-book (Ducange, article "Gradale"), was displaced by the new *graal* or *greal*. On the other hand, M. Fauriel derives graal from an old Provençal word for a cup, *grazal*. But this *grazal*, according to the article in Ducange, seems to be of Armorican origin; anyhow M. Fauriel has not proved its use in the sense of cup at a period earlier than the rise of the Graal legend.

4. The spread and ascendency to which the Graal conception rapidly attained in all Christian countries made the creations of Arthurian romance the delight of all cultivated minds, from Caerleon to Venice, and from Iceland to the Straits of Gibraltar. From England, which we must regard as the land of its origin, the Graal legend at once passed to France, and found an enthusiastic and capable interpreter in Robert or Robiers de Boron. This Boron was no Englishman of Nottinghamshire, as some English writers have pretended, but, as Paulin Paris conclusively proves, a French poet of the county of Montbeliard in the region of the Vosges. Chrestien de Troyes in his *Percival* (written before 1191, for it is dedicated to Count Philip of Flanders who died in that year), gives in a metrical dress the legend of Percival, one of the knights of the round table, under the transformation which the introduction of the Graal conception had effected. The continuations of the poem, by Denet and Manessier, come down to about 1240. The famous Mid-German poem of *Parzival*, by Wolfram von Eschenbach, which appeared near the beginning of the 13th century, is founded partly on Chrestien's *Percival*, but partly also on some other, perhaps Provençal, source, which is now lost. A rude English metrical version of the French prose romance of the *Saint Graal*, by one Harry Lonelich, dating from the reign of Henry VI., has been recently edited by Mr Furnivall for the Roxburghe Club. Flemish, Icelandic, and Welsh reproductions of the Graal romances have been found to exist. One of the first employments of the printing press in England, France, and Germany was to multiply poems or romances embodying this legend. Hence Caxton printed for Sir Thomas Malory (1485) *The Historie of Kyng Arthur and his Noble Knyghtes*, a version in English prose of the French romances of *Merlin*, *Lancelot*, *Tristan*, the *Quête du Saint Graal*, and *Mort Artur*, or at any rate based upon them. An early French edition of the *Tristan*, of which there is a copy in the British Museum, is dated 1489. *Lancelot du Lac* was printed at Paris in 1513; and not long afterwards editions of the *Tristan* and other portions of the Arthur cycle, always as interpenetrated by the Graal legend, appeared both in Italy and Spain (Graalsage, p. 110).

[illegible]

GRAINS OF PARADISE, Guinea Grains, or Melegueta Pepper (German, *Paradieskörner*; French, *Graines de Paradis, Maniguette*), the *semina cardamomi majoris* or *piper melegueta* of pharmaceutists, are the seeds of *Amomum Melegueta*, Roscoe, a reed-like plant of the natural order *Zingiberaceæ*, which is a native of tropical western Africa, and of Princes and St Thomas's Islands in the Gulf of Guinea, is cultivated in British Guiana, and may with ease be grown in hot-houses in England. The plant has a branched horizontal rhizome; smooth, nearly sessile, alternate leaves, with the blade oblong-lanceolate; large, white, pale pink, or purplish flowers; and an ovate-oblong fruit, ensheathed in bracts, which is of a scarlet colour when fresh, and reaches under cultivation a length of 5 inches. The seeds are contained in the acid pulp of the fruit, are commonly wedge-shaped and bluntly angular, are about 1½ line in diameter, and have a glossy dark-brown husk, with a conical light-coloured membranous caruncle at the base, and a white kernel. They contain, according to Flückiger and Hanbury, 0·3 per cent. of a faintly yellowish neutral essential oil, having an aromatic, not acrid taste, and a specific gravity at 15·5° C. of 0·825, and giving on analysis the formula $C_{20}H_{32}O$, or $C_{10}H_{16} + C_{10}H_{16}O$; also 5·83 per cent. of an intensely pungent, viscid, brown resin. Grains of paradise were formerly officinal in British pharmacopœias, and in the 13th and succeeding centuries were used as a drug and a spice, the wine known as hippocras being flavoured with them and with ginger and cinnamon. In 1629 they were employed among the ingredients of the twenty-four herring pies which were the ancient fee-favour of the city of Norwich, ordained to be carried to court by the lord of the manor of Carleton (Johnston and Church, *Chem. of Common Life*, p. 355, 1879). Grains of paradise were in past times brought overland from West Africa to the Mediterranean ports of the Barbary States, to be shipped for Italy. They are now exported almost exclusively from the Gold Coast. The amount received by Great Britain in 1871 was upwards of 760 cwts. Grains of paradise are to some extent used in veterinary practice, but for the most part illegally to give a fictitious strength to malt liquors, gin, and cordials. By 56 Geo. III. c. 58, no brewer or dealer in beer shall have in his possession or use grains of paradise, under a penalty of £200 for each offence; and no druggist shall sell the same to a brewer under a penalty of £500. They are, however, devoid of any injurious physiological action, and are much esteemed as a spice by the natives of Guinea.

See Bentley and Trimen, *Medicinal Plants*, part 30, tab. 268; Lanessan, *Hist. des Drogues*, pp. 456–460, 1878.

GRAM, or Chick-pea, called also Egyptian Pea, or Bengal Gram (Hindi, *chaná*; Bengali, *chholá*; Italian, *cece*; Spanish, *garbanzo*), an herbaceous, annual, leguminous plant, the *Cicer arietinum* of Linnæus, so named from the resemblance of its seed to a ram's head, is a native of the south of Europe and India. Its leaves are imparipinnate, with ovate, equal, and serrate leaflets; the flowers are axillary, and of a bluish purple colour, and bloom in India from September to October; and the pods have a length of 1 to 1½ inch, and contain either one or two somewhat pointed and commonly pale yellow seeds, about 3 lines long. Gram is largely cultivated in the East, where the seeds are eaten raw, or cooked and prepared in various ways, both in their ripe and unripe condition, and when roasted and ground are made to subserve the same purposes as ordinary flour. In Europe the seeds are used as an ingredient in soups. They contain, in 100 parts without husks, nitrogenous substances 22·7, fat 3·76, starch 63·18, mineral matters 2·6 parts, with water (Forbes Watson, quoted in Parkes's *Hygiene*). The liquid which exudes from the glandular hairs clothing the leaves and stems of the plant, more especially during the cold season, when the seeds ripen, contains a notable proportion of oxalic acid, and is said to be very injurious to the leather shoes of those who walk through fields of gram. In Mysore the dew containing it is collected by means of cloths spread on the plant over night, and is valued as a remedy for dyspepsia, indigestion, and costiveness. The steam of water in which the fresh plant is immersed is in the Deccan resorted to by the Portuguese for the treatment of dysmenorrhœa. The seed of *Phaseolus Mungo*, Linn., or green gram (Hind. and Beng., *mung*), a variety of which plant, *P. Mungo melanospermus* (*P. Max*, Roxb.), is termed black gram, is an important article of diet among the labouring classes in India, and is annually exported in large quantities from Madras. Soup made from it is considered to be especially suited to sick persons. The meal is an excellent substitute for soap, and is stated by Elliot to be an invariable concomitant of the Hindu bath. *P. Roxburghii*, W. and Arn., or *P. radiatus*, Roxb. (Hind., *urid*; Beng., *másh-kalái*), which also is known as green gram, is perhaps the most esteemed of the leguminous plants of India, where the meal of its seed enters into the composition of the more delicate cakes and dishes, and is used in medicine both externally and internally. *P. aconitifolius* goes by the name of Turkish gram. Horse gram, *Dolichos uniflorus*, Lam. (Hind. and Beng., *kulthi*), which supplies in Madras the place of the chick-pea, affords seed which, when boiled, is extensively employed as a food for horses and cattle in South India, where also it is eaten in curries, and, made into poultices or pastes, is applied to medicinal purposes. Turkish gram is the *Dolichos Catjang* of Roxburgh. White gram, *Glycine* (*Soja*) *hispida*, produces the beans from which soy is made. The quantity of gram exported from India in 1876–77, chiefly to Mauritius, Ceylon, and the Straits, amounted to 316,592 cwt., against 322,661 cwt. in the previous year.

See W. Elliot, "On the Farinaceous Grains and the various kinds of Pulses used in Southern India," *Edin. New Phil. Journ.*, 1862, vol. xvi. p. 16 *sq.*; H. Drury, *The Useful Plants of India*, 1873; U. C. Dutt, *Materia Medica of the Hindus*, Calcutta, 1877.

GRAMMAR.

GRAMMAR. By the grammar of a language is meant either the relations borne by the words of a sentence and by sentences themselves one to another, or the systematized exposition of these. The exposition may be, and frequently is, incorrect; but it always presupposes the existence of certain customary uses of words when in combination. In what follows, therefore, grammar will be generally employed in its primary sense, as denoting the mode in which words are connected together in order to express a complete thought, or, as it is termed in logic, a proposition.

Scope of grammar.

The object of language is to convey thought, and so long as this object is attained the machinery for attaining it is of comparatively slight importance. The way in which we combine our words and sentences matters but little, provided that our meaning is clear to others. The expressions "horseflesh" and "flesh of a horse," are equally intelligible to an Englishman and therefore are equally recognized by English grammar. The Chinese manner of denoting a genitive is by placing the defining word before that which it defines, as in *koue jin*, "man of the kingdom," literally "kingdom man," and the only reason why it would be incorrect in French or Italian is that such a combination would be unintelligible to a Frenchman or an Italian. Hence it is evident that the grammatical correctness or incorrectness of an expression depends upon its intelligibility, that is to say, upon the ordinary use and custom of a particular language. Whatever is so unfamiliar as not to be generally understood is also ungrammatical. In other words, it is contrary to the habit of a language, as determined by common usage and consent.

In this way we can explain how it happens that the grammar of a cultivated dialect and that of a local dialect in the same country so frequently disagree. Thus, in the dialect of West Somerset, *thee* is the nominative of the second personal pronoun, while in cultivated English the plural accusative *you* (Anglo-Saxon, *eow*) has come to represent a nominative singular. Both are grammatically correct within the sphere of their respective dialects, but no further. *You* would be as ungrammatical in West Somerset as *thee* is in classical English; and both *you* and *thee*, as nominatives singular, would have been equally ungrammatical in Early English. Grammatical propriety is nothing more than the established usage of a particular body of speakers at a particular time in their history.

It follows from this that the grammar of a people changes, like its pronunciation, from age to age. Anglo-Saxon or Early English grammar is not the grammar of Modern English, any more than Latin grammar is the grammar of modern Italian; and to defend an unusual construction or inflexion on the ground that it once existed in literary Anglo-Saxon, is as wrong as to import a peculiarity of some local dialect into the grammar of the cultivated speech. It further follows that different languages will have different grammars, and that the differences will be more or less according to the nearer or remoter relationship of the languages themselves, and the modes of thought of those who speak them. Consequently, to force the grammatical framework of one language upon another is to misconceive the whole nature of the latter, and seriously to mislead the learner. Chinese grammar, for instance, can never be understood until we discard, not only the terminology of European grammar, but the very conceptions which underlie it, while the polysynthetic idioms of America defy all attempts to discover in them "the parts of speech" and the various grammatical ideas which occupy so large a place in our school-grammars. The endeavour to find the distinctions of Latin grammar in that of English has only resulted in grotesque errors, and a total misapprehension of the usage of the English language.

Subdivision of grammar.

It is to the Latin grammarians,—or, more correctly, to the Greek grammarians, upon whose labours those of the Latin writers were based,—that we owe the classification of the subjects with which grammar is commonly supposed to deal. The grammar of Dionysius Thrax, which he wrote for Roman schoolboys in the time of Pompey, has formed the starting-point for the innumerable school-grammars which have since seen the light, and suggested that division of the matter treated of which they have followed. He defines grammar as a practical acquaintance with the language of literary men, and as divided into six parts,—accentuation and phonology, explanation of figurative expressions, definition, etymology, general rules of flexion, and critical canons. Of these, phonology and accentuation, or prosody, can properly be included in grammar only in so far as the construction of a sentence and the grammatical meaning of a word are determined by accent or letter-change; the accentual difference in English, for example, between *íncense* and *incénse* belongs to the province of grammar, since it indicates a difference between noun and verb; and the changes of vowel in the Semitic languages, by which various nominal and verbal forms are distinguished from one another, constitute a very important part of their grammatical machinery. But where accent and pronunciation do not serve to express the relations of words in a sentence, they fall into the domain of phonology, not of grammar. The explanation of figurative expressions, again, must be left to the rhetorician, and definition to the lexicographer; the grammarian has no more to do with them than he has with the canons of criticism.

In fact, the old subdivision of grammar, inherited from the grammarians of Rome and Alexandria, must be given up, and a new one put in its place. What grammar really deals with are all those contrivances whereby the relations of words and sentences are pointed out. Sometimes it is position, sometimes phonetic symbolization, sometimes composition, sometimes flexion, sometimes the use of auxiliaries, which enables the speaker to combine his words together so that they shall be intelligible to another. Grammar may accordingly be divided into the three departments of composition or "word-building," syntax, and accidence, by which is meant an exposition of the means adopted by language for expressing the relations of grammar when recourse is not had to composition or simple position.

Modes of treatment.

A systematized exposition of grammar may be intended for the purely practical purpose of teaching the mechanism of a foreign language. In this case, all that is necessary is a correct and complete statement of the facts. But a correct and complete statement of the facts is by no means so easy a matter as might appear at first sight. The facts will be distorted by a false theory in regard to them, while they will certainly not be presented in a complete form if the grammarian is ignorant of the true theory they presuppose. The Semitic verb, for example, remains unintelligible so long as the explanation of its forms is sought in the conjugation of the Aryan verb, since it has no tenses in the Aryan sense of the word, but denotes relation and not time.

A good practical grammar of a language, therefore, should be based on a correct appreciation of the facts which it expounds, and a correct appreciation of the facts is only possible where they are examined and co-ordinated in accordance with the scientific method. A practical grammar ought, wherever it is possible, to be preceded by a scientific grammar.

Comparison is the instrument with which science works, and a scientific grammar, accordingly, is one in which the comparative method has been applied to the relations of speech. If we would understand the origin and real nature of grammatical forms, and of the relations which they represent, we must compare them with similar forms in kindred dialects and languages, as well as with the forms under which they appeared themselves at an earlier period of their history. We shall thus have a comparative grammar and an historical grammar, the latter being devoted to tracing the history of grammatical forms and usages in the same language. Of course, an historical grammar is only possible where a succession of written records exists; where a language possesses no older literature, we must be content with a comparative grammar only, and look to cognate idioms to throw light upon its grammatical peculiarities. In this case we have frequently to leave whole forms unexplained, or at most conjecturally interpreted, since the machinery by means of which the relations of grammar are symbolized is often changed so completely during the growth of a language as to cause its earlier shape and character to be unrecognizable. Moreover, our area of comparison must be as wide as possible; where we have but two or three languages to compare, we are in danger of building up conclusions on insufficient evidence. The grammatical errors of the classical philologists of the last century were in great measure due to the fact that their area of comparison was confined to Latin and Greek.

The historical grammar of a single language or dialect, which traces the grammatical forms and usages of the language as far back as documentary evidence allows, affords material to the comparative grammarian, whose task it is to compare the grammatical forms and usages of an allied group of tongues, and thereby reduce them to their earliest forms and meanings. The work thus carried out by the comparative grammarian within a particular family of languages is made use of by universal grammar, the object of which is to determine the ideas that underlie all grammar whatsoever, as distinct from those that are peculiar to special families of speech. Universal grammar is sometimes known as "the metaphysics of language," and it has to decide such questions as the nature of gender, or of the verb, the true purport of the genitive relation, or the origin of grammar itself. Such questions, it is clear, can only be answered by comparing the results gained by the comparative treatment of the grammars of various groups of language. What historical grammar is to comparative grammar, comparative grammar is to universal grammar.

Universal grammar.

Universal grammar, as founded on the results of the scientific study of speech, is thus essentially different from that "universal grammar" so much in vogue at the beginning of the present century, which consisted of a series of *a priori* assumptions based on the peculiarities of European grammar and illustrated from the same source. But universal grammar, as conceived by modern science, is as yet in its infancy; its materials are still in the process of being collected. The comparative grammar of the Aryan languages is alone in an advanced state, those of the Semitic idioms, of the Ugro-Altaic tongues, and of the Bântu or Kaffre dialects of southern Africa, are still in a backward condition; and the other families of speech existing in the world, with the exception of the Malayo-Polynesian, and the Sonorian of North America, have not as yet been treated scientifically. Chinese, it is true, possesses an historical grammar, and Mr Van Eys, in his comparative grammar of Basque, has endeavoured to solve the problems of that interesting language by a comparison of its various dialects; but in both cases the area of comparison is too small for more than a limited success to be attainable. Instead of attempting the questions of universal grammar therefore it will be better to confine our attention to three points,—the fundamental differences in the grammatical conceptions of different groups of languages, the main results of a scientific investigation of Aryan grammar, and the light thrown by comparative philology upon the grammar of our own tongue.

Differences in grammar of unallied languages.

The proposition or sentence is the unit and starting-point of speech, and grammar, as we have seen, consists in the relations of its several parts one to another, together with the expression of them. These relations may be regarded from various points of view. In the polysynthetic languages of America the sentence is conceived as a whole, not composed of independent words, but, like the thought which it expresses, one and indivisible. What we should denote by a series of words is consequently denoted by a single long compound,—*kuligatchis* in Delaware, for instance, signifying "give me your pretty little paw," and *aglekkiyuartorasuarnipok*, in Eskimo, "he goes away hastily and exerts himself to write." Individual words can be, and often are, extracted from the sentence; but in this case they stand, as it were, outside it, being represented by a pronoun within the sentence itself. Thus, in Mexican, we can say not only *nixochitemoa*, "I look for flowers," but also *niktemoa xochitl*, where the interpolated guttural is the objective pronoun. As a necessary result of this conception of the sentence the American languages possess no true verb, each act being expressed as a whole by a single word. In Cherokee, for example, while there is no verb signifying "to wash" in the abstract, no less than thirteen words are used to signify every conceivable mode and object of washing. In the incorporating languages, again, of which Basque may be taken as a type, the object cannot be conceived except as contained in the verbal action. Hence every verbal form includes an objective pronoun, even though the object may be separately expressed. If we pass to an isolating language like Chinese, we find the exact converse of that which meets us in the polysynthetic tongues. Here each proposition or thought is analysed into its several elements, and these are set over against one another as so many independent words. The relations of grammar are consequently denoted by position, the particular position of two or more words determining the relation they bear to each other. The analysis of the sentence has not been carried so far in agglutinative languages like Turkish. In these the relations of grammar are represented by individual words, which, however, are subordinated to the words expressing the main ideas intended to be in relation to one another. The defining words, or indices of grammatical relations, are, in a large number of instances, placed after the words which they define; in some cases, however, as, for example, in the Bâ ntu languages of southern Africa, the relation is conceived from the opposite point of view, the defining words being prefixed. The inflexional languages call in the aid of a new principle. The relations of grammar are denoted symbolically either by a change of vowel or by a change of termination, more rarely by a change at the beginning of a word. Each idea, together with the relation which it bears to the other ideas of a proposition, is thus represented by a single word; that is to say, the ideas which make up the elements of a sentence are not conceived severally and independently, as in Chinese, but as always having a certain connexion with one another. Inflexional languages, however, tend to become analytical by the logical separation of the flexion from the idea to which it is attached, though the primitive point of view is never altogether discarded, and traces of flexion remain even in English and Persian. In fact, there is no example of a language which has wholly forsaken the conception of the sentence and the relation of its elements with which it started, although each class of languages occasionally trespasses on the grammatical usages of the others. In language, as elsewhere in nature, there are no sharp lines of division, no sudden leaps; species passes insensibly into species, class into class. At the same time the several types of speech—polysynthetic, isolating, agglutinative, and inflexional—remain clear and fixed; and even where two languages belong to the same general type, as, for instance, an Aryan and a Semitic language in the inflexional group, or a Kaffre and a Turkish language in the agglutinative group, we find no certain example of grammatical interchange. A mixed grammar, in which the grammatical procedure of two distinct families of speech is intermingled, is almost, if not altogether, unknown.

It is obvious, therefore, that grammar constitutes the surest and most important basis for a classification of languages. Words may be borrowed freely by one dialect from another, or, though originally unrelated, may, by the action of phonetic decay, come to assume the same forms, while the limited number of articulate sounds and conceptions out of which language was first developed, and the similarity of the circumstances by which the first speakers were everywhere surrounded, naturally produce a resemblance between the roots of many unconnected tongues. Where, however, the fundamental conceptions of grammar, and the machinery by which they are expressed are the same, we may have no hesitation in inferring a common origin.

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The main results of scientific inquiry into the origin and primitive meaning of the forms of Aryan or Indo-European grammar may be summed up as follows. We start with stems or themes, by which are meant words of two or more syllables which terminate in a limited number of sounds. These stems can be classed in groups of two kinds, one in which the groups consist of stems of similar meanings and similar initial syllables, and another in which the final syllables alone coincide. In the first case we have what are termed roots, the simplest elements into which words can be decomposed; in the second case stems proper, which may be described as consisting of suffixes attached to roots. Roots, therefore, are merely the materiels out of which speech can be made, the embodiments of isolated conceptions with which the lexicographer alone has to deal, whereas stems present us with words already combined in a sentence and embodying the relations of grammar. If we would rightly understand primitive Aryan grammar, we must conceive it as having been expressed or implied in the suffixes of the stems, and in the order according to which the stems were arranged in a sentence. In other words, the relations of grammar were denoted partly by juxtaposition or syntax, partly by the suffixes of stems.

These suffixes were probably at first unmeaning, or rather clothed with vague significations, which changed according to the place occupied in the sentence by the stem to which they were joined. Gradually this vagueness of signification disappeared, and particular suffixes came to be set apart to represent particular relations of grammar. What had hitherto been expressed by mere position now attached itself to the terminations or suffixes of stems, which accordingly became full-grown words. Some of the suffixes denoted purely grammatical ideas, that is to say, were flexions; others were classificatory, serving to distinguish nouns from verbs, presents from aorists, objects from agents, and the like; while others, again, remained unmeaning adjuncts of the root. This origin of the flexions explains the otherwise strange fact that the same suffix may symbolize wholly different grammatical relations. In Latin, for instance, the context and dictionary will alone tell us that *mus-as* is the accusative plural of a noun, and *am-as* the second person singular of a verb, or that *mus-a* is the nominative singular of a feminine substantive, *bon-a* the accusative plural of a neuter adjective. In short, the flexions were originally merely the terminations of stems which were adapted to express the various relations of words to each other in a sentence, as these gradually presented themselves to the consciousness and were extracted from what had been previously implied by position. Necessarily, the same suffix might be used sometimes in a classificatory, sometimes in a flexional sense, and sometimes without any definite sense at all. In the Greek dative-locative πόδ-εσ-σι, for example, the suffix -ες is classificatory; in the nominative πόδ-ες, it is flexional.

When a particular termination or suffix once acquired a special sense, it would be separated in thought from the stem to which it belonged, and attached in the same sense to other stems and other terminations. Thus in modern English we can attach the suffix *-ize* to almost any word whatsoever, in order to give the latter a transitive meaning, and the Greek πόδεσσι, quoted above, really contains no less than three suffixes, -ες, -συ, and -ι, the last two both denoting the locative, and coalescing, through σϝι, into a single syllable -σι. The latter instance shows us how two or more suffixes denoting exactly the same idea may be tacked on one to another, if the original force and signification of the first of them comes to be forgotten. Thus, in Old English *sang-estre* was the feminine of *sang-ere*, "singer," but the meaning of the termination has so entirely died out of the memory that we have to add the Romanic *-ess* to it if we would still distinguish it from the masculine *singer*. A familiar example of the way in which the full sense of the exponent of a grammatical idea fades from the mind and has to be supplied by a new exponent is afforded by the use of expletives in conversational English to denote the superlative. "Very warm" expresses little more than the positive, and to represent the intensity of his feelings the Englishman has recourse to such expressions as "horribly warm" like the German "schrecklich warm."

Such words as "very," "horribly," "schrecklich," illustrate a second mode in which Aryan grammar has found means of expression. Words may lose their true signification and become the mere exponents of grammatical ideas. Professor Earle divides all words into *presentive* and *symbolic*, the former denoting objects and conceptions, the latter the relations which exist between them. Symbolic words, then, are what the Chinese grammarians call "empty words,"—words, that is, which have been divested of their original signification and serve a grammatical purpose only. Many of the classificatory and some of the flexional suffixes of Aryan speech can be shown to have had this origin. Thus the suffix *tar*, which denotes names of kinship and agency, seems to come from the same root as the Latin *terminus* and *trans*, our *through*, the Sanskrit *tar-āmi*, "I pass over," and to have primarily signified "one that goes through" a thing. Thus, too, the English *hood* or *head*, in words like *godhead* and *brotherhood*, is the Anglo-Saxon *hád*, "character" or "rank;" *dom*, in *kingdom*, the Anglo-Saxon *dóm*, "judgment;" and *lock* or *ledge*, in *wedlock* and *knowledge*, the Anglo-Saxon *lác*, "sport" or "gift." In all these cases the "empty words," after first losing every trace of their original significance, have followed the general analogy of the language and assumed the form and functions of the suffixes with which they had been confused.

A third mode of representing the relations of grammar is by the symbolic use of vowels and diphthongs. In Greek, for instance, the distinction between the reduplicated present δίδωμι and the reduplicated perfect δέδωκα is indicated by a distinction of vowel, and in primitive Aryan grammar the vowel *a* seems to have been set apart to denote the subjunctive mood just as *ya* or *i* was set apart to denote the potential. So, too, according to M. Hovelacque, the change of *a* into *i* or *u* in the parent-Aryan symbolized a change of meaning from passive to active. This symbolic use of the vowels, which is the purest application of the principle of flexion, is far less extensively carried out in the Aryan than in the Semitic languages. The Semitic family of speech is therefore a much more characteristic type of the inflexional languages than is the Aryan.

The primitive Aryan noun possessed at least eight cases,—nominative, accusative, vocative, instrumental, dative, genitive, ablative, and locative. M. Bergaigne has attempted to show that the first three of these, the "strong cases" as they are termed, are really abstracts formed by the suffixes *as* (*-s*), *-an*, *m*, *-t*, *-i-*, *-d*, and *-ya* (*-i*), the plural being nothing more than an abstract singular, as may be readily seen by comparing words like the Greek ἔπο-ς and ὄπε-ς, which mean precisely the same. The remaining "weak" cases, formed by the suffixes *-sma*, *-sya*, *-syā*, *-yā*, *-ā*, *-an*, *-t*, *-bhi*, *-su*, *-i*, *-a*, and *-d*, are really adjectives and adverbs. No distinction, for example, can be drawn between "a cup of gold" and "a golden cup," and the instrumental, the dative, the ablative, and the locative are, when closely examined, merely adverbs attached to a verb. The terminations of the strong cases do not displace the accent of the stem to which they are affixed; the suffixes of the weak cases, on the other hand, generally draw the accent upon themselves.

According to Hübschmann, the nominative, accusative, and genitive cases are purely grammatical, distinguished from one another through the exigencies of the sentence only, whereas the locative, ablative, and instrumental have a logical origin and determine the logical relation which the [illegible] bear to each other and the verb. The nature of the dative is left undecided. The locative primarily denotes rest in a place, the ablative motion from a place, and the instrumental the means or concomitance of an action. The dative Hübschmann regards as "the case of the participating object." Like Hübschmann, Holzweissig divides the cases into two classes,—the one grammatical and the other logical,—and his analysis of their primitive meaning is the same as that of Hübschmann, except as regards the dative, the primary sense of which he thinks to have been motion towards a place. This is also the view of Delbrück, who makes it denote tendency towards an object. Delbrück, however, holds that the primary sense of the ablative was that of separation, the instrumental originally indicating concomitance, while there was a double locative, one used like the ablative absolute in Latin, the other being a locative of the object.

The dual was older than the plural, and after the development of the latter survived as a merely useless encumbrance, of which most of the Aryan languages contrived in time to get rid. There are still many savage idioms in which the conception of plurality has not advanced beyond that of duality. In the Bushman dialects, for instance, the plural, or rather that which is more than one, is expressed by repeating the word; thus *tu* is "mouth," *tutu* "mouths." It may be shown that most of the suffixes of the Aryan dual are the longer and more primitive forms of those of the plural which have grown out of them by the help of phonetic decay. The plural of the weak cases, on the other hand (the accusative alone excepted), was identical with the singular of abstract nouns; so far as both form and meaning are concerned, no distinction can be drawn between ὄπες and ἔπος. Similarly, *humanity* and *men* signify one and the same thing, and the use of English words like *sheep* or *fish* for both singular and plural shows to what an extent our appreciation of number is determined by the context rather than by the form of the noun. The so-called "broken plurals" of Arabic and Ethiopic are really singular collectives employed to denote the plural.

Gender is the product partly of analogy, partly of phonetic decay. In many languages such as Eskimo and Chocktaw, its place is taken by a division of objects into animate and inanimate, while in other languages they are separated into rational and irrational. There are many indications that the parent-Aryan in an early stage of its existence had no signs of gender at all. The terminations of the names of *father* and *mother*, *pater* and *mater*, for example, are exactly the same, and in Latin and Greek many diphthongal stems, as well as stems in *i* or *ya* and *u* (like ναῦς and νέκυς, πόλις and λῖς), may be indifferently masculine and feminine. Even stems in *o* and *a* (of the second and first declensions), though the first are generally masculine and the second generally feminine, by no means invariably maintain the rule; and feminines like *humus* and ὁδός, or masculines like *advena* and πολίτης, show that there was a time when these stems also indicated no particular gender, but owed their subsequent adaptation, the one to mark the masculine and the other to mark the feminine, to the influence of analogy. The idea of gender was first suggested by the difference between man and woman, male and female, and, as in so many languages at the present day, was represented not by any outward sign but by the meaning of the words themselves. When once arrived at, the conception of gender was extended to other objects besides those to which it properly belonged. The primitive Aryan did not distinguish between subject and object, but personified objects by ascribing to them the motive and powers of living beings. Accordingly they were referred to by different pronouns, one class denoting the masculine and another class the feminine, and the distinction that existed between these two classes of pronouns was after a time transferred to the noun. As soon as the preponderant number of stems in *o* in daily use had come to be regarded as masculine on account of their meaning, other stems in *o*, whatever might be their original sense, were made to follow the general analogy, and were similarly classed as masculines. In the same way, the suffix *ā* or *yā* acquired a feminine sense, and was set apart to represent the feminine gender. Unlike the Semites, the Aryans were not satisfied with these two genders, masculine and feminine. As soon as object and subject, patient and agent, were clearly distinguished from each other, there arose a need for a third gender, which should be neither masculine nor feminine, but denote things without life. This third gender was actually expressed either by the objective case used as a nominative (*e.g.*, *jugum*), or by a stem without any case ending at all (*e.g.*, *virus*).

The adverbial meaning of so many of the cases explains the readiness with which they became crystallized into adverbs and prepositions. An adverb is the attribute of an attribute,—"the rose smells sweetly," for example, being resolvable into "the rose has the attribute of scent with the further attribute of sweetness." In our own language *once*, *twice*, *needs*, are all genitives; *seldom* is a dative. The Latin and Greek *humi* and *χαμαί* are locatives, *facillime* (*facillumed*) and *ἐντεχνῶς* ablatives, *πάντῃ* and *ἅμα* instrumentals, *πάρος*, *ἑξῆς*, and *τηλοῦ* genitives. The frequency with which particular cases of particular nouns were used in a specifically attributive sense caused them to become, as it were, petrified, the other cases of the nouns in question passing out of use, and the original force of those that were retained being gradually forgotten. Prepositions are adverbs employed to define nouns instead of verbs and adjectives. Their appearance in the Aryan languages is comparatively late, and the Homeric poems allow us to trace their growth in Greek. The adverb, originally intended to define the verb, came to be construed with the noun, and the government of the case with which it was construed was accordingly transferred from the verb to the noun. Thus when we read in the *Odyssey* (iv. 43), *αὐτοὺς δ᾽ εἰσῆγον θεῖον δόμον*, we see that *εἰς* is still an adverb, and that the accusative is governed by the verb; it is quite otherwise, however, with a line like *Ἀτρείδης δὲ γέροντας ἀολλέας ἤγεν Ἀχαιῶν ἐς κλισίην* (*Il.*, i. 89.) where the adverb has passed into a preposition. The same process of transformation is still going on in English, where we can say indifferently, "What are you looking at?" using "at" as an adverb, and governing the pronoun by the verb, and "At what are you looking?" where "at" has become a preposition. With the growth and increase of prepositions the need of the case-endings diminished, and in some languages the latter disappeared altogether.

Like prepositions, conjunctions also are primarily adverbs used in a demonstrative and relative sense. Hence most of the conjunctions are petrified cases of pronouns. The relation between two sentences was originally expressed by simply setting them side by side, afterwards by employing a demonstrative at the beginning of the second clause to refer to the whole preceding one. The relative pronoun can be shown to have been in the first instance a demonstrative; indeed, we can still use *that* in English in a relative sense. Since the demonstrative at the beginning of the second clause represented the first clause, and was consequently an attribute of the second, it had to stand in some case, and this case became a conjunction. How closely allied the adverb and the conjunction are may be seen from Greek and Latin, where *ὡς* or *quum* can be used as either the one or the other. Our own *and*, it may be observed, has probably the same root as the Greek locative adverb *ἔτι*, and originally signified "going farther."

Another form of adverb is the infinitive, the adverbial force of which appears clearly in such a phrase as "A wonderful thing to see." Various cases, such as the locative, the dative, or the instrumental, are employed in Vedic Sanskrit in the sense of the infinitive, besides the bare stem or neuter formed by the suffixes *man* and *van*. In Greek the neuter stem and the dative case were alone retained for the purpose. The first is found in infinitives like *ἴδμεν* and *φέρειν* (for an earlier *φερε-Fεν*), the second in the infinitives en-ai. Thus the Greek *δοῦναι* answers letter for letter to the Vedic dative *dâvane*, "to give," and the form *ψεύδεσθαι* is explained by the Vedic *vayodhai*, for *vayas-dhai*, literally "to do living," *dhai* being the dative of a noun from the root *dhâ*, "to place" or "do." When the form *ψεύδεσθαι* had once come into existence, analogy was ready to create such false imitations as *γράφεσθαι* or *γραφήσεσθαι*. The Latin infinitive in *-re* for *-se* has the same origin, *amare*, for instance, being the dative of an old stem *amas*. In *fieri* for *fierei* or *fiesei*, from the same root as our English *be*, the original length of the final syllable is preserved. The suffix in *-um* is an accusative, like the corresponding infinitive of classical Sanskrit. This origin of the infinitive explains the Latin construction of the accusative and infinitive. When the Roman said, "Miror te ad me nihil scribere," all that he meant at first was, "I wonder at you for writing nothing to me," where the infinitive was merely a dative case used adverbially.

The history of the infinitive makes it clear how little distinction must have been felt at the outset between the noun and the verb. Indeed, the growth of the verb was a slow process. There was a time in the history of Aryan speech when it had not as yet risen to the consciousness of the speaker, and in the period when the noun did not possess a plural there was as yet also no verb. The attachment of the first and second personal pronouns, or of suffixes resembling them, to certain stems, was the first stage in the development of the latter. Like the Semitic verb, the Aryan verb seems primarily to have denoted relation only, and to have been attached as an attribute to the subject. The idea of time, however, was soon put into it, and two tenses were created, the one expressing a present or continuous action, the other an aoristic or momentary one. The distinction of sense was symbolized by a distinction of pronunciation, the root-syllable of the aorist being an abbreviated form of that of the present. This abbreviation was due to a change in the position of the accent (which was shifted from the stem-syllable to the termination), and this change again was probably occasioned by the prefixing of the so-called augment to the aorist, which survived into historical times only in Sanskrit, Zend, and Greek, and the origin of which is still a mystery. The weight of the first syllable in the aorist further caused the person-endings to be shortened, and so two sets of person-endings, usually termed primary and secondary, sprang into existence. By reduplicating the root-syllable of the present tense a perfect was formed; but originally no distinction was made between present and perfect, and Greek verbs like *δίδωμι* and *ἥκω* are memorials of a time when the difference between "I am come" and "I have come" was not yet felt. Reduplication was further adapted to the expression of intensity and desire (in the so-called intensive and desiderative forms). By the side of the aorist stood the imperfect, which differed from the aorist, so far as outward form was concerned, only in possessing the longer and more original stem of the present. Indeed, as Benfey first saw, the aorist itself was primitively an imperfect, and the distinction between aorist and imperfect is not older than the period when the stem-syllables of certain imperfects were shortened through the influence of the accent, and this differentiation of forms appropriated to denote a difference between the sense of the aorist and the imperfect which was beginning to be felt. After the analogy of the imperfect, a pluperfect was created out of the perfect by prefixing the augment (of which the Greek *ἐμέμηκον* is an illustration); though the pluperfect, too, was originally an imperfect formed from the reduplicated present.

Besides time, mood was also expressed by the primitive Aryan verb, recourse being had to symbolization for the purpose. The imperative was represented by the bare stem, like the vocative, the accent being drawn back to the first syllable, though other modes of denoting it soon came into vogue. Possibility was symbolized by the attachment of the suffix -*ya* to the stem, probability by the attachment of -*a* and -*â*, and in this way the optative and conjunctive moods first arose. The creation of a future by the help of the suffix -*sya* seems to belong to the same period in the history of the verb. This suffix is probably identical with that used to form a large class of adjectives and genitives (like the Greek *ἵπποιο* for *ἵπποσιο*); in this case future time will have been regarded as an attribute of the subject, no distinction being drawn, for instance, between "rising sun" and "the sun will rise." It is possible, however, that the auxiliary verb *as*, "to be," enters into the composition of the future; if so, the future will be the product of the second stage in the development of the Aryan verb when new forms were created by means of composition. The sigmatic or first aorist is in favour of this view, as it certainly belongs to the age of Aryan unity, and may be a compound of the verbal stem with the auxiliary *as*.

After the separation of the Aryan languages, composition was largely employed in the formation of new tenses. Thus in Latin we have perfects like *scrip-si* and *ama-vi*, formed by the help of the auxiliaries *as* (*sum*) and *fuo*, while such forms as *amaveram* (*amavi-eram*) or *amarem* (*ama-sem*) bear their origin on their face. So, too, the future in Latin and Old Celtic (*amabo*, Irish *carub*) is based upon the substantive verb *fuo*, "to be," and the English preterite in -*ed* goes back to a suffixed *did*, the reduplicated perfect of *do*. New tenses and moods, however, were created by the aid of suffixes as well as by the aid of composition, or rather were formed from nouns whose stems terminated in the suffixes in question. Thus in Greek we have aorists and perfects in -*κα*, and the characteristics of the two passive aorists, *η* and *θη*, are more probably the suffixes of nominal stems than the roots of the two verbs *ya*, "to go," and *dhâ*, "to place," as Bopp supposed. How late some of these new formations were may be seen in Greek, where the Homeric poems are still ignorant of the weak future passive, the optative future, and the aspirated perfect, and where the strong future passive occurs but once and the desiderative but twice. On the other hand, many of the older tenses were disused and lost. In classical Sanskrit, for instance, of the modal aorist forms the precative and benedictive almost alone remain, while the pluperfect, of which Delbrück has found traces in the Veda, has wholly disappeared.

The passive voice did not exist in the parent-Aryan speech. No need for it had arisen, since such a sentence as "I am pleased" could be as well represented by "This pleases me," or "I please myself." It was long before the speaker was able to imagine an action without an object, and when he did so, it was a neuter or substantival rather than a passive verb that he formed. The passive, in fact, grew out of the middle or reflexive, and, except in the two aorists, continued to be represented by the middle in Greek. So, too, in Latin the second person plural is really the middle participle with *estis* understood, and the whole class of deponent or reflexive verbs proves that the characteristic *r* which Latin shares with Celtic could have had at the outset no passive force.

Much light has been thrown on the character and construction of the parent-Aryan sentence by comparative syntax. In contradistinction to Semitic, where the defining word follows that which is defined, the Aryan languages place that which is defined after that which defines it; and Bergaigne has made it clear that the original order of the sentence was (1) object, (2) verb, and (3) subject. Greater complication of thought and its expression, the connexion of sentences by the aid of conjunctions, and rhetorical inversion caused that dislocation of the original order of the sentence which reaches its culminating point in the involved periods of Latin literature. Our own language still remains true, however, to the syntax of the parent-Aryan when it sets both adjective and genitive before the nouns which they define. In course of time a distinction came to be made between an attribute used as a mere qualificative and an attribute used predicatively, and this distinction was expressed by placing the predicate in opposition to the subject and accordingly after it. The opposition was of itself sufficient to indicate the logical copula, or substantive verb; indeed, the word which afterwards commonly stood for the latter at first signified "existence," and it was only through the wear and tear of time that a phrase like *Deus bonus est*, "God exists as good," came to mean simply "God is good." It is needless to observe that neither of the two articles was known to the parent Aryan; indeed, the definite article, which is merely a decayed demonstrative pronoun, has not yet been developed in several of the languages of the Aryan family.

Investigation of English grammar

We must now glance briefly at the results of a scientific investigation of English grammar and the modifications they necessitate in our conception of it. The idea that the free use of speech is tied down by the rules of the grammarian must first be given up; all that the grammarian can do is to formulate the current uses of his time, which are determined by habit and custom, and are accordingly in a perpetual state of flux. We must next get rid of the notion that English grammar should be modelled after that of ancient Rome; until we do so we shall never understand even the elementary principles upon which it is based. We cannot speak of declensions, since English has no genders except in the pronouns of the third person, and no cases except the genitive and a few faint traces of an old dative. Its verbal conjugation is essentially different from that of an inflexional language like Latin, and cannot be compressed into the same categories. In English the syntax has been enlarged at the expense of the accidence; position has taken the place of forms. To speak of an adjective "agreeing" with its substantive is as misleading as to speak of a verb "governing" a case. In fact, the distinction between noun and adjective is inapplicable to English grammar, and should be replaced by a distinction between objective and attributive words. In a phrase like "this is a cannon," *cannon* is objective; in a phrase like "a cannon-ball," it is attributive; and to call it a substantive in the one case and an adjective in the other, is only to introduce confusion. With the exception of the nominative, the various forms of the noun are all attributive; there is no difference, for example, between "doing a thing" and "doing badly." Apart from the personal pronouns, the accusative of the classical languages can be represented only by position; but if we were to say that a noun which follows a verb is in the accusative case we should have to define "king" as an accusative in such sentences as "he became king" or "he is king." In conversational English "it is me" is as correct as "c'est moi" in French, or "det er mig" in Danish; the literary "it is I" is due to the influence of classical grammar. The combination of noun or pronoun and preposition results in a compound attribute. As to the verb, Mr Sweet has well said that "the really characteristic feature of the English finite verb is its inability to stand alone without a pronominal prefix." Thus "dream" by itself is a noun; "I dream" is a verb. The place of the pronominal prefix may be taken by a noun, though both poetry and vulgar English frequently insert the pronoun even when the noun precedes. The number of inflected verbal forms is but small, being confined to the third person singular and the special forms of the preterite and past participle, though the latter may with more justice be regarded as belonging to the province of the lexicographer rather than to that of the grammarian. The inflected subjunctive (*be*, *were*, *save* in "God save the Queen," &c.) is rapidly disappearing. New inflected forms, however, are coming into existence; at all events, we have as good a right to consider *won't*, *shan't*, *can't* new inflected forms as the French *aimerai* (*amare habeo*), *aimerais* (*amare habebam*). If the ordinary grammars are correct in treating forms like "I am loving," "I was loving," "I did love," as separate tenses, they are strangely inconsistent in omitting to notice the equally important emphatic form "I do love" or the negative form "I do not love ("I don't love"), as well as the semi-inflexional "I'll love," "he's loving." It is true that these latter contracted forms are heard only in conversation and not seen in books; but the grammar of a language, it must be remembered, is made by those who speak it and not by the printers.

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Our school grammars are the inheritance we have received from Greece and Rome. The necessities of rhetoric obliged the Sophists to investigate the structure of the Greek language, and to them was accordingly due the first analysis of Greek grammar. Protagoras distinguished the three genders and the verbal moods, while Prodicus busied himself with the definition of synonyms. Aristotle, taking the side of Democritus, who had held that the meaning of words is put into them by the speaker, and that there is no necessary connexion between sound and sense, laid down that words "symbolize" objects according to the will of those who use them, and added to the ὄνομα or "noun," and the ῥῆμα or "verb," the σύνδεσμος or "particle." He also introduced the term πτῶσις, "case," to denote any flexion whatsoever. He further divided nouns into simple and compound, invented for the neuter another name than that given by Protagoras, and starting from the termination of the nominative singular, endeavoured to ascertain the rules for indicating a difference of gender. Aristotle was followed by the Stoics, who separated the ἄρθρον or "article" from the particles, determined a fifth part of speech, the πανδέκτης or "adverb," confined the term "case" to the flexions of the nouns, distinguishing the four principal cases by names, and divided the verb into its tenses, moods, and classes. Meanwhile the Alexandrian critics were studying the language of Homer and the Attic writers, and comparing it with the language of their own day, the result being a minute examination of the facts and rules of grammar. Two schools of grammarians sprang up,—the Analogists, headed by Aristarchus, who held that a strict law of analogy existed between idea and word, and refused to admit exceptions to the grammatical rules they laid down, and the Anomalists, who denied general rules of any kind, except in so far as they were consecrated by custom. Foremost among the Anomalists was Crates of Mallos, the leader of the Pergamenian school, to whom we owe the first formal Greek grammar and collection of the grammatical facts obtained by the labours of the Alexandrian critics, as well as an attempt to reform Greek orthography. The immediate cause of this grammar seems to have been a comparison of Latin with Greek, Crates having lectured on the subject while ambassador of Attalus at Rome in 159 B.C. The zeal with which the Romans threw themselves into the study of Greek resulted in the school grammar of Dionysius Thrax, a pupil of Aristarchus, which he published at Rome in the time of Pompey, and which is still in existence. Latin grammars were soon modelled upon it, and the attempt to translate the technical terms of the Greek grammarians into Latin was productive of numerous blunders which have been perpetuated to our own day. Thus *tenues* is a mistranslation of the Greek ψιλά, "unaspirated;" *genetivus* of γενική, the case "of the genus;" *accusativus* of αἰτιατική, the case "of the object;" *infinitivus* of ἀπαρέμφατος, "without a secondary meaning" of tense or person. New names were coined to denote forms possessed by Latin and not by Greek; *ablative*, for instance, was invented by Julius Cæsar, who also wrote a treatise *De Analogia*. By the 2d century of the Christian era the dispute between the Anomalists and the Analogists was finally settled, analogy being recognized as the principle that underlies language, though every rule admits of exceptions. Two eminent grammarians of Alexandria, Apollonius Dyscolus and his son Herodian, summed up the labours and controversies of their predecessors, and upon their works were based the Latin grammar composed by Ælius Donatus in the 4th century, and the eighteen books on grammar compiled by Priscian in the age of Justinian. The grammar of Donatus dominated the schools of the Middle Ages, and, along with the productions of Priscian, formed the type and source of the Latin and Greek school-grammars of modern Europe.

Learning of grammar of foreign languages.

A few words remain to be said, in conclusion, on the bearing of a scientific study of grammar upon the practical task of teaching and learning foreign languages. The grammar of a language is not to be confined within the rules laid down by grammarians, much less is it the creation of grammarians, and consequently the usual mode of making the pupil learn by heart certain fixed rules and paradigms not only gives a false idea of what grammar really is, but also throws obstacles in the way of acquiring it. The unit of speech is the sentence; and it is with the sentence therefore, and not with lists of words and forms, that the pupil should begin. When once a sufficient number of sentences has been, so to speak, assimilated, it will be easy to analyse them into their component parts, to show the relations that these bear to one another, and to indicate the nature and varieties of the latter. In this way the learner will be prevented from regarding grammar as a piece of dead mechanism or a Chinese puzzle, of which the parts must be fitted together in accordance with certain artificial rules, and will realize that it is a living organism which has a history and a reason of its own. The method of nature and science alike is analytic; and if we would learn a foreign language properly we must learn it as we did our mother-tongue, by first mastering the expression of a complete thought and then breaking up this expression into its several elements.

See Steinthal, *Charakteristik der hauptsächlichsten Typen des Sprachbaues*, Berlin, 1860; Schleicher, *Compendium of the Comparative Grammar of the Indo-European Languages*, translated by H. Bendall, London, 1874; Pezzi, *Aryan Philology according to the most recent Researches*, translated by E. S. Roberts, London, 1879; Sayce, *Introduction to the Science of Language*, London, 1879; Lersch, *Die Sprachphilosophie der Alten*, Bonn, 1838–41; Steinthal, *Geschichte der Sprachwissenschaft bei den Griechen und Römern mit besonderer Rucksicht auf die Logik*, Berlin, 1863; Delbrück, *Ablativ Localis Instrumentalis in Altindischen, Lateinischen, Griechischen, und Deutschen*, Berlin, 1864; Jolly, *Ein Kapitel vergleichender Syntax*, Munich, 1873; Hubschmann, *Zur Casuslehre*, Munich, 1875; Holzweissig, *Wahrheit und Irrthum der localistischen Casustheorie*, Leipsic, 1877; Draeger, *Historische Syntax der Lateinischen Sprache*, Leipsic, 1874–76; Sweet, *Words, Logic, and Grammar*, London, 1876. (A. H. S.)

GRAMMONT (Belgian, *Geeraerdsbergen*), a town of Belgium, province of East Flanders, is situated on both sides of the Dender, 21 miles S.S.E. of Ghent. It is surrounded by walls and possesses a college, a town-hall, and a hospital. Its principal manufactures are lace, cotton, and woollen goods, leather, beer, paper, and tobacco; and there are also bleaching and dyeing works. The population in 1866 was 8861.

GRAMONT, PHILIBERT, COUNT DE (1621–1707). A happy accident has preserved for the instruction of mankind rather than for their edification the portrait and the history of a man who entirely represents one section, fortunately a small section, of the society of his day. Of good family, rich, a gallant soldier, endowed with every kind of cleverness, the Count de Gramont endeavoured to live the life of unrestrained enjoyment. In this he so far succeeded that, although the following century furnished more numerous examples of his kind, he may be taken as the most finished specimen. His ideal man was a being without conscience, without principle, without religion, without a soul. At the court of Charles II. he found companions like himself,—women without virtue, men without honour, yet disguised and adorned with courtly manners and that external refinement which did duty for principle; and had it not been that his brother-in-law, Hamilton, conceived the design of writing the memoirs which have made him famous, Gramont would have been as entirely forgotten as most of his friends, save for a brief mention by St Evremond and another by Bussy Rabutin in that little-visited gallery of portraits, the *Histoire Amoureuse*. His grandfather had the distinction of being husband to Diane d'Andouins, *la belle Corisande*, one of the mistresses of Henry IV. The grandson always regretted that the king had not acknowledged his father for his own son, lamenting even in the presence of Louis XIV. that his family had missed the chance of becoming, in this illegitimate fashion, a branch of the royal line. The anecdote is entirely characteristic. It was at first proposed to enter him in the church, but he speedily perceived that his vocation was not ecclesiastical, and joined the army, in which he saw a great deal of active service, and was rewarded with the governorship of the Pays d'Aunis, and with other small posts. He crossed over to England during the protectorate of Cromwell. In the year 1662, two years after the restoration of Charles II., he was exiled from the French court and again repaired to London, where he found such a welcome as was due to his manners, his gaiety, his extraordinary good spirits, and his love of gambling, intrigue, gallantry, and pleasure. It is the period of his residence at the English court which forms the greater part of Hamilton's memoirs. He is described by Bussy Rabutin as having "laughing eyes, a well-formed nose, a pretty mouth, a little dimple in the chin which gave an agreeable effect to the whole face, a certain finesse in his countenance, and a fairly good stature but for a stoop." In the whole English court there was no one more full of wit, more avid of pleasure, more devoid of all moral restraint, not even Rochester himself, than the Count de Gramont. Naturally, the court being what it was, there was no one more popular. In a court where the women vied with each other for the king's favour, where the men habitually cheated at play, seduced their friends' wives, and corrupted their friends' daughters, that man would be most popular in whom the absence of principle became, by reason of his grace, *esprit*, and elegance, in itself a recommendation. Gramont was as purely a sensualist as any Roman of the later empire.

He married, in London, but on compulsion, the sister of his future biographer, Miss Hamilton, who, her brother tells us in these memoirs, was able to fix his affections. The statement must be received with some qualifications. The count, it is true, was by no means young when he married. At the same time, he "gallanted" for many years afterwards, and, in fact, to the very end of a long life. He was the only old man, says [illegible], who could affect the [illegible]. In fact Gramont, [illegible], was a spoiled child to whom everything was allowed, and who [illegible] by perpetual high spirits, and a continual flow of wit and *bons mots*. At the age of seventy [illegible] he had a dangerous illness, during which he became converted, [illegible], to the church, but on recovery, relapsed into his old habits. At eighty, [illegible] his brother-in-law Anthony Hamilton. When they were finished he sold the manuscript for 1500 francs and kept most of the money himself. Fontenelle, then censor of the press, refused to license the work, from considerations of respect to the old man who had so strangely exposed in its pages the whole of his character. These scruples were overcome by the count himself, who had the pleasure of seeing his biography appear in his own lifetime, and of laughing with the rest of the world at his own rogueries at cards, his amorous adventures, and his secret intrigues.

He died at the great age of eighty-six. His biographer Hamilton died thirteen years later at the age of seventy-four. The memoirs of the Count de Gramont are not to be recommended for general reading; yet they have the merit of being true; in no other work is the reality of that profligate society of St James's so vividly expressed; in no other contemporary memoirs is there so much wit, such grace of style, such skill in portraiture. Numerous editions and translations have been issued of this work, whose popularity seems destined to continue and grow.

GRAMPUS (*Orca gladiator*, Lacep.), a cetacean belonging to the *Delphinidæ* or dolphin family, and characterized by its rounded head without distinct beak, its high dorsal fin, and its large conical permanent teeth. Its upper part is of a nearly uniform glossy black colour, and the under part white, with a strip of the same colour over each eye. The name "grampus" is derived from the French *grand poisson*, through the Norman *grapois*. It is also known as the "killer," in allusion to its ferocity in attacking its prey, which consists largely of seals, porpoises, and the smaller species of dolphins. Its fierceness is only equalled by its voracity, which is such that in a specimen measuring 21 feet in length, dissected by Professor Eschricht, the remains of fourteen seals and thirteen porpoises were found, while the animal appeared to have been choked in the endeavour to swallow another seal, the skin of which was found entangled in its teeth. They also pursue and commit great havoc among the bulky but gentle belugas or white whales, which sometimes throw themselves ashore in order to escape from their remorseless persecutors. The grampus is an inhabitant of northern seas, occurring on the shores of Greenland, and having been caught, although rarely, as far south as the Mediterranean. It is not common, although there are numerous instances of its capture, on the British coasts. The latest of these occurred in March 1876, about a mile to the west of Granton, on the Firth of Forth. The creature on being dragged ashore, while still alive, was said by the onlookers to have given forth shrill piercing cries somewhat resembling in their sharpness a woman's voice. The specimen was an adult male, and measured 21 feet 10 inches along the curve of the back, with a girth of 13 feet. It had 24 teeth in each jaw, the front tooth on each side of the lower jaw being exceedingly small and almost hidden by the overlapping of the gum, while the two immediately succeeding these on each side were worn down almost to the level of the gum. A striking feature in the grampus is the high dorsal fin, which in the specimen mentioned measured within 2 inches of 4 feet in height.

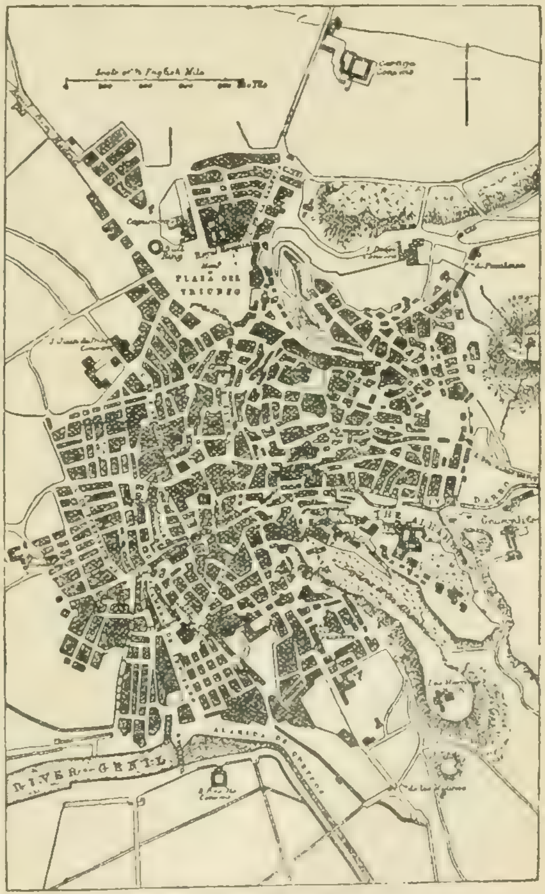
GRAN (the ancient *Istrogranum*, whence Hungarian *Esztergom*, and Latin *Strigonium*), the capital of a county of the same name, seat of the prince primate, and formerly a royal free city, is situated on the right bank of the Danube, nearly opposite the confluence of the Garam (Gran), 25 miles north-west of Buda, 47° 46′ N. lat., 18° 44′ E. long. It may be generally divided into the town proper, the episcopal quarter, also called Viziváros (Watertown), and the townships of St Thomas and of St George. The finest houses and public buildings are to be found in the two first-named portions of the town. On an elevated and commanding position, where once a fortress stood, are the seminary and theological institute for the education of priests, the residences of the chapter, and the basilica. This cathedral, commenced in 1821, consecrated in 1856, and completed in 1870, is built after the model of St Peter's at Rome, and is one of the finest churches in Hungary. Among the other public edifices and educational establishments, besides several churches and two monastic houses, are the archiepiscopal residence, the county and town halls, a training school for teachers, an upper gymnasium, a hospital, a library, a savings bank, &c. The population in 1870 was 8780, chiefly employed in cloth-weaving, wine making, and agricultural pursuits. There is connexion with the market town of Parkany on the left bank of the Danube by means of a bridge of boats.

Gran is one of the oldest towns of Hungary, and is famous as the birthplace of St Stephen, the first prince crowned "apostolic king" of Hungary. During the early times of the Hungarian monarchy it was the most important mercantile centre in the country, and it was the meeting place of the diets of 1016, 1111, 1114, and 1256. It was almost completely destroyed by Tartar hordes in 1241, but was rebuilt and fortified by King Bela IV. In 1543 it fell into the hands of the Turks, from whom it was recovered, in 1595, by Carl von Mansfeld. In 1604 it reverted to the Turks, who held it till 1683, when it was regained by the united forces of John Sobieski, king of Poland, and Prince Charles of Lorraine. In 1708 it was declared a free city by Joseph I. On the 13th April 1818 it was partly destroyed by fire. Gran lay in the direct route of the victorious revolutionary campaign of April 1849. Since 1876 its civil privileges have been of a corporate character.

GRANADA, a modern province of Spain, consisting of the central portion of the old kingdom of the same name, is bounded on the N. and N.E. by Jaen, Albacete, and Murcia, on the E. by Almeria, on the S. by the Mediterranean, and on the W. by Malaga and Cordova, having an area of 4937 English square miles and an estimated population (1870) of 485,346. It includes, and indeed chiefly consists of, the western and loftier portion of the Sierra Nevada, which in the peaks Cerro de Mulhacen and Picacho de la Veleta, overlooking the town of Granada, attains the heights of 11,781 and 11,597 feet respectively. From the central chain of this Sierra all the principal rivers of the province take their rise:—the Guadianamenor which, flowing past Guadix in a northerly direction, falls into the Guadalquivir in the neighbourhood of Ubeda; the Genil which, after traversing the vega of Granada, leaves the province a little to the westward of Loja, and joins the Guadalquivir betwixt Cordova and Seville; and the Rio Grande which falls into the Mediterranean at Motril. The climate in the lower valleys and the narrow fringe along the coast is warm, but on the higher grounds of the interior is somewhat severe; and the vegetation varies accordingly from the subtropical to the alpine. The soil of the plains is very productive, and that of the vega of Granada is considered the richest in the whole peninsula; from the days of the Moors it has been subjected to most careful and systematic irrigation, and it continues to yield in great abundance and in good quality wheat, barley, maize, wine, oil, sugar, flax, cotton, silk, and almost every variety of fruit. There are productive mines of lead, silver, copper, zinc, and manganese, which in 1866 gave employment to 1099 persons; mining indeed, with various agricultural and horticultural operations, including bee-farming, constitutes the staple industry of the province. In the mountains immediately surrounding the city of Granada occur many kinds of alabaster, some of which are very fine; there are also quantities of jasper and other precious stones in considerable variety. Mineral waters, chiefly chalybeate and sulphurous, are abundant, the most important springs being those of Alhama, which have a temperature of 118° Fahr. The chief centres of population are, besides Granada, the capital, Motril, Alhama, Loja, Guadix, and Huescar. Apart from the great highways traversing the province, which are excellent, the means of communication are few, and on the whole bad. The only railway is that which connects Granada with Bobadilla on the Malaga and Cordova line.

During the Roman period, Granada from the time of Augustus formed an undistinguished portion of the province of Baetica, of which the four *conventus juridici* were Cadiz, Cordova, Ecija, and Seville. Along with the rest of Andalusia, as a result of the great invasion from the north in the 5th century, it fell to the lot of the Vandals. Under the caliphs of Cordova, onwards from the 8th century, the town of Granada rapidly gained in importance, and ultimately became the seat of a provincial government, which, after the fall of the Ommiades (1038), ranked with Seville, Jaen, and others as an independent principality. By the conquests of St Ferdinand in the first half of the 13th century, Granada was left the sole representative of the Mahometan power in Spain; and even it was compelled to pay tribute to the sovereigns of Castile. The limits of the kingdom at that time were nearly identical with those of the province prior to 1833, the modern provinces of Malaga and Almeria being until that date included. It is said to have contained a population of 3,000,000, and to have had considerable commerce, especially with Italy in silk. On the capitulation of Boabdil in January 1492, Granada was united to the crown of Castile, but with special privileges which were afterwards treacherously withdrawn.

GRANADA, the capital of the above province, is situated at the confluence of the Darro and the Genil, not far from the base of the Sierra Nevada (37° 13′ N. lat., 3° 41′ W. long.). Different suggestions have been made as to the etymology of the name, which is rather obscure,—the least probable being that it is derived from *granada*, "a pomegranate," in allusion to the abundance of pomegranate trees in its neighbourhood. The Moors called it Karnattah or Karnattah al-Yahoud, and possibly the name is composed of the Arabic words *kurn*, "a hill," and *nattah*, "stranger"—the "city" or "hill of strangers." Granada is built



Plan of Granada.

partly on level ground near the Genil and partly on the slopes of two adjacent hills, at an elevation of about 2300 feet above the sea. The more ancient quarters of the town still retain much of the Moorish style, but the modern part is somewhat commonplace. It contains several squares, of which the most remarkable is the Bibarrambla, where tournaments were formerly held. There is also a beautiful shady walk, called the Alameda, which is one of the most frequented promenades. The old city comprises the faubourgs of Antequeruela, Alcazaba, Alhambra, and Albaicin, the last being named after the settlers who came from Baeza, after the capture of that city by St Ferdinand. For a detailed account of the Alhambra the reader is referred to the special article, vol. i. p. 570. The Antequeruela and Albaicin are mostly inhabited by the working classes. In the cemetery of the latter there are still a few ruins of an ancient mosque. The town proper contains a great number of churches and other public edifices. The cathedral, a somewhat heavy and irregular building, was begun in 1529 by Diego de Siloe, and finished in 1639. It is profusely ornamented with jasper and coloured marble and surmounted by a dome; and it contains several valuable paintings by Alonso Cano, portraits of Ferdinand and Isabella by Rincon, and marble statues of several kings and queens of Spain. In one of its numerous chapels (the Chapel Royal) are buried their "Catholic Majesties," and Philip and Juana. The church of Nuestra Señora de las Angustias has a splendid high altar and fine towers. That of St José is an elegant modern building. Other remarkable edifices are the monastery of St Gerónimo, founded by Gonzalo de Cordova, who is buried there; the Carthusian convent (Cartuja) adorned with paintings by Murillo, Morales, and Cano; the university, founded in 1531 by Charles V.; and the library. Granada is the birthplace of many eminent writers and artists, both Mahometan and Christian; among the latter may be mentioned Fray Luis de Granada (1505); Hurtado de Mendoza (1505), the historian of the war of Granada; Alonso Cano (1601), the great painter; and Moya (1610), who was both painter and sculptor. The climate of the town is pleasant and healthy, especially during the spring and summer months. Its manufactures are unimportant, the chief being coarse woollen stuffs, hats, paper, saltpetre, and gunpowder. Silk-weaving was once extensively carried on, and large quantities of silk were exported to Italy, France, Germany, and even America; but the production now is very limited. The education of the lower classes is much neglected, the city having only a few insignificant schools. In the year 1878 the population amounted to about 75,000.

The history of Granada does not go back far, if at all, into the Roman period (for it is not to be confounded with the ancient Illiberis), and even under the Moors it held a place of very subordinate importance until the period of the conquests of St Ferdinand, when it became the exclusive seat of Islam in Spain, and rose to almost unparalleled splendour, under Mohammed-Ibn-Alhamar, the builder of the Alhambra. It is said in its best days to have had 400,000 inhabitants, 70,000 houses, and 60,000 warriors, but this is probably an exaggeration. In the 15th century it was the last stronghold of the Moors against the Christian forces under Ferdinand and Isabella, and after a long siege it was surrendered by Boabdil on 2d January 1492. From that time Granada's wealth and importance rapidly decreased till 1610, when the Moors were expelled from Spain.

GRANADA, a city of Central America, state of Nicaragua, is situated on the N.W. bank of the Lake of Nicaragua, 30 miles N.N.W. of the town of that name. The suburbs are composed of cane huts occupied by the poorer inhabitants, but the city proper is formed of one-storied houses built of adobes or sun-dried bricks, roofed with tiles. They have balconied windows, and are surrounded by courtyards with ornamental gateways. It possesses several old churches and the remains of ancient fortifications. By means of the lake and the river San Juan, it communicates with the Caribbean Sea, and carries on a considerable trade in cocoa, cochineal, indigo, and hides. The steamer "Coburg" in the end of 1878, after several unsuccessful attempts, forced a passage up the river San Juan from the sea to Lake Nicaragua, thus establishing steam navigation between Granada, the Bay de la Vierge, San George, and other towns, and direct communication between Greyton and Granada. The feat is of importance in view of the project of constructing an oceanic canal by this route.

Granada was founded by Francisco Fernandez de Cordova in 1522, and he erected a fort for its protection. At an early period it surpassed Leon in importance, and was one of the richest cities in North America. It suffered greatly from the attacks of pirates in the latter half of the 17th century, and in 1686 was completely sacked by them. In 1855 it was taken by the filibuster William Walker, and partially destroyed by fire, and though retaken in 1857 it has never recovered its former prosperity, a great part of it being still in ruins. The population is about 10,000.

GRANADA, Luis de (1504–1588), a Spanish preacher and ascetic writer, was born of poor parents at Granada in 1504. At five years of age he was left an orphan, but the Conde de Tendilla, alcalde of Alhambra, having accidentally observed his singular intelligence, took him under his protection and had him educated with his own sons. At the age of nineteen he entered the Dominican convent of Santa Cruz, Granada, whence he went to the college of St Gregory, Valladolid. After completing his theological education he was named prior of the convent of Scala Cœli, where he exercised his preaching gifts under the direction of the celebrated orator Juan de Avila, whom he subsequently rivalled, if he did not surpass him, in eloquence. Having been invited by Cardinal Henry, infanta of Portugal and archbishop of Evora, to Badajoz in 1555, he founded a monastery there, and two years later was elected provincial of Portugal. He was also appointed confessor and councillor to the queen regent, but he declined promotion to the archbishopric of Braga, and on the expiry of his provincial office in 1561 he retired to a Dominican convent at Lisbon, where he died in 1588. Luis de Granada enjoyed the reputation of being the first ecclesiastical orator of his day, and his description of the "descent into hell" is one of the finest specimens of eloquence in the Spanish language. He also acquired great fame as a mystic writer, his *Guia de Pecadores*, or *Guide to Sinners*, first published in 1556, being still a favourite book of devotion in Spain, and having been translated into nearly every European language.

His principal other works are *Libro de la Oracion y Meditacion*, Salamanca, 1567; *Introduccion al simbolo de la Fe*, Salamanca, 1582; *Rhetoricæ Ecclesiasticæ, sive de ratione concionandi, Libri VI.*, Lisbon, 1576; *Silva locorum communium omnibus verbi concionatoribus necessaria*, 1582; and several series of sermons. A collected edition of the works of Luis de Granada was published by Planta at Antwerp, in 1572, at the expense of the duke of Alva, and by Luis Muñoz, Madrid, in 1657, afterwards reprinted at various periods. See preface to this edition of his works; preface to *Guia de Pecadores*, Madrid, 1781; *Biblioteca de Autores Esp.*, tom. vi., viii., xi.; Ticknor's *History of Spanish Literature*; and Eug. Baret, *Hist. de la litt. espagnole*, Paris, 1863.

GRANADILLA, the name applied to *Passiflora quadrangularis*, Linn., a plant of the natural order *Passifloreæ*, a native of tropical America, having smooth, cordate, ovate, or acuminate leaves; petioles bearing from 4 to 6 glands; an emetic and narcotic root; scented flowers; and a large, oblong fruit, containing numerous seeds, imbedded in a subacid edible pulp. The granadilla is sometimes grown in British hothouses. The fruits of several other species of *Passiflora* are eaten. *P. laurifolia* is the "water lemon," and *P. maliformis* the "sweet calabash" of the West Indies.

GRAN CHACO, an extensive region in the heart of South America, which stretches from 20° to 29° of S. lat., and belongs partly to Bolivia and partly to the Argentine Republic, the boundary between the two states coinciding with the parallel 22°. The area is estimated at about 425,000 square miles, or more than twice the area of France, and the greater portion is still unexplored. It all belongs to the La Plata basin and in general terms may be described as a plain inclining towards the S.E. and watered by the Pilcomayo, the Vermejo, and other tributaries of the Paraguay. The northern portion, lying within the region of tropical rains, has a profusion of marshes and lakes, while the southern portion is a dry cactus-growing steppe, except in the neighbourhood of the rivers, which annually submerge large areas with the surplus water they bring from the north. The whole of the Gran Chaco is still in the hands of the Indians, who are just beginning to learn a little agriculture,—to grow pumpkins, water melons, and maize; but the richness and extent of its forests and pastures will certainly secure the country a prosperous future. It possesses more timber suitable for every purpose than the whole of Europe; it already exports large numbers of cattle to the neighbouring states; and, according to Major Host, it will be able to furnish abundant supplies of petroleum. "At the foot of the western slope of the Santa Barbara range, 25 leagues from the confluence of the San Francisco river and the Vermejo, there is an extensive petroleum basin called the Laguna de la brea de San Miguel del Rastro, capable of yielding 2000 gallons per day."

See Von Reden, "Die Staaten im Strom-Gebiet des La Plata," in *Petermann's Mitth.*, 1856; Petermann and Burmeister, *Die Südamerikanischen Republiken, Argentina*, &c., 1875; Major Host in *La Plata Monatschrift*, 1873.

GRAND'COMBE, a town of France, in the department of Gard and arrondissement of Alais, is situated on the Gardon, 35 miles N.W. of Nimes. In the neighbourhood there are very extensive coal-mines, and the town possesses manufactures of zinc, lead, and glass. The population in 1876 was 5342.

GRAND HAVEN, a city of the United States, capital of Ottawa county, Michigan, is situated on Lake Michigan, at the mouth of Grand River, opposite Milwaukee, to which, as well as to the principal other towns on the lake, several steamers ply daily. It is a station of the Grand Haven Railway, and the terminus of the Detroit, Grand Haven, and Milwaukee line. On account of its fine situation and its medicinal springs, Grand Haven is becoming a favourite summer resort. It has saw and shingle mills, and manufactories of agricultural implements, of sashes and blinds, and of windmills. Shipbuilding is also carried on. In the neighbourhood there are extensive peach forests. Lumber and fruit are the principal shipments. Grand Haven was laid out in 1836, and became a city in 1867. Population (1870) 3147, now about 5000.

GRANDIMONTANES, or Grammontines (Ordo Grandimontensis), a small religious order confined almost entirely to France. Its origin, which can be traced to about the close of the 11th century, is involved in some obscurity. The founder, St Stephen of Tigerno or Thiers, was born at Château Thiers, in Auvergne, in 1046, was educated for the church partly at Benevento and partly at Rome, and, returning home about 1073, in obedience to the solicitations of an inner voice which had been making itself heard for years, embraced a life of solitary asceticism. The scene of his retreat was the lonely glen of Muret, about a league eastward from Limoges; as his reputation for piety extended, his cell became a favourite resort with many like-minded persons, and ultimately a community large enough to excite public attention was formed. The nature of the rule observed by them at that time is not accurately known; a reply which, according to tradition, Stephen gave to the papal legates when asked to give some account of himself, forbids alike the belief that he identified himself with any of the religious orders then in existence and the assumption that he had already received permission to establish a new one. Shortly after his death, which occurred on the 8th of February 1124, the lands at Muret were claimed by the neighbouring Augustinian friars of Ambazac,—a circumstance which in 1154 compelled the followers of Stephen to remove their abode, under the leadership of their second "corrector," some miles further eastward, to Grammont or Grandmont, whence the order subsequently took its name. So far as can be ascertained, the rule by which the community was governed was not reduced to writing until the time of Stephen of Lisiac, its fourth corrector. This rule, which was confirmed by Urban III. in 1186, was characterized by considerable severity, especially in the matters of silence, fasting, and flagellation; its rigour, however, was mitigated by Innocent IV. in 1247, and again by Clement V. in 1309. Under Stephen of Lisiac the order greatly flourished in Aquitania, Anjou, and Normandy, where the number of its establishments in 1170 is said to have exceeded sixty. The first Grandimontane house within the dominions of the king of France was that founded at Vincennes near Paris by Louis VII. in 1164; it soon acquired a position of considerable importance. Stephen of Thiers was, at the request of Henry II. of England, canonized by Clement III. in 1189; and the bestowal of this honour seems to have marked a culminating point in the history of the order which he had originated. The Grandimontanes (sometimes also like the followers of Francisco de Paola called Les bonshommes), owing to an almost endless series of internal disputes at once symptomatic and productive of disunion and disorganization, failed to achieve any considerable place in history, and were finally pensioned off and disbanded in 1769. To them belonged, until 1463, the priory of Creswell in Herefordshire, and also until 1441 that of Alberbury or Abberbury in Shropshire.

The *Annales* of the order were published at Troyes in 1662; and the *Regula*, sometimes attributed, though erroneously, to Stephen of Thiers, was first printed in the 17th century. A collection of maxims or instructions, professedly by the same author, has also been largely circulated in France since 1704. See Helyot, *Histoire des Ordres Monastiques*, vol. vi.

GRAND RAPIDS, a city of the United States, capital of Kent county, Michigan, is picturesquely situated on both sides of the Grand River near the rapids, 30 miles E. of Lake Michigan. The river is navigable up to this point, and steamers connect the city with Grand Haven and the navigation of Lake Michigan. The city is also the point of intersection of six railways. It possesses two public parks, a county jail, a central school, a large public library, and a scientific institute. It is the seat of the United States circuit and district courts for the western district of Michigan. The manufactures include a great variety of woodware (especially furniture, carriages, and waggons), agricultural implements, machinery, chemical substances, leather, beer, fruit, bricks of a very fine quality, and gypsum, which is very abundant in the neighbourhood. There is also a very extensive trade in lumber. The fall of the river at the rapids is about 18 feet in 1½ miles, and this water power has been taken advantage of for many of the manufactories. Grand Rapids was settled in 1833 and incorporated in 1850. The population has been rapidly increasing; while in 1850 it was only 2686, it was 16,507 in 1870, of whom 5725 were foreigners.

GRANDSON. See Granson.

GRANDVILLE. See Gérard, Jean I. I.

GRANET, François Marius (1777–1849), was the first painter who felt and attempted to render the æsthetic charm of Middle Age and Renaissance architecture. He was born at Aix in Provence, on the 17th December 1777; his father was a small builder, but the boy's own strong desires led his parents to place him—after some preliminary teaching from a passing Italian artist—in a free school of art directed by M. Constantin, a landscape painter of some reputation who lived in the town. In 1793 Granet followed the volunteers of Aix to the siege of Toulon, at the close of which he obtained employment as a decorator in the arsenal. Whilst yet a lad he had, at Aix, made the acquaintance of the young Comte de Forbin, and it was upon his invitation that Granet, in the course of the year 1797, proceeded to Paris. De Forbin was one of the pupils of David, and Granet entered the same studio. Later on he got possession of a cell in the convent of Capuchins, which, having served for a manufactory of assignats during the Revolution, was afterwards inhabited almost exclusively by artists. In the changing lights and shadows of the corridors of the Capuchins, Granet found the materials for that one picture to the painting of which, with varying success, he devoted his life. In 1802 he left Paris for Rome, where he remained until 1819, when he returned to Paris, bringing with him besides various other works one of fourteen repetitions of his celebrated Chœur des Capucins, executed in 1811. The figures of the monks celebrating mass are taken in this subject as a substantive part of the architectural effect, and this is the case with all Granet's works, even with those in which the figure subject would seem to assert its importance, and its historical or romantic interest. Stella painting a Madonna on his Prison Wall, 1810 (Leuchtenberg collection); Sodoma à l'Hopital, 1815 (Louvre); Basilique basse de St François d'Assise, 1823 (Louvre); Rachat de Prisonniers, 1831 (Louvre); Mort de Poussin, 1834 (Villa Demidoff, Florence), are among his principal works; all are marked by the same peculiarities, everything is sacrificed to tone. In 1819 Louis Philippe decorated Granet, and afterwards named him Chevalier de l'Ordre St Michel, and Conservateur des tableaux de Versailles (1826). He became member of the Institute in 1830; but in spite of these honours, and the ties which bound him to M. de Forbin, then director of the Louvre, Granet constantly returned to Rome. After 1848, he retired to Aix, immediately lost his wife, and died himself on the 21st November 1849. He bequeathed to his native town the greater part of his fortune and all his collections; these are now exhibited in the Musée, together with a very fine portrait of the donor painted by Ingres in 1811. M. Delécluze, in *Louis David et son temps*, devotes a few pages to Granet and his friend the Comte de Forbin.

GRANITE, a rock so named from the Latin *granum*, a grain, in allusion to the granular texture of many of its varieties. The term appears to have been introduced by the early Italian antiquaries, and it is believed that the first recorded use of the word occurs in a description of Rome by Flaminius Vacca, an Italian sculptor of the 16th century. This description was published by Montfaucon in his *Diarium Italicum*, where we read of certain columns "ex marmore granito Ægyptio" (cap. xvii.), and of others "ex marmore granito Æthaliæ insulæ" (cap. xviii.), showing that the Romans of Vacca's day were acquainted with granite from Egypt and from Elba. Granite is also referred to by Cæsalpinus in his treatise *De Metallicis* (1596), and by Tournefort in his *Relation d'un Voyage au Levant* (1698); indeed the latter has been cited by Emmerling (*Lehrb. d. Mineral.*) as the first author who uses the term. By these early writers, however, the name was loosely applied to several distinct kinds of granular rock, and it remained for Werner to give it that precise meaning which it at present possesses as the specific designation of a rock.

Granite is a crystalline-granular rock consisting, in its typical varieties, of orthoclase, quartz, and mica, to which a plagioclastic felspar is usually added. These minerals are aggregated together without the presence of any matrix or ground-mass. Thin sections of a true granite, examined under the microscope by transmitted light, show no trace of any amorphous or crypto-crystalline ground-mass. The chemical composition of the rock will, of course, vary with its mineralogical constitution. For an average analysis see GEOLOGY, vol. x. p. 233. The proportion of silica varies from 62 to 81 per cent. Granite belongs therefore to Bunsen's class of *acid* rocks, or those which contain more than 60 per cent. of silica. Dr Haughton has found an exceptionally low proportion of this oxide in some of the Irish granites (58·44 per cent., *e.g.*, in some Donegal granite, *Quart. Journ. Geol. Soc.*, xviii., 1862, p. 408). The specific gravity of granite varies from 2·59 to 2·73.

Orthoclase, or potash felspar, is the principal constituent of most granites. This mineral occurs either in simple crystals, or in twins formed on what is known as the "Carlsbad type," such crystals being common at Carlsbad in Bohemia. In porphyritic granites, such as those of Cornwall and Devon, the orthoclase crystals may attain to a length of several inches, and the twinning is marked on the fractured crystals by a line running longitudinally down the middle, and dividing the crystal into two halves. In colour the orthoclase generally varies between snow-white and flesh-red. The green felspar known as Amazon stone, which occurs in certain granites, has lately been shown by Des Cloiseaux to belong to the species *microcline*, and not, as previously supposed, to orthoclase (*Annales d. Ch.*, 5 ser., ix., 1876, p. 433). The plagioclastic, anorthic, or triclinic felspar of granite occurs in crystals which are generally smaller than those of the orthoclase, and which exhibit, even to the naked eye, their characteristic twin striation. Moreover the lustre is frequently resinous or fatty, while that of the orthoclase is pearly on the cleavage-planes. In most cases the plagioclase is the soda-lime felspar called *oligoclase*; but in some granites it is *albite* or soda felspar, as shown by Haughton in many of the Irish and Cornish granites (*Proc. Roy. Soc.*, xvii., 1869, p. 209). When a granite becomes weathered, the felspar may decompose into *kaolin* or *china-clay*; the commencement of this alteration is indicated under the microscope by the turbidity of the felspar, by the ill-defined edges of the crystals, and in the case of plagioclase by disappearance of the characteristic striæ.

The quartz of granite occurs generally in irregularly-shaped angular grains; but occasionally in distinct crystals which are double hexagonal pyramids with or without the corresponding prism. Colourless quartz is most common, but grey, brown, or bluish varieties also occur. Whatever its colour, it is as a rule transparent in microscopic sections, though sometimes rendered milky by the presence of vast numbers of minute cavities containing liquid (see GEOLOGY, *ut supra*, and for Sorby's original researches *Quart. Journ. Geol. Soc.*, xiv. p. 453). In many granites the quartz fills up the spaces between the crystals of felspar and of mica, and receives impressions from these minerals. This fact has been advanced against the view that granite has existed in a state of fusion; since it is assumed that, as the quartz is the most infusible of the three component minerals, it would have been the first to solidify on the cooling of the magma, whereas the relation of the quartz to the associated minerals in most cases shows that it must have solidified after the crystallization of the felspar and mica. In some granites, however, the quartz is developed in free crystals, thus pointing to an early solidification of this mineral. The mica, which is usually the least abundant constituent of the granite, occurs in thin scales of irregular shape or in hexagonal plates. It is either a white biaxial potash mica (muscovite) or a dark brown magnesian mica, generally uniaxial (biotite). Both species may occur in the same granite. Haughton has shown that some of the white mica of the Cornish granites is lepidolite, or lithia mica, while some of the black mica in the same rocks is the iron potash mica, *lepidomelane* (*Proc. Roy. Soc.*, xvii. p. 209). Professor Heddle finds that the black mica of most Scottish granites is a distinct species, which he calls *Haughtonite* (*Mineralog. Mag.*, No. 13, 1879, p. 72). A large number of accessory minerals occur in granite, no fewer than forty-four being cited by Zirkel (*Lehrb. d. Petrog.*, i. p. 481). Upon the presence of these supplementary minerals numerous varieties of granite have been founded. Thus, if tourmaline be present, the rock is a *schorlaceous* or *tourmaline granite*; when cassiterite or tin-stone occurs, it forms a *stanniferous granite*; the presence of epidote gives rise to an *epidote granite*; and so on with other minerals. The most common accessory constituent of granite is hornblende, a mineral which appears to replace to some extent the mica, and thus produces a *hornblendic* or *syenitic granite*. This rock was formerly, and by some petrographers is still, termed *syenite*; it is the *syenites* of Pliny, so named from Syene in Upper Egypt, where a smiliar rock was quarried by the ancient Egyptians. By modern petrographers, however, the term syenite is usually restricted to a rock which is an aggregate of orthoclase and hornblende,—in other words, a granite in which the quartz has disappeared while the mica has been superseded by hornblende. A beautiful schorlaceous rock, which is apparently a variety of granite, has been described by Pisani under the name of *luxullianite* (*Comptes Rendus*, lix., 1864, p. 913). It occurs in the parish of Luxullian, near Lostwithiel, in Cornwall, where it is found in the form of boulders, but has not been detected *in situ*. This rock is composed of tourmaline, or schorl, with quartz and orthoclase; the last named mineral occurring in large flesh-coloured crystals, which by contrast with the dark base produce a very beautiful effect. Two varieties of tourmaline, one brown and the other bluish, have been detected by Professor Bonney (*Mineralog. Mag.*, No. 7, 1877, p. 215). The sarcophagus of the duke of Wellington, in St Paul's Cathedral, is wrought out of a splendid block of luxullianite. Many varieties of granite are founded upon structural characteristics. Occasionally the constituents are developed in such large individuals as to form a *giant granite*. Crystals of orthoclase, associated with quartz in a peculiar parallel arrangement, produce the variety known as *graphic granite* or *Lapis Judaicus*—names which refer to the resemblance which the rock presents, when cut in certain directions, to lines of Hebrew characters. Graphic granite was termed by Hauy *pegmatite*, but this name is now generally applied to a coarse admixture of orthoclase, quartz, and silvery mica. When any of the component minerals occur in large crystals, embedded in a fine-grained base, a *porphyritic granite* is produced. Generally the crystals are those of orthoclase, as in many of the West of England granites, and in the characteristic rock of Shap Fell in Westmoreland. *Granitite* is a name applied to a variety of granite made up of orthoclase and quartz, with more or less plagioclase and a small proportion of mica. A granite composed of only felspar and quartz is called *haplite* or *semi-granite*. Some of the micaless varieties are known as *granulite*. When, instead of the mica disappearing, the felspar is absent, the resulting aggregate of quartz and mica is termed *greisen*; it is frequently a tin-bearing rock. Occasionally the granite, when fine in grain, loses its mica, and an intimate mixture of orthoclase and quartz is thus obtained; such a rock is known as a *felstone*. Crystals of orthoclase disseminated through a felsitic matrix, either compact or microcrystalline, give rise to a *felspar porphyry*; while crystals or rounded grains of quartz in a similar felsitic base produce a *quartz-porphyry* or *quartz-felsite*. By Cornish miners these quartz-porphyries are termed *elvans* (*elvanite* of Jukes); but this name is also applied to fine grained granites and to almost any rock which occurs as a dyke running through the killas or clay slate.

Few questions have been more warmly discussed than the origin of granite. When this rock is found forcing its way through older rocks, and appearing at the surface in large bosses from which veins are sent forth in all directions, there can be little doubt of its eruptive character. The small width of some of these granitic veins, or apophyses, suggests that the rock must have existed in a condition of perfect fusion or complete liquidity, and not simply as a viscous paste, before it could have been injected into such narrow fissures as those which are now occupied by granite. In many cases, the rocks which are penetrated by the granitic veins are altered in such a manner as to indicate a considerable elevation of temperature: a limestone in the neighbourhood of the veins may become saccharoidal, and shales may become indurated or even converted into hornstone, while new minerals are often developed in the vicinity of the intruded veins. In these veins the granite is apt to change its mineralogical constitution, becoming either fine-grained or felsitic, or even reduced at the extremities of the vein to quartz. From the days of Hutton it has been generally admitted that most granite is of igneous origin. Since it appears to have been solidified at great depths beneath the surface, it has been distinguished as a *plutonic* rock, while those eruptive rocks which have risen to the surface, and have there consolidated, are termed *volcanic* rocks. The older geologists regarded granite as the primitive rock of the earth's crust, forming the floor of all stratified deposits and the nucleus of mountain chains. Such a view, however, has been long exploded. It is known indeed that granite, so far from being in all cases an original rock, may be of almost any geological age. Some is undoubtedly as old as the Silurian period, while other granites are certainly as young as the Tertiary rocks, and perhaps of even more recent date. By many field-geologists granite has of late years been regarded as a metamorphic rather than as a truly igneous rock. Metamorphism, however, is a term which has been so vaguely used that most of our eruptive rocks may, in a certain sense, be said to be metamorphic. Still, in the case of granite, it has often been pointed out that a passage may be traced from this rock into gneiss, and that gneiss itself may be regarded as an altered sedimentary rock. Thus so experienced an observer as Professor Ramsay expresses his opinion that "granite is sometimes merely gneiss still further metamorphosed by heat in the presence of moisture" (*Phys. Geol. of Gt. Brit.*, 5 ed., 1878, p. 42). For a number of instances in which granite is said to pass into gneissose rocks, and these in turn, by numerous gradations, into undoubtedly stratified deposits, see Green's *Geology*, part i. p. 307, and also GEOLOGY, vol. x, p. 309.

Chemists have also brought forward arguments against the igneous origin of granite. Thus it has been argued that the specific gravity of the quartz of granite is about 2·6, while that of silica after fusion is only 2·2. It must be remembered, however, that the quartz of granite has solidified under great pressure, as proved by Mr Sorby's observations, and it is probable that such pressure would increase the density of the silica. Moreover, it has been pointed out by the late D. Forbes (*Geol. Mag.*, iv., No. 10, 1867, p. 443) that the siliceous tests of certain infusoria, which assuredly have not been fused, are as low as 2·2. Another argument which has been advanced against the igneous origin of granitic rocks is based on the fact that they contain minerals of a basic character which could not have existed in a state of fusion in the presence of free silica, without forming a combination with the latter. Again, some of the accessory minerals in granite would suffer change by an elevation of temperature, while many of them contain water which, it is assumed, would be expelled on fusion. Probably, however, these minerals are in most cases of secondary origin, and have been produced by the alteration of the granite. The mere presence of water is not incompatible with a pyrognostic origin; and Forbes has asserted (*op. cit.*) that specimens of lava, taken from a current on Etna while the lava was still flowing, contained crystals of stilbite, a mineral containing 16 per cent. of water. Mr Sorby has shown, too, that the quartz of volcanic rocks contains microscopic cavities enclosing liquid. It appears, indeed, that in the fusion of all eruptive rocks water has played a very important part. Dr Haughton has sought to reconcile the opposing views as to the origin of granite by admitting what he calls a *hydrometamorphic* origin for this rock. He believes that the rock, having been poured into veins and dykes when in a state of fusion, was subsequently altered by the action of water at temperatures which, though high, were insufficient for the fusion of the granite (*On the Origin of Granite: an Address to the Geol. Soc. of Dublin*, 1862).

Granitic rocks are extensively used for constructive and decorative purposes, though their industrial applications are necessarily restricted by the expense of working so hard a material. Although some granites are apt to decompose on exposure to atmospheric influences, the felspar passing into china-clay, other varieties are remarkable for their extreme durability, as attested by the monuments of ancient Egypt, on which the incised hieroglyphics still retain their sharpness. It appears that in England granite was not brought into extensive use much before the beginning of the present century (Creasy). It is now largely employed for massive structures, such as bridges and sea-walls, as also for kerbs and paving-sets. The best known granites are the grey variety from Aberdeen and the red granite of Peterhead, 30 miles north of Aberdeen. The granite of Dartmoor in Devonshire, and of the huge bosses which protrude through the clay slate of Cornwall, are largely worked as building and ornamental stones (for description of these granites see Sir H. T. de la Beche's *Report on the Geol. of Cornwall and Devon*). In Ireland there is much fine granite, which is quarried to a limited extent,—the Castlewellan granite having been used in the Albert Memorial in Hyde Park (Hull's *Building and Ornam. Stones*, 1872). The hornblendic varieties of granite are remarkably tough, and are largely employed for road-metal. For this purpose great quantities are quarried in the Channel Islands. Red granite occurs in abundance on the coasts of Maine, U.S., as well as in New Brunswick, and grey granite at Quincy and elsewhere in Massachusetts. Granite is frequently polished when used for monumental and decorative purposes. The polishing is effected by an iron tool, worked first with sand and water, then with emery, and lastly with putty-powder or oxide of tin; when the emery and putty are used, a surface of flannel is interposed between the granite and the iron tool ("On Granite Working," by Geo. W. Muir, *Journ. Soc. Arts*, xiv., 1866, p. 470).

As an element of scenery granite generally forms rounded hills, scantily clad with vegetation, but it sometimes rises into sharp pinnacles, as in the *aiguilles* of the Alps. By denudation the rock may break up into cuboidal blocks, which often remain piled upon each other, forming the characteristic "tors" of Cornwall and Devon. Hills of granite are frequently surmounted by masses of weathered rock of spheroidal form, such as the Cornish rocking-stones or logan-stones. The weathering of granite often produces boulder-shaped masses in such numbers as to form, around the summit of the hill, a "sea of rocks" (*Felsenmeer*).

In [illegible] the following may be consulted:— [illegible], 1866; [illegible] by [illegible], 1871; [illegible] F. H. [illegible] London, 1872; and the [illegible] by the Rev. Prof. Haughton in *Proc. Irish Acad.*, and *Quart. Journ. Geol. Soc. Lond.* For chemical composition of Cleopatra's Needle, by G. W. Wigner, see the *Analyst*, 1878, p. 382. (F. W. R.*)

GRANMICHELE, or GRAMMICHELE, a market-town of Sicily, in the province of Catania, about 8 miles from Caltagirone on the road to Catania. It lies on the side of a hill, the summit of which is crowned by a castle which, along with the town itself, was formerly a fief of the Branciforti Butera family. Beautiful marble is found in the vicinity, and the inhabitants, who in 1871 numbered 10,058, trade in oil.

GRANSON, GRANDSON, or GRANDSEE, a small town in Switzerland, canton of Vaud, is situated near the south-western extremity of the Lake of Neufchâtel. It possesses the ruins of an old castle, containing a collection of antiquities, and has a very ancient church, once connected with a Benedictine abbey, with a number of pre-Christian images. The town is of Roman origin. It was captured in 1475 by the Eidgenossen, and retaken in the following year by Charles the Bold; but in March of that year the Eidgenossen again defeated him near Granson with great slaughter. From that time till 1803 it was one of their lordships. The site of the battle is marked by three great blocks of marble. The population of the town in 1870 was 1587.

GRANT, MRS ANNE (1755–1838), a Scottish authoress, generally known as Mrs Grant of Laggan, was born at Glasgow, 21st February 1755. Her father, Duncan MacVicar, who held a commission in the army, went in 1757 with his regiment to America, and his family followed him in 1758. He received an allotment of land on retiring from the army in 1765, but ill health compelled him to return to Scotland in 1768, and after the outbreak of the revolutionary war his lands were confiscated. In 1779 Anne married the Rev. Mr Grant of Laggan, near Fort Augustus, Inverness, and on his death in 1801 she was left with a large family and only a very small income. It being known to several of her friends that she occasionally wrote verses, a proposal was made that she should publish a volume of poems, and this being acceded to, the names of as many as 3000 subscribers were obtained. The volume appeared in 1803 under the title of *Original Poems, with some Translations from the Gaelic*, and met with a rather favourable reception, on account of its easy versification and the truth and tenderness of the sentiment of some of its smaller pieces. In 1806 she published *Letters from the Mountains, being a Selection from the Author's Correspondence with her Intimate Friends from 1773 to 1804*, which, by its spirited descriptions of Highland scenery, character, and legends, awakened a large amount of interest. Her other works are *Memoirs of an American Lady, with Sketches of Manners and Scenery in America as they existed previous to the Revolution* (1808), containing reminiscences of her stay with Mrs Schuyler, the lady with whom she spent four years of her childhood in America; *Essays on the Superstitions of the Highlanders of Scotland* (1811), and *Eighteen Hundred and Thirteen, a Poem* (1814). After the death of her husband, Mrs Grant resided for some time on a small farm near Laggan; but in 1803 she removed to Woodend near Stirling, in 1806 to Stirling, and in 1810 to Edinburgh, in the society of which she was until her death a prominent figure, being much esteemed for her conversational powers, her tact and good sense, her cheerfulness of disposition, and her thorough kindness of heart. For the last twelve years of her life she received a pension from Government; and this, along with her other sources of income, not only placed her in easy circumstances, but enabled her to gratify her generosity by giving to others. She died November 7, 1838.

See *Memoir and Correspondence of Mrs Grant of Laggan*, edited by her son J. P. Grant, 3 vols., 1844.

GRANT, Sir Francis (1803-1878), an English portrait painter, and president of the Royal Academy in London, was the fourth son of Francis Grant of Kilgraston, Perthshire, and was born at Edinburgh in 1803. He was educated for the bar, and, according to the testimony of Sir Walter Scott in his diary, it was originally his intention after spending his small patrimony in field sports to make his fortune by the law. By the time, however, that the first part of his purpose had been accomplished, he had resolved to adopt painting in preference to law as his profession, and at the age of twenty-four he began at Edinburgh systematically to study the practice of art. On completing a course of instruction he removed to London, and as early as 1843 exhibited at the Royal Academy. At the beginning of his career he utilized his sporting experiences by painting groups of huntsmen, horses, and hounds, such as the Meet of H.M. Staghounds and the Melton Hunt; and doubtless if he had chosen to devote himself to the careful treatment of this class of subjects his success might have been more thorough and permanent, if less brilliant and lucrative, than it was. If, however, the reputation he acquired as a fashionable portrait-painter was aided by his social position and gentlemanly manners, it rested also on certain special artistic qualifications. The first and chief of these was his power of thoroughly reproducing the outward tone and manner of fashionable life, or, as Sir Walter Scott called it, his "sense of beauty derived from the best source, that is, the observation of really good society." If also his execution was superficial and thin, it was bright, clear, facile, and unconstrained. In drapery he had the taste of a connoisseur, and rendered the minutest details of costume with felicitous accuracy. In female portraiture he achieved considerable success, although rather in depicting the highborn graces and external characteristics than the true and individual personality. Among his portraits of this class may be mentioned Lady Glenlyon, the marchioness of Waterford, Lady Rodney, and Mrs Beauclerk. In his protraits of generals and sportsmen he proved himself more equal to his subjects than in those of statesmen and men of letters. He painted many of the principal celebrities of the time—especially those occupying high social position—including Scott, Macaulay, Lockhart, Disraeli, Hardinge, Gough, Derby, Palmerston, and Russell, his brother Sir J. Hope Grant, and his friend Sir Edwin Landseer. From the first his career was rapidly prosperous, and his recognition by the Academy fully kept pace with his reputation as an artist. In 1842 he was elected an associate, and in 1851 an Academician; and in 1866 he was chosen to succeed Sir C. Eastlake in the post of president, for which his chief recommendations were his social distinction, tact, urbanity, and friendly and liberal consideration of his brother artists; and its difficult and often invidious duties he performed so as both to increase the harmony and influence of the institution and to enhance its efficiency. Shortly after his election as president he received the honour of knighthood, and in 1870 the degree of D.C.L. was conferred upon him by the university of Oxford. He died October 5, 1878.

GRANT, Sir James Hope (1808-1875), an English general, brother of the preceding, and fifth and youngest son of Francis Grant of Kilgraston, Perthshire, was born July 22, 1808. He entered the army in 1826 as cornet in the 9th Lancers, and became lieutenant in 1828 and captain in 1835. In 1842 he acted as brigade-major to Lord Saltoun in the Chinese War, and specially distinguished himself at the capture of Chin-Keang, after which he received the rank of major and was nominated companion of the bath. In the first Sikh War of 1845-46 he took part in the battle of Sobraon; and in the Punjab campaign of 1848-49 he held command of his old regiment the 9th Lancers, and won high reputation in the battles of Chillianwalla and Gujrat. In 1854 he became brevet-colonel, and in 1856 brigadier of cavalry. He took a leading part in the suppression of the Indian mutiny of 1857, holding for some time the command of the cavalry division, and afterwards of a movable column of horse and foot. After rendering valuable service in the operations before Delhi and in the final assault on the city, he directed the victorious march of the cavalry and horse artillery despatched in the direction of Cawnpore to open up communication with the commander-in-chief Sir Colin Campbell, whom he met near the Alumbagh, and who raised him to the rank of brigadier-general, and placed the whole force under his command during what remained of the perilous march to Lucknow for the relief of the residency. After the retirement towards Cawnpore he greatly aided in effecting there the total rout of the rebel troops, by making a detour which threatened their rear; and following in pursuit with a flying column, he defeated them with the loss of nearly all their guns at Serai Ghat. He also took part in the operations connected with the recapture of Lucknow, shortly after which he was promoted to the rank of major-general, and appointed to the command of the force employed for the final pacification of India, a position in which his unwearied energy, and his vigilance and caution united to high personal daring, rendered very valuable service. Before the work of pacification was quite completed he was created K.C.B. In 1859 he was appointed to the command of the British land forces in the united French and British expedition against China, whose object was accomplished three months subsequent to the landing of the forces at Peh-tang, 1st August 1860, Pekin having surrendered at discretion after the Chinese army had thrice suffered defeat in the open and the Taku forts had been carried by assault. For his conduct in this, which has been called "most successful and the best carried out of England's little wars," he received the thanks of parliament, and was gazetted G.C.B. In 1861 he was made lieutenant-general and appointed commander-in-chief of the army of Madras; on his return to England in 1865 he was made quartermaster-general at headquarters; and in 1872 he was transferred to the command of the camp at Aldershot. In the same year he was gazetted general. He died at London, March 7, 1875.

Incidents in the Sepoy War of 1857-58, *compiled from the Private Journal of General Sir Hope Grant, K.C.B., together with some explanatory chapters by Capt. H. Knollys, Royal Artillery*, was published in 1873, and *Incidents in the China War of* 1860 appeared posthumously under the same editorship in 1875.

GRANTHAM, a municipal and parliamentary borough and market-town of England, county of Lincoln, is situated on both sides of the Witham, at the junction of several railways with the Great Northern line, 105 miles N.N.E. of London and 22 miles S.S.W. of Lincoln. The parish church, a spacious Gothic edifice of the 13th century, has been restored by Sir G. G. Scott. It is surmounted by an elegant spire 274 feet high, and has an elaborately carved front, and some splendid monuments. At the free grammar school, founded by Bishop Fox in 1528, Sir Isaac Newton received part of his education. Among the other public buildings are the guild-hall, with a spacious assembly-room, the two exchanges, the town-hall, the literary institution, the gaol, the dispensary, and the workhouse. A bronze statue of Sir Isaac Newton was erected in 1858. The principal trade is that of malting, which is carried on to a considerable extent. There are also tanneries and coach factories, and a large agricultural implement factory and iron foundry. Grantham returns two members to parliament. The population of the municipal borough (area, 406 acres) in 1871 was 5028, and of the parliamentary borough (area, 5811 acres) 13,250.

GRANVELLA, Antoine Perrenot, Cardinal de (1517–1586), one of the ablest and most influential of the princes of the church during the great political and ecclesiastical movements which immediately followed the appearance of Protestantism in Europe, was born 20th August, 1517, at Ornans, Burgundy, where his father, Nicolas Perrenot de Granvelle, who afterwards became chancellor of the empire under Charles V., was at that time engaged in practice as a junior at the provincial bar. On the completion of his studies in law at Padua and in divinity at Louvain, he for a short time held a canonry at Besançon, but his talents had already marked him for a higher sphere, and he was promoted to the bishopric of Arras when barely twenty three (1540). In his episcopal capacity he attended several diets of the empire, as well as the opening meetings of the council of Trent; and the influence of his father, now become chancellor, led to his being entrusted with many difficult and delicate pieces of public business, in the execution of which he developed a rare native talent for diplomacy, and at the same time acquired an intimate acquaintance with most of the currents of European politics. One of his specially noteworthy performances was the settlement of the terms of peace after the defeat of the Smalkaldic league at Muhlberg in 1547, a settlement in which, to say the least, some particularly sharp practice was exhibited. In 1550 he succeeded his father in the offices of secretary of state and chancellor of the empire; in this capacity he attended Charles in the war with Maurice, accompanied him in the flight from Innsbruck, and afterwards drew up the treaty of Passau (August 1552). In the following year he conducted the negotiations for the marriage of Mary of England and Philip of Spain, to whom in 1555, on the abdication of the emperor, he transferred his services. In April 1559 Granvella was one of the Spanish commissioners who arranged the peace of Cateau Cambrésis, and on Philip's withdrawal from the Netherlands in August of the same year he was appointed prime minister to the regent, Margaret of Parma. The policy of repression which in this capacity he pursued during the next five years secured for him many tangible rewards; in 1560 he was elevated to the archiepiscopal see of Malines, and in 1561 he received the cardinal's hat; but the growing hostility of a people whose moral and religious convictions he had studiously set himself to trample under foot, ultimately made it impossible for him to continue in the Low Countries; and by the advice of his royal master he in 1564 retired to Franche Comté. Nominally this withdrawal was only of a temporary character, but it proved to be final. The following six years were spent in comparative quiet, which was devoted chiefly to study and to the society of learned men; but in 1570 Granvella, at the call of Philip, resumed public life by accepting a mission to Rome as representative of the interests of Spain in framing the proposed treaty of alliance with Venice and the papal see against the Turks. In the same year he was advanced to the viceroyalty of Naples, a post of some difficulty and danger, which for five years he occupied with ability and success. Summoned to Madrid in 1575, to be president of the supreme council of Italy and afterwards of that of Castile, he still continued to find ample scope for his rare aptitudes. Among the more delicate negotiations of his later years were those of 1580, which had for their object the ultimate union of the crowns of Spain and Portugal, and those of 1584, which resulted in a check to France by the marriage of the Spanish infanta to Duke Philip of Savoy. In the same year he was made archbishop of Besançon, but meanwhile a lingering disease had laid an unrelenting grasp upon his iron frame; he never was enthroned, but died at Madrid, 21st September 1586. His body was removed to Besançon, where his father had been buried before him.

Numerous letters and memoirs of Granvella are preserved in the archives of Besançon. These were to some extent made use of by Prosper Levêque in his *Mémoires pour servir* (1753), as well as by the Abbé Boisot in the *Trésor de Granvella*. A commission for publishing the whole of the letters and memoirs was appointed by Guizot in 1834, and the result has been the issue of nine volumes of the *Papiers d'État du Cardinal de Granvelle*, edited by Weiss (1841–1852). They form a part of the *Collection de documents inédits sur l'histoire de France*. See also the anonymous *Histoire du Cardinal de Granvelle*, attributed to Courchetet D'Esnans (Paris, 1761), and Motley's *Rise of the Dutch Republic*.

GRANVILLE, a fortified seaport town of France, department of Manche, is situated at the mouth of the Bosq and at the foot of a steep rocky promontory projecting into the English Channel, 30 miles S.W. of St Lô. It is surrounded by strong walls, and is built principally of granite, and its streets are mostly steep and narrow. The parish church dates from the 15th century. Among the other public buildings are the tribunal of commerce, the hospital, the public baths, and the naval school. Granville occupies the seventh place in point of importance among the seaports of France, and the harbour is accessible to vessels of the largest tonnage. There is regular steam communication with Jersey and Guernsey. The principal exports are fruits, vegetables, oysters, fish, corn, wood, and cattle. A large number of the inhabitants are engaged in the cod and oyster fisheries, and among the other industries are the manufacture of brandy, chemicals, cod-liver oil, and leather. Shipbuilding is also carried on. Granville was founded by the English in the beginning of the 15th century, taken by the French in 1450, bombarded and burned by the English in 1695, and partly destroyed by the Vendean troops in 1793. The population in 1876 was 12,372.

GRANVILLE, John Carteret, Earl (1690–1763), English statesman, son of George, Lord Carteret, was born 22d April 1690, and in his fifth year succeeded to his father's title. He was educated at Westminster school and at Christ Church, Oxford, and even early in life had acquired a knowledge of the classics, of philosophy, of general literature, and of modern languages, which rendered him perhaps superior to all his contemporaries in the extent of his intellectual accomplishments. Soon after taking his seat in the House of Lords in 1711, he began to distinguish himself by his eloquent advocacy of the Protestant succession, and his zeal was rewarded when George I. came to the throne, by the appointment in 1715 of bailiff of the island of Jersey, and in 1716 of lord lieutenant of Devon; and his mother was also created countess of Granville. In 1719 he was sent on an embassy to Sweden; and in 1720 he was named ambassador-extraordinary to the congress of Cambray. In May of the following year he was appointed secretary of state under Walpole's administration; but Walpole's jealousy of his influence with the king led to his resignation on the 3d April 1724, and on the same day he was appointed lord-lieutenant of Ireland, an office which he held till 1730, when differences with the ministry led to his resignation. After his return he became the leader of the opposition, the duties of which office he discharged with great versatility of resource and with frequent effectiveness, but with a negligent rashness which rendered him almost as dangerous to his friends as to his opponents. In 1742 he was at last successful in overthrowing Sir Robert Walpole's Government, and was immediately thereafter appointed secretary of state. He now obtained a complete ascendency over the mind of George II., whose German policy he carried out irrespective of the opinions of his colleagues; but his imperiousness soon gained him both their enmity and the hatred of the people, and enabled his opponents, for whom he cherished unmitigated contempt, to effect his political annihilation. Pitt, afterwards earl of Chatham, spoke of him as "an execrable, a sole minister, who had renounced the British nation, and seemed to have drunk of the potion described in poetic fiction, which made men forget their country." In 1744 he found it necessary, from the resignation of his colleagues and his inability to find proper successors, to tender his resignation, and, according to Horace Walpole, he "retired from St James's laughing." Shortly before this he had, by the death of his mother, become Earl Granville. His administration was popularly distinguished by the epithet "drunken"—a title which had reference to his character both as a politician and as a private individual. Notwithstanding his want of political success, contemporary opinion is unanimous in affirming that he was not only the most brilliant debater but the ablest statesman of his time. Chatham declared that he owed all that he was to his friendship and instruction, and Swift, Smollett, Chesterfield, and Horace Walpole have borne equally laudatory testimony to his abilities. He was besides regarded as an authority in questions of scholarship by the most eminent classicists of his time, and Bentley was greatly indebted to his assistance in preparing his edition of Homer. His fatal defects appear to have been his careless arrogance and his deficiency in definite political principle and purpose. After the resignation of the Pelham ministry he was again appointed secretary of state, but almost immediately resigned, holding office, according to a political squib, for only forty-eight hours, three quarters, seven minutes, and eleven seconds. In 1749 he was created knight of the garter and appointed president of the council; but, though he retained his influence with the king, the part he thenceforth played in English politics was indirect and subordinate. He died January 2, 1763.

Various information regarding Earl Granville will be found in Chesterfield's *Characters*; Lord Hervey's *Memoirs of the Reign of George II*; Horace Walpole's *Letters and Memoirs of the Reign of George II*; and the *Autobiography of Shelburne*. See also Lecky's *History of England in the Eighteenth Century*.

GRAPE. See VINE

GRAPHITE. See CARBON, vol. v. p 86, and FURNACE, vol. ix. p. 843.

GRAPHOTYPE is a name which has been given to an ingenious process of autographic engraving, by which typographic printing blocks are produced. The general principles of the process are as follows. A block of chalk or some similar material is reduced to a level surface, and on this surface a design is drawn with a glutinous ink, this ink being sufficiently fluid to penetrate some little distance into the porous chalk. The ink having become dry, gentle friction is applied to the surface of the block, so as gradually to rub away those parts of the chalk which are not indurated by the glutinous ink. The lines of the drawing being thus left in relief, a perfect model of the required printing block is obtained, and this model is next hardened by immersion in a bath containing a solution of an alkaline silicate, after which it is dried and reproduced by the stereotype or the electrotype process. This method of typographic engraving was brought to a practical form, and patented in 1860 (No. 2309) by an American wood engraver, Mr de Witt Clinton Hitchcock. The first step in his process is to reduce French chalk or talc to an extremely fine state of division by repeated grindings, elutriations, and siftings, after which a layer of the material, rather over an eighth of an inch in thickness, is forced down upon, and made to adhere to, a thick zinc plate,—the necessary pressure being obtained by means of an hydraulic press, the platen of which is faced with a polished steel plate, so as to communicate a good surface to the layer of compressed French chalk. The device is now drawn (of course, reversed) on the prepared block with an ink consisting of a weak solution of glue coloured by lamp black or some other pigment. In drawing on the prepared block care must be taken not to damage the somewhat tender surface of the compressed chalk, and the safest instrument with which to apply the glutinous ink is a fine sable brush, but an ordinary pen may be employed if the operation of drawing is performed with caution. A pad of silk velvet or a fitch brush may be used for rubbing the block so as to leave the lines in relief, and it is quite sufficient to continue the friction until a depth equal to the thickness of an ordinary playing card is produced,—the spaces corresponding to any extended whites of the engraving being then cut out by means of a tool. A 10 per cent. solution of silicate of sodium may be used for hardening the block, and when dry nothing remains but to take a mould from it and to reproduce it in metal.

GRASLITZ, or GRASSLITZ (Bohemian *Kraslice*), a town in the north-west of Bohemia, near the Saxon frontier, in the circle of Elbogen, 88 miles N.W. of Prague, 50° 21′ N. lat., 12° 27′ E. long., is advantageously situated in a valley between high hills, at the confluence of the Silberbach and Zwoda. It is the headquarters of a military district, the seat of a court of justice, and has a custom-house, a handsome church built in 1618 and dedicated to Corpus Christi, and several manufactories of cotton and woollen stuffs, and of musical and mathematical instruments, looking-glasses, brass, copper, and wire goods, and paper. Graslitz is one of the most important industrial towns in Bohemia, and the centre of the lace-weaving districts of the Erzgebirge. In 1869 the population, inclusive of the small suburb of Glasberg, amounted to 6549.

GRASSE, a town of France, capital of an arrondissement in the department of Alpes-Maritimes, 20 miles W. of Nice. It occupies a picturesque situation on the southern declivity of a hill facing the Mediterranean, from which it is about 7 miles distant; and it possesses a climate remarkably mild and salubrious. It is well supplied with water from a rivulet which rises above it. The streets are narrow, steep, and winding, but the houses are generally well built. The town was formerly the seat of a bishop, and possesses a Gothic cathedral with a beautiful tower, an old chapel dating from the 11th century, now used as a powder magazine, a hospital, a town-hall, an exchange, a theatre, a communal college, and a public library. The chapel of the hospital contains three pictures by Rubens. Next to Paris, Grasse carries on the largest manufacture of perfumery in France. Citrons, oranges, lemons, figs, pomegranates, and the flowers used by the perfumers, are grown in the gardens of the town and neighbourhood, and fine marble, alabaster, and jasper are found in the vicinity. Grasse was founded in the 6th century by Jews from Sardinia. The population in 1876 was 9673.

GRASSES (*Gramineæ—Gramina*) are monocotyledonous flowering-plants, possessing certain characters in common, and constituting the order *Gramineæ*. No plant is correctly termed a grass which is not a member of this family, but the word is in common language also used, generally in combination, for many plants of widely different affinities which possess some resemblance (often slight) in foliage to truly graminaceous species; *e.g.*, knot grass (*Polygonum aviculare*), cotton-grass (*Eriophorum*), rib grass (*Plantago*), scorpion-grass (*Myosotis*), sea-grass (*Zostera*). In agriculture the word has an extended signification to include the various fodder-plants, chiefly leguminous, often called "artificial grasses" (see AGRICULTURE). Indeed, formerly *grass* (also spelt *gærs*, *gres*, *gyrs*, in the old herbals) meant any green herbaceous plant of small size.

Yet the first attempts at a classification of plants recognized and separated a group—considered even of primary value—of *Gramina*, and this, though bounded by nothing more definite than habit and general appearance, contained the *Gramineæ* of modern botanists. The older group, however, even with such systematists as Ray (1703), Scheuchzer (1719), and Micheli (1729), embraced in addition the *Cyperaceæ*, *Juncaceæ*, and some other mono-

monocotyledons with inconspicuous flowers. Singularly enough, the sexual system of Linnæus (1735) served to mark off more distinctly the true grasses from these allies, since very nearly all of the former then known fell under his Triandria Digynia, whilst the latter found themselves under other of his artificial classes and orders.

1. STRUCTURE.—The general type of true grasses is familiar in the cultivated cereals of temperate climates—wheat, barley, rye, oats, and in the smaller plants which make up our pastures and meadows and form a principal factor of the turf of natural downs. Less familiar are the grains of warmer climes—rice, maize, millet, and sorgho, or the sugar cane. Still further removed are the bamboos of India and America, the columnar stems of which reach to the height of forest trees. All are, however, formed on a common type, which we proceed to examine.

Root.—Most cereals and many other grasses are annual, and possess a tuft of very numerous slender root-fibres, much branched, and of great length. The greater part of the order are of longer duration, and have the roots also fibrous, but fewer, thicker, and less branched. In such cases they are very generally given off from just above each node (often in a circle) of the lower part of the stem or rhizome, perforating the leaf-sheaths. In some bamboos they are very numerous from the lower nodes of the erect culms, and pass downwards to the soil around them, whilst those from the upper nodes shrivel up and form circles of spiny fibres.

Stem.—The root-stock of perennial grasses is usually well developed, and often forms very long creeping or subterranean rhizomes, with elongated internodes and sheathing scales; it is also frequently short, with the nodes crowded. The very large root-stock of the bamboos (fig. 1) is a striking example of "definite" growth; it is much branched, the short thick curved branches being given off below the apex of the older ones and at right angles to them, the whole forming a series of connected arched axes, truncate at their ends which were formerly continued into leafy culms. The root-stock is always solid, and has the usual internal structure of the monocotyledonous stem.

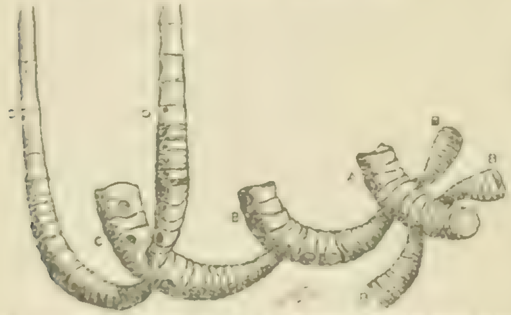


Fig. 1.—Rhizome of Bamboo. A, B, C, D, successive series of axes, the last bearing a leafy culm.

The aerial leaf-bearing branches (culms) are a characteristic feature of grasses. They are generally numerous, erect, cylindrical (rarely flattened), and conspicuously jointed with prominent nodes. The nodes are solid, a strong plate of tissue passing across the stem, but the internodes are commonly hollow, although examples of completely solid stems are not uncommon (many Andropogons, sugar cane). The general character is thus not unlike that of [illegible]. The exterior of the culms is more or less concealed by the leaf-sheaths; it is usually smooth and often highly polished, the epidermal cells containing an amount of silica sufficient to leave after burning a distinct skeleton of their structure. Tabasheer is a white substance nearly composed of silica, found in the joints of several bamboos. A few of the lower internodes may become enlarged and sub-globular, forming nutriment-stores, and grasses so changed are termed "bulbous" (*Arrhenatherum*, *Poa bulbosa*, &c.). In internal structure grass-culms, save in being hollow, conform to that usual in monocotyledons; the vascular bundles run parallel in the internodes, but a horizontal interlacement occurs at the partitions. Nearly all grasses branch to some extent, and many extensively; the branches are strictly distichous, and many buds are abortive, or the resulting branches short and stunted. In many bamboos they are long and spreading or drooping and copiously ramified, in others reduced to hooked spines. *Dinochloa* is truly scandent, and climbs over trees 100 feet or more in height. *Olyra latifolia* is also a climber on a humbler scale.

Grass-culms grow with great rapidity, as is most strikingly seen in bamboos, where a height of over 100 feet is attained in from two to three months, and many species grow two, three, or even more feet in twenty-four hours. Silicic hardening does not commence till the full height is nearly attained. The largest bamboo recorded is 170 feet, and the diameter is usually reckoned at about 4 inches to each 50 feet. A specimen in the British Museum is over 8 inches in diameter. In the same collection are some remarkable monstrosities, in which the septa are oblique and the internodes triangular or rhomboidal; Kurz has also figured one in the Calcutta Museum in which the cavities are confluent into a continuous spiral.

Leaves.—These present special characters usually sufficient for ordinal determination. They are always solitary at each node and strictly distichous, and consist of two distinct portions, the sheath and the blade. The *sheath* is often of great length, and generally completely surrounds the culm; as a rule it is split down its whole length, thus differing from that of *Cyperaceæ*, which is almost invariably (*Eriospora* is an exception) a complete tube. In a few grasses (*Melica*, *Bromus*) the edges are soldered together as in the latter order. The sheaths are much dilated in *Alopecurus vaginatus* and in a species of *Potamochloa*, in the latter serving as floats. At the summit of the sheath, above the origin of the blade, is the *ligule*, a usually membranous process of small size (occasionally reaching an inch in length) erect and pressed around the culm. It is rarely quite absent, but may be represented by a tuft of hairs (very conspicuous in *Pariana*). *Melica uniflora* possesses, in addition to the ligule, a green erect tongue-like process, from the line of junction of the edges of the sheath.

The *blade* is frequently wanting or small and imperfect in the basal leaves, but in the rest is long and set on to the sheath at an angle. The usual form is familiar,—sessile, more or less ribbon-shaped, tapering to a point, and entire at the edge. The chief modifications are the articulation of the (deciduous) blade on to the sheath, which occurs in all the *Bambuseæ* (except *Planotia*) and in *Spartina stricta*, and the interposition of a petiole between the sheath and the blade, as in *Leptaspis*, *Pharus*, *Panicum*, *Lophatherum*, &c. In the latter case the form of the leaf usually becomes oval, ovate, or even cordate or sagittate, but these forms are found in sessile leaves also (*Olyra*, *Panicum*). The venation is strictly parallel, the midrib usually strong, and the other ribs more slender. In *Arundinella* there are several nearly equal ribs, and in some broad-leaved grasses (*Bambusa*, *Pharus*, *Leptaspis*) the venation becomes tessellated by transverse connecting veins. The thick prominent veins in [illegible] occupy the whole upper surface of the leaf. Epidermal appendages are rare, the most frequent being marginal, scabrous, cartilaginous teeth, usually minute, but occasionally (*Danthonia scabra*, *Panicum serrulatum*) so large as to give the margin a serrate appearance. [illegible] and one or two Panicums have woolly leaves.

Inflorescence.—This possesses an exceptional importance in grasses, since, their floral envelopes being much reduced and the sexual organs of very great uniformity, the characters employed for classification are mainly derived from the arrangement of the flowers and their investing bracts. The subject also presents unusual difficulties from the various interpretations which have been given to these numerous organs and the different terms employed for them by various writers. It may, however, be now considered as settled that the whole of the bodies known as glumes and paleæ, and distichously arranged externally to the flower, form no part of the floral envelopes, but are of the nature of bracts. These are so arranged round the small flowers as to form *spikelets* (locustæ), and each spikelet may contain one, two, three, or a greater number of flowers (in some species of *Eragrostis* nearly 60). The flowers are, as a rule, placed laterally on the axis (rachilla) of the spikelet, but in uniflorous spikelets they appear to be terminal, and are probably really so in *Alopecurus* (fig. 9, 2) and in two anomalous genera, *Anomochloa* and *Streptochæta*.

In immediate relation with the flower itself, and often entirely concealing it, is the *palea* or *pale* ("upper pale" of most systematic agrostologists; "palecla interior," Dumortier; "spathella," Döll). This organ (fig. 3, 1) is peculiar to grasses among *Glumiferæ*, and is almost always present, certain *Oryzeæ* and *Phalarideæ* being the only exceptions. It is of thin membranous consistence, usually obtuse, often bifid, and possesses no central rib or nerve, but is furnished with two lateral ones, one on either side; the margins are frequently folded in at the ribs, which thus become placed at the sharp angles. This structure points to the fusion of two organs, and the pale was by R. Brown considered to represent two portions soldered together of a trimerous perianth-whorl, the third portion being the "lower pale," to be immediately mentioned. By Bentham the homology of the organ is suggested to be with the two bracteoles found in *Hypolytrum pungens* and *Platylepis*, and with the perigynium of the female flower of *Carex* in *Cyperaceæ*. It is rarely (*Triachyrum*, *Diachyrium*) found split into two separate organs.

The flower with its pale is sessile, and is placed in the axil of another bract in such a way that the pale is exactly opposed to it, though at a slightly higher level. It is this second bract which has been generally called by systematists the "lower pale," and with the "upper pale" considered to form an outer floral envelope ("calyx," Jussieu; "perianthium," Brown; "stragulum," Palisot de Beauvois; "glumella," Dumortier). In the writings of most botanists even though this view is not held, yet, where the term "flower" is employed, it includes these organs. It is, however, certain that the two bracts are on different axes, one secondary to the other, and cannot therefore be parts of one whorl of organs. This was made out from the study of so-called "viviparous" grasses, in which the lower pales become transformed into ordinary foliage leaves, first by Von Mohl in 1845, and more clearly by Germain de St Pierre in 1852, who terms the lower pale the "glume fertile." Döll and Bentham have also independently arrived at the same result, and the latter in 1858 first published the terminology here adopted, and used for the same organ the name *flowering glume*. The two bracts are usually quite unlike one another, but in some genera (*e.g.*, most *Festuceæ*) they are considerably similar in shape and appearance.

The flowering glume has generally a more or less boat-shaped form, is of firm consistence, and possesses a well-marked central midrib and frequently several lateral ones. The midrib in a large proportion of genera extends into an appendage termed the *awn* (fig. 10, 3), and the lateral veins more rarely extend beyond the glume as sharp points (*e.g.*, *Pappophorum*). The form of the flowering glume is very various, this organ being plastic and extensively modified in different genera. In *Leptaspis* it is formed into a closed cavity by the union of its edges, and encloses the flower, the styles projecting through the pervious summit. Valuable characters are obtained from the awn. This presents itself variously developed from a mere subulate point to an organ several inches in length, and when complete (as in *Andropogoneæ*, *Aveneæ*, and *Stipeæ*) consists of two well marked portions, a lower twisted part and a terminal straight portion, usually set in at an angle with the former sometimes trifid and occasionally beautifully feathery. The lower part is most often suppressed, and in the large group of the *Paniceæ* awns of any sort are very rarely seen. The awn may be either terminal or may come off from the back of the flowering glume, and Duval Jouve's observations have shown that it represents the blade of the leaf of which the portion of the flowering-glume below its origin is the sheath; the twisted part (so often suppressed) corresponds with the petiole, and the portion of the glume extending beyond the origin of the awn (very long in some species, *e.g.*, of *Danthonia*) with the ligule of the developed foliage-leaf. When terminal the awn has three fibro-vascular bundles, when dorsal only one; it is covered with stomate-bearing epidermis.

The flower with its palea is thus sessile in the axil of a floriferous glume, and in a few grasses (*Leersia* (fig. 2), *Coleanthus*, *Nardus*) the spikelet consists of nothing more, but usually (even in uniflorous spikelets) other glumes are present. Of these the two placed distichously opposite each other at the base of the spikelet never bear any flower in their axils, and are called the *basal* or *empty glumes* (fig. 10, 1). They are the "glumes" of most writers ("paleæ" of Dumortier), and together form what was called the "gluma" by R. Brown ("tegmen," Palisot de Beauvois). They rarely differ much from one another, but one may be smaller or quite absent (*Panicum* (fig. 8, 2), *Vulpia*, *Paspalum*, *Lolium*), or both be altogether suppressed, as above noticed. They are commonly firm and strong, often enclose the spikelet, and are rarely provided with long points or imperfect awns. Generally speaking they do not share in the special modifications of the flowering glumes, and but rarely themselves undergo modification, chiefly in hardening of portions (*Sclerachne*, *Manisuris*, *Antephora*, *Peltophorum*), so as to afford greater protection to the flowers or fruit. But it is usual to find, besides the basal glumes, a few other empty ones, and these are in two- or more-flowered spikelets (fig. 11, 2) at the extremity (numerous in *Lophatherum*), or in uniflorous ones (fig. 8, 2) below, interposed between the floral glume and the basal pair. Descriptive writers have been accustomed to call these empty glumes "barren" or "neutral flowers," a misleading use of terms.

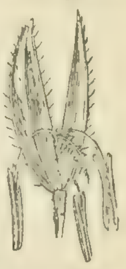


FIG. 2.—Spikelet of *Leersia*.

The axis of the spikelet, when short and rounded, has been termed the *callus*, when long the *rachillus*. It is frequently jointed and breaks up into articulations above each flower. Tufts or borders of hairs are frequently present (*Calamagrostis*, *Phragmites*, *Andropogon*), often so long as to surround and conceal the flowers. The axis is often continued beyond the last flower or glume as a bristle or stalk.

Involucres or organs outside the spikelets are not unfrequent, the morphology of which is various. Thus in *Setaria*, *Pennisetum*, &c., the one or more circles of simple or feathery hairs represent abortive branches of the inflorescence; in *Cenchrus* these become consolidated, and the inner ones flattened out so as to form a very hard globular spiny case to the spikelets. The cup-shaped involucre of *Cornucopiæ* is a dilatation of the axis into a hollow receptacle with a raised border. In *Cynosurus* the pectinate involucre which conceals the spikelet is a barren or abortive spikelet. True *bracts* of a more general character subtending branches of the inflorescence are singularly rare in *Gramineæ*, in marked contrast with *Cyperaceæ*, where they are so conspicuous. They however occur in a whole section of *Andropogon*, in *Anomochloa*, and at the base of the spike in *Sesleria*. The remarkable ovoid involucre of *Coix*, which becomes of stony hardness, white, and polished (then known as "Job's tears"), is also a modified bract or leaf-sheath. It is entirely closed except at the apex, and contains the female spikelet, the stalks of the male inflorescence and the long styles emerging through the small apical orifice.

Any number of spikelets may compose the inflorescence, and their arrangement is very various. In the spicate forms, with sessile spikelets on the main axis, the latter is often dilated and flattened (*Paspalum*), or is more or less thickened and hollowed out (*Stenotaphrum*, *Rottbœllia*, *Tripsacum*), when the spikelets are sunk and buried within the cavities. Every variety of racemose and paniculate inflorescence obtains, and the number of spikelets composing those of the large kinds is often immense. Rarely the inflorescence consists of very few flowers; thus *Lygeum Spartum*, the most anomalous of European grasses, has but two or three large uniflorous spikelets, which are fused together at the base, and have no basal glumes, but are enveloped in a large hooded spathe-like bract.

Flower.—This is characterized by remarkable uniformity. The *perianth* is represented by very rudimentary, small, fleshy, hypogynous scales called *lodicules* ("squamulæ," Kunth, "nectarium," Schreber); they are elevated or truncate, sometimes fringed with hairs, and are in contact with the ovary. Their usual number is two, and they are placed collaterally at the anterior side of the flower, that is, next to the flowering glume. They are generally considered to represent the inner whorl of the ordinary monocotyledonous (liliaceous) perianth, the outer whorl of three being suppressed as well as the posterior member of the inner whorl. This latter is present almost constantly in *Stipeæ* and *Bambuseæ*, which have three lodicules, and in the latter group they are occasionally more numerous (five, spreading and persistent in *Pseudostachyum*, six to eight in *Beesha*). In *Anomochloa* they are represented by hairs. In *Streptochæta*, according to Döll, there are six lodicules, alternately arranged in two whorls. They are often quite absent. In some cases lodicules are of the nature of stipules to the palea, and appear as though split off from its sides at the base. Such stipular lodicules often co-exist along

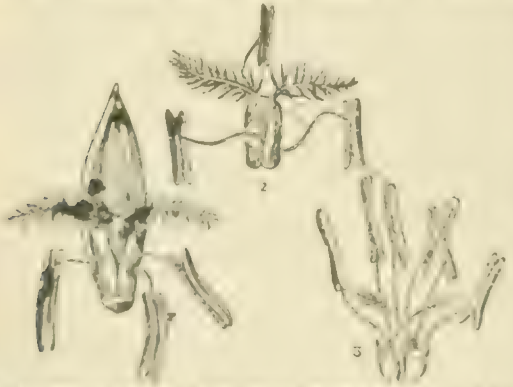


FIG. 3.—Flowers of Grasses. 1, [illegible]; 2, Poa; 3, Oryza.

with the perianthial ones, and are then either free from or combined with the two anterior ones.

Sexual Organs.—Grass-flowers are usually hermaphrodite, but there are very many exceptions. Thus it is very common to find one or more imperfect (usually male) flowers in the same spikelet with bisexual ones, and their relative position is important in classification. *Holcus* and *Arrhenatherum* are examples in English grasses; and as a rule in species of temperate regions separation of the sexes is not carried further. In warmer countries monœcious and diœcious grasses are more frequent. In such cases the male and female spikelets and inflorescence may be very dissimilar, as in the maize, Job's tears, *Euchlæna*, *Spinifex*, &c.; and in some diœcious species this dissimilarity has led to the two sexes being referred to different genera (*e.g.*, *Antephora axilliflora*, Steud., is the female of *Buchloe dactyloides*, Engelm., and *Neurachne paradoxa*, Br., of a species of *Spinifex*). In other grasses, however, with the sexes in different plants (*e.g.*, *Brizopyrum*, *Distichlis*, *Eragrostis capitata*, *Gynerium*), no such dimorphism obtains. *Amphicarpum* is remarkable in having cleistogamic flowers borne on long radical subterranean peduncles which are fertile, whilst the conspicuous upper paniculate ones, though apparently perfect, never produce fruit. Something similar occurs in *Leersia oryzoides*, where the fertile spikelets are concealed within the leaf-sheaths.

Andrœcium.—In the vast majority there are three stamens alternating with the lodicules, and therefore one anterior, *i.e.*, opposite the flowering glume, the other two being posterior and in contact with the palea. They are hypogynous, and have long and very delicate filaments, and large, linear or oblong two-celled anthers, dorsifixed and ultimately very versatile, deeply indented at each end, and commonly exserted and pendulous. Suppression of the anterior stamen sometimes occurs (*e.g.*, *Anthoxanthum*), or the two posterior ones may be absent (*Uniola*, *Cinna*, *Phippsia*, *Festuca bromoides*). On the other hand there is in some genera (*Oryza*, most *Bambuseæ*) another row of three stamens, making six in all (fig. 3, 3); and *Anomochloa* and *Tetrarrhena* possess four. The stamens become numerous (ten to forty) in the male flowers of a few monœcious genera (*Pariana*, *Luziola*). In [illegible] they vary from seven to thirty, and in *Gigantochloa* they are monadelphous.

Gynœcium.—There is but little variation here from a bicarpellary pistil, with a small rounded one-celled ovary containing a single laterally attached or ascending ovule, capped by two styles quite distinct or connate at the base,

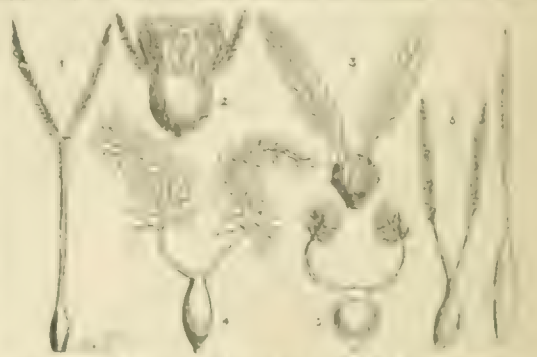


FIG. 4.—Pistils of Grasses. 1, [illegible]; 2, [illegible]; 3, [illegible]; 4, [illegible]; 5, [illegible].

and with densely hairy or feathery stigmas (fig. 4). Occasionally there is but a single style (*Nardus*, *Lygeum*), and this may attain to a great length (6 inches in the maize). Or three styles may be present (some *Bambuseæ*, *Pariana*, *Streptochæta*). Nees has described a case in which three complete carpels were found in *Schedonorus*.

We thus see that, comparing the flower of *Gramineæ* with the normal liliaceous plan (fig. 5), it differs in the complete suppression of the outer row and the posterior member of the inner row of the perianth leaves, of the whole inner row of stamens, and of the anterior carpel, whilst the remaining members of the perianth are in a rudimentary condition. But each or any of the usually missing organs are to be found normally in different genera, or as occasional developments.

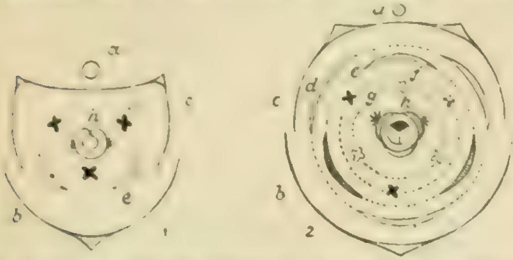


FIG. 5.—Diagrams of the ordinary grass-flower. 1, actual condition; 2, theoretical, with the suppressed organs supplied. *a*, axis; *b*, flowering glume; *c*, palea; *d*, outer row of perianth leaves; *e*, inner row; *f*, outer row of stamens; *g*, inner row; *h*, pistil.

Fruit.—The ovary ripens into a usually small ovoid or rounded fruit, which is entirely occupied by the single large seed, from which it is not to be distinguished, the thin pericarp being completely united to its surface. To this peculiar fruit the term *caryopsis* has been applied (more familiarly "grain"); it is commonly furrowed longitudinally down one side (usually the inner, but in *Coix* and its allies, the outer), and an additional covering is not unfrequently provided by the adherence of the persistent palea, or even also of the flowering glume ("chaff" of cereals). From this type are a few deviations; thus in *Sporobólus*, &c. (fig. 6), the pericarp is not united with the seed but is quite distinct, dehisces, and allows the loose seed to escape. Sometimes the pericarp is membranous, sometimes hard and brittle, whilst, on the other hand, in some genera of *Bambuseæ*, it becomes thick and fleshy, forming a "berry," or rather a drupe. In *Melocanna baccifera* this forms a fruit 3 or 4 inches long, with a pointed beak of 2 inches more; it is indehiscent, and the small seed germinates whilst the fruit is still attached to the tree, putting out a tuft of roots and a shoot, and not falling till the latter is 6 inches long. A similar germination also occurs in *Pseudostachyum compactum*, which has the largest fruit of the order.

FIG. 6.—Fruit of *Sporobolus*, showing the dehiscent pericarp and seed.

Seed.—The testa is thin and membranous but occasionally coloured, and the embryo small, the great bulk of the seed being occupied by the hard farinaceous endosperm (albumen) on which the nutritive value of the grain depends.

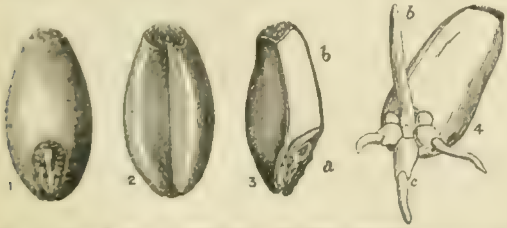


FIG. 7.—A grain of wheat. 1, back, and 2, front view; 3, vertical section, showing (*b*) the endosperm, and (*a*) embryo; 4, commencement of germination, showing (*b*) the plumule and (*c*) the secondary rootlets surrounded by their coleorrhizæ.

The embryo presents many points of interest. Its position is remarkable, closely applied to the surface of the endosperm at the base of its outer side. This character is absolute for the whole order, and effectually separates *Gramineæ* from *Cyperaceæ*. The part in contact with the endosperm is flat and plate like, and is known as the *scutellum*. Some difference of opinion is held on the nature of this; but it is probably correctly regarded (as by Van Tieghem) as the main portion of the cotyledon, the white epigœal sheath (*pileola*) protecting the plumule—which is often described as the cotyledon—being the ligule only of that organ greatly developed. The radicle is inferior, broad, and blunt; the primary root is very slightly developed in germination, but several secondary lateral ones burst through above its point, and thus become surrounded at their base with little sheaths (coleorrhizæ).

II. CLASSIFICATION.—*Gramineæ* are thus sharply defined from all other plants, and there are no genera as to which it is possible to feel a doubt whether they should be referred to it or not. The only order closely allied is *Cyperaceæ*, and the points of difference between the two have been alluded to above, but may be here brought together. The best distinctions are found in the position of the embryo in relation to the endosperm—lateral in grasses, basal in *Cyperaceæ*—and in the possession by *Gramineæ* of the 2-nerved palea below each flower. Less absolute characters, but generally trustworthy and more easily observed, are the feathery stigmas, the always distichous arrangement of the glumes, the usual absence of more general bracts in the inflorescence, the split leaf-sheaths, and the hollow, cylindrical, jointed culms,—some or all of which are wanting in all *Cyperaceæ*. The same characters will distinguish grasses from the other glumiferous orders, *Restiaceæ*, *Eriocauloneæ*, and *Desvauxiaceæ*, which are besides further removed by their capsular fruit and pendulous ovules. To other monocotyledonous families the resemblances are merely of adaptive or vegetative characters. Some *Commelynaceæ* and *Marantaceæ* approach grasses in foliage; the leaves of *Allium*, &c., possess a ligule; the habit of some palms reminds one of the bamboos; and *Juncaceæ* and a few *Liliaceæ* possess an inconspicuous scarious perianth.

The great uniformity among the very numerous species of this vast family renders its *classification* very difficult. The difficulty has been increased by the confusion resulting from the multiplication of genera founded on slight characters, and from the description of identical plants under several different genera in consequence of their wide distribution.

No characters for main divisions can be obtained from the flower proper or fruit; though both Kunth and Reichenbach have used them—especially the form of the styles and stigmas, the lodicules and the caryopsis—they have not been generally employed by botanists, who have found it necessary to trust to characters derived from the usually less important inflorescence and bracts.

The earlier authors made the general arrangement of the spikelets (spicate, paniculate, &c.) the basis of their classifications. Palisot de Beauvois's main divisions are founded on the existence in the same inflorescence of similar or diverse spikelets. Fries has proposed a division into *Euryantheæ* and *Clisantheæ*, according to the condition of the flowering glume and pale, separated or close during inflorescence. Dumortier gives a classification into *Rachideæ*, *Rachilliftoræ*, and *Callifloræ*; the first with the spikelets inserted into excavations of the rachis, the second with the flowers of the free spikelet inserted on its axis (rachillus), and the last with the flower or flowers borne on the short callus of the glumes. Both these systems, and others which have been suggested, possess merits of their own, but they have not as yet been found capable of application to the order as a whole, having been framed for the accommodation mainly of European genera.

For such general treatment no better primary divisions have been found than those proposed by Robert Brown in 1810 and further elaborated in 1814, which have been adopted by Munro (1868) and Bentham (1878) in their most recent revisions of the Cape and Australian genera. The basis of Brown's division of the whole order into Panicaceæ and Poaceæ is the position of the most perfect flower in the spikelet; this is the upper (apparently terminal) one in the first, whilst in the second it occupies the lower position, the more imperfect ones (if any) being above it. Munro has supplemented this by another character easier of verification, and of even greater constancy, in the articulation of the pedicel in the Panicaceæ immediately below the glumes; whilst in Poaceæ this does not occur, but the axis of the spikelet frequently articulates above the pair of empty basal glumes. Neither of these two great divisions will well accommodate certain genera allied to Phalaris, for which Munro proposed tentatively a third group, since named Phalarideæ; this, or at least the greater part of it, is placed by Bentham under the Poaceæ.

The following arrangement is based on the writings of these authors, but it cannot be considered very satisfactory. Probably no serial disposition can represent the tangled network of genera related in different ways and various degrees which make up this very natural but complicated family, and though some of the following tribes are fairly natural, the limits of others are but ill-defined, and the position of many genera uncertain.

I. Panicaceæ.—Pedicel articulated below the glumes. Spikelet with one or two flowers, the more perfect fertile one above, the male or barren one, if present, below it.

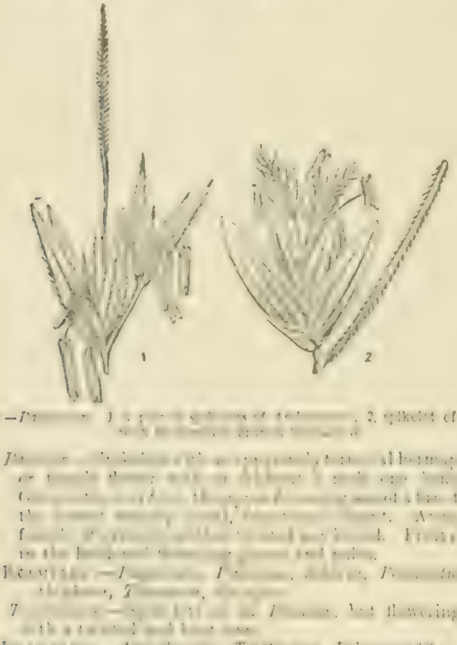


Fig. 8.—[illegible] 1, [illegible]; 2, spikelet of *Setaria*, [illegible]

1. *Paniceæ*.—[illegible] hermaphrodite or [illegible] beneath it. [illegible] texture, [illegible] rarely [illegible]

   Examples:—[illegible], *Panicum*, [illegible], [illegible] *An-thephora*, [illegible]

2. *Tristegineæ*.—[illegible] *Paniceæ*, but flowering glume with a twisted and bent awn.

   Examples:—*Arundinella*, *Tristegis*, [illegible](?).

3. [illegible] usually in pairs [illegible] the other [illegible]

   Examples:—[illegible]

4. [illegible]

   Examples:—[illegible]

5. [illegible]

   Examples:—*Coix*, *Zea*, *Chionachne*, *Tripsacum*, [illegible]

6. *Olyreæ*.—Spikelets monœcious, or some hermaphrodite and some male in the same panicle; the flowering glume large, [illegible]. Stamens three, six, or more. Leaves often broad and petiolate.

   Examples:—[illegible], *Pharus*, *Olyra*, *Pariana*.

II. Phalarideæ.—Pedicel either articulated below the glumes or not, but the rachis of the spikelet articulated above the two lower glumes. Spikelets with one or three flowers, the perfect fertile one above, the two male, if present, below it. Two-nerved palea usually absent.

   Examples:—*Phalaris*, *Anthoxanthum*, [illegible], [illegible], *Alopecurus*, *Phleum*, *Crypsis*, *Lygeum* (?).

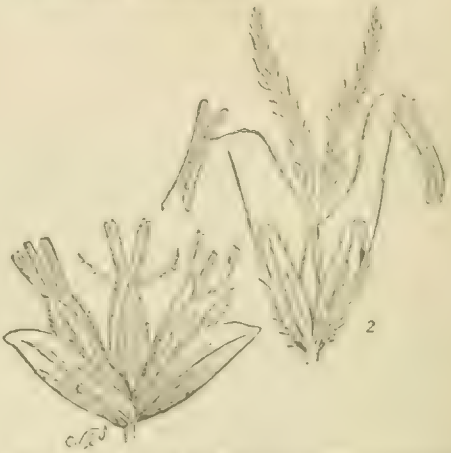


Fig. 9.—*Phalarideæ*. 1, spikelet of *Hierochloe*; 2, spikelet of *Anthoxanthum*.

III. Poaceæ.—Pedicel not articulated below the glumes. Rachis of spikelet often articulated above the two lowest glumes. Spikelets with one, two, or more fertile flowers, the male or imperfect ones (if any) above them. Rachis of spikelet often continued as a point or bristle beyond the flowers.

1. *Oryzeæ*.—Spikelets one-flowered. Empty basal glumes very small or wanting. Two-nerved palea usually absent. Stamens usually six.

   Examples:—*Oryza*, *Leersia*, *Potamophila*, *Zizania*, *Anomochloa* (?).

2. *Stipeæ*.—Spikelets one-flowered. Flowering glume with a terminal twisted and bent awn. Palea small and the lodicules three.

   Examples:—*Stipa*, *Aristida*, *Piptatherum*.

3. *Agrostideæ*.—Spikelets one-flowered. Flowering glume usually with a terminal or dorsal bent awn. [illegible] Lodicules two.

   Examples:—*Agrostis*, [illegible], *Calamagrostis*, [illegible](?)

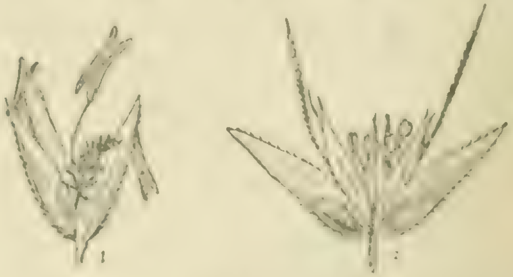


Fig. 10.—[illegible] 1, spikelet of [illegible], 2, spikelet of *Avena*.

4. *Aveneæ*.—Spikelets generally two, rarely three or more flowered. [illegible]

   Examples:—*Aira*, *Holcus*, *Arrhenatherum*, *Avena*, *Trisetum*, [illegible]

(2, 3, and 4 together form Bentham's tribe *Agrostideæ*.)

5. *Pappophoreæ*.—Spikelets one or several flowered. Flowering glume rounded on the back, terminating in three or more teeth, [illegible] into straight awns.

   Examples:—*Pappophorum*, [illegible], [illegible], *Triodia*.

6. *Chlorideæ*.—Spikelets one or several flowered, [illegible] on one-sided spikes. Flowering glumes rarely awned.

EXAMPLES:—[illegible], *Chloris*, *Eleusine*, *Leptochloa*, *Spartina*, [illegible], [illegible].

7. [illegible].—Spikelets [illegible] several-flowered, pedicellate. Flowering glumes usually [illegible]. Palea large.

EXAMPLES:—[illegible].

8. *F*[illegible].—Spikelets several- to many-flowered, stalked, paniculate or [illegible]. Flowering glumes [illegible], or with a straight awn, [illegible] above the [illegible].

EXAMPLES:—[illegible], *Poa*, [illegible], [illegible], *Melica*.

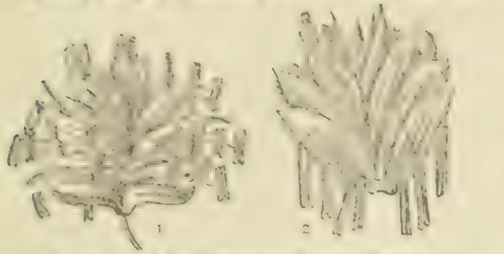


FIG. 11.—*Poaceæ*. 1 spikelet of *Briza*, 2 spikelet of *Triticum*.

9. *Bambuseæ*.—Spikelets one-, several-, or many-flowered, usually sessile, paniculate or capitate. Lodicules three. Stamens generally six. Stems very large and tall (called arborescent or shrubby). Blade of leaf articulated with the sheath.

EXAMPLES:—*Arundinaria*, *Chusquea*, *Nastus*, [illegible], *Melocanna*, [illegible].

10. *Hordeæ*.—Spikelets one- or several-flowered, sessile on the opposite sides of the main axis of the spike. Otherwise as in *Festuceæ*.

EXAMPLES:—*Hordeum*, *Agropyrum*, *Ægilops*, *Triticum*, *Lolium*, *Lepturus*, *Elymus*.

[5 to 10 comprise Bentham's tribe *Astrepta*.]

III. DISTRIBUTION.—Grasses are the most universally diffused over the globe of all flowering-plants. There is no district in which they do not occur, and in nearly all they are a leading and dominant feature of the flora. In actual number of species *Gramineæ* comes considerably after *Compositæ* and *Leguminosæ*, the two most numerous orders of phanerogams, but in number of individual plants it probably far exceeds either; whilst from the wide extension of many of its species, the proportion of *Gramineæ* to other orders in the various floras of the world is much higher than its whole number of species would lead one to expect. This number can, however, scarcely be put much below 6000, which is probably somewhat more than a fifth of all monocotyledons. This is only about $\frac{1}{16}$th of the phanerogams as a whole, yet in any given locality, with a very few exceptions, this proportion is largely exceeded. In tropical regions, where *Leguminosæ* is the leading order, grasses closely follow as the second, whilst in the warm and temperate regions of the northern hemisphere, in which *Compositæ* takes the lead, *Gramineæ* again occupies the second position. As the colder latitudes are entered the grasses become relatively more numerous, and are the leading family in Arctic and Antarctic regions. The only countries where the order plays a distinctly subordinate part are some extra-tropical regions of the southern hemisphere, Australia, the Cape, Chili, &c. The actual proportion of graminaceous species to the whole phanerogamic flora in different countries is found to vary from nearly $\frac{1}{4}$th in the Arctic regions to about $\frac{1}{20}$th at the Cape; in the British Isles it is about $\frac{1}{12}$th. The following are proportions per cent. in various floras, from Decandolle's *Geogr. Botanique*, which must, however, be taken as merely approximations in most cases:—

In the tropics:—Cape Verd Islands, 13; Abyssinia and Nubia, 12; Mexico, 10; Hawaiian Islands, 10; Congo, 8; Mauritius, 8; neighbourhood of Quito, 10; Barbados, 6; Surinam, 6; Tunis, 6; New Guinea, 4; New Grenada, 4. In temperate regions of the northern hemisphere:—Banda and some other districts of India, 15 to 17; Egypt, 12; Texas, 12; Azores, 12; Madeira, 11; Algeria, 9½; Canaries, 8; United States, 8; Sardinia, 9; Holland, 10; Sweden, 8½; Great Britain, 8½; France, 7½; Germany, 7; China, 8; [illegible], 1½; Japan, [illegible]. In arctic regions (beyond 60° N. lat.).—Melville Island, 20; Spitzbergen, 15; Iceland, 11. In extra-tropical regions of the southern hemisphere:—Chili, 6; Cape Colony, 4½; Swan River district, 2. In Antarctic islands:—Kerguelen, 20; Tristan da Cunha, 15.

The principal climatic cause influencing the number of graminaceous species appears to be amount of moisture; it is only in very dry countries that they become distinctly less numerous. A remarkable feature of the distribution of grasses is its uniformity; there are no great centres for the order, as in *Compositæ*, where a marked preponderance of endemic species exists; and the genera, except some of the smallest or monotypic ones, have usually a wide distribution. Speaking generally, however, the *Panicaceæ* are tropical and warm temperate plants, whilst the grasses of temperate and colder regions are members of the *Poaceæ*. The former are very sparingly represented in Europe by a few species of the vast tropical genera *Andropogon* and *Panicum*. *Poaceæ*, on the other hand, form a fair proportion of tropical *Gramineæ*, especially in the higher districts where, as in the mountains of Abyssinia, are several endemic genera and many species. The largest tropical genus of *Poaceæ* is *Eragrostis*.

The distribution of the tropical tribe *Bambuseæ* is interesting. There are 170 or more species, which are about equally divided between the Indo-Malayan region and tropical America, only one species being common to both. Apparently there is but a single native species on the African continent, where it has a wide range, and none are recorded for Australia, though species may perhaps occur on the northern coast. One species of *Arundinaria* reaches northwards as far as Virginia, and the elevation attained in the Andes by some species of *Chusquea* is very remarkable,—one, *C. aristata*, being abundant from 15,000 feet up to nearly the level of perpetual snow.

Many grasses are almost cosmopolitan, such as our common reed, *Phragmites communis*; and many range throughout the warm regions of the globe, *e.g.*, *Cynodon Dactylon*, *Eleusine indica*, *Imperata arundinacea*, *Sporobolus indicus*, &c., and such weeds of cultivation as species of *Setaria*, *Echinochloa*, which are found over both Old and New Worlds. The recent masterly revision of the whole of the Australian species by Bentham well exhibits the wide range of the genera of the order in a flora generally so peculiar and restricted as that of Australia. Thus of the 90 indigenous genera (many monotypic or very small) only 14 are endemic, 1 extends to South Africa, 3 are common to Australia and New Zealand, 18 extend also into Asia, whilst no less than 54 are found in both the Old and New Worlds, 26 being chiefly tropical and 28 chiefly extra-tropical.

Of specially remarkable species *Lygeum* is found on the sea-sand of the eastern half of the Mediterranean basin, and the minute *Coleanthus* has only occasionally occurred at intervals in three or four isolated spots in Europe (Norway, Bohemia, Normandy). Many remarkable endemic genera occur in tropical America, including *Anomochloa* of Brazil, and most of the large aquatic species with separated sexes are found in this region. The only genus of flowering plants peculiar to the arctic regions is the beautiful and rare grass *Pleuropogon Sabinii*, R. Br., of Melville Island.

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Handbook of Brit. Flora (1858); Id., in *Journ. Linn. Soc. Lond.*, xv. p. 390 (1877); Id., *Flora Australiensis*, vii. (1878); Munro, in Harvey, *Genera S. African Plants*, ed. 2 (1862); Id., *Bambuseæ*, in *Trans. Linn. Soc. Lond.*, xxvi. p. 1 (1868); Duval Jouve, in *Mém. de l'Acad. des Sciences de Montpellier* (1871); Van Tieghem, in *Ann. des Sc. Nat.*, ser. 5, xv. p. 236 (1872); Eichler, *Blüthendiagramme*, i. (1875); Fournier, in *Bull. Soc. Bot. Belg.*, xv. p. 459 (1876). (H. T.)

GRASSHOPPER (French *Sauterelle*, Italian *Grillo*, German *Grashüpfer*, *Heuschrecke*, Swedish *Gräshoppa*), a collective term applied to certain orthopterous insects belonging to the families *Locustidæ* and *Acrydiidæ*, according to the now generally received classificatory views. They are especially remarkable for their saltatory powers, due to the great development of the hind legs, which are much longer than the others and have stout and powerful thighs, and also for their stridulation, which is not always an attribute with them of the male only. The distinctions between the two families may be briefly stated as follows:—the *Locustidæ* have very long thread-like antennæ, and four-jointed tarsi; the *Acrydiidæ* have short stout antennæ, and three-jointed tarsi. As the term "grasshopper" is almost synonymous with LOCUST, the subject will be more extensively treated under the latter heading (*q. v.*). Under both "grasshopper" and "locust" are included members of both families above-noticed, but the majority belong to the *Acrydiidæ* in both cases. In Britain the term is chiefly applicable to the large green grasshopper (*Locusta viridissima*) common in most parts of the south of England, and to smaller and more obscure species of the genera *Stenobothrus*, *Gomphocerus*, and *Tettix*, the latter remarkable for the great extension of the pronotum, which often reaches beyond the extremity of the body. All are vegetable feeders, and, as in all orthopterous insects, have an incomplete metamorphosis, so that their destructive powers are continuous from the moment of emergence from the egg till death. The notorious migratory locust (*Pachytylus migratorius*) may be considered only an exaggerated grasshopper, and the too-famous Rocky Mountain locust (*Caloptenus spretus*) is still more entitled to the name. In Britain the species are not of sufficient size, nor of sufficient numerical importance, to do any great damage, and their cheerful "song" more than counteracts the slight mischief they may cause in devouring grasses and other plants. The colours of many of them assimilate greatly to those of their habitats; the green of the *Locusta viridissima* is wonderfully similar to that of the herbage amongst which it lives, and those species that frequent more arid spots are protected in the same manner. Yet many species have brilliantly coloured under-wings (though scarcely so in English forms), and during flight are almost as conspicuous as butterflies; but when settled it is nearly impossible to detect them, even although the spot where they dropped may have been carefully marked, and they rise again almost under the feet of the observer. Those that belong to the *Acrydiidæ* mostly lay their eggs in more or less cylindrical masses, surrounded by a glutinous secretion, in the ground. Some of the *Locustidæ* also lay their eggs in the ground, but others deposit them in fissures in trees and low plants, in which the female is aided by a long flattened ovipositor, or process at the extremity of the abdomen, whereas in the *Acrydiidæ* there is only an apparatus of valves. The stridulation or "song" is mainly produced by friction of the hind legs against portions of the wings or wing-covers, but variations exist in the exact method. To a practised ear it is perhaps possible to distinguish the "notes" of even closely allied species, and some are said to produce a sound differing by day and night. The British species are not numerous; but in some parts of the world (and even in Europe) their numbers are very great, both in species and individuals.

GRATIANUS, AUGUSTUS (359–383), Roman emperor, son of Valentinianus I., was born in 359. In the ninth year of his age he received from his father the title of Augustus, but on his father's death in 375 he was compelled to share the Western empire with his infant brother, Valentinianus II., of whom he was appointed guardian, while his uncle Valens ruled over the Eastern empire. In 378 he gained a victory over the Alemanni near the site of the present town of Colmar. Through the death of Valens in the same year, there devolved upon him the government of the Eastern empire, but feeling himself unable to resist unaided the incursions of the barbarians, he ceded it to Theodosius, January 19, 379. For some years Gratianus conducted the government of his empire with energy and success, but gradually he sank into indolence and occupied himself chiefly with the pleasures of the chase. By adopting as the guards of his person a body of the Alani, and appearing in public in the dress of a Scythian warrior, he awakened the contempt and resentment of his Roman troops. A Roman named Maximus took advantage of this feeling to raise the standard of revolt in Britain, and invaded Gaul with a large army, upon which Gratianus, who was then in Paris, being deserted by his troops, fled to Lyons, where, through the treachery of the governor, he was delivered over to one of the rebel generals and assassinated, August 25, 383.

GRATIANUS, FRANCISCUS, compiler of the *Concordia discordantium Canonum* or *Decretum Gratiani*, and founder of the science of canon law, was born about the end of the 11th century at Chiusi in Tuscany or, according to another account, at Carraria near Orvieto. In early life he appears to have been received into the Camaldulian monastery of Classe near Ravenna, whence he afterwards removed to that of San Felice in Bologna, where he spent many years in the preparation of the *Concordia*. The precise date of this important work cannot be ascertained, but it contains references to the decisions of the Lateran council of 1139, and the statement is vouched for by tolerably good authority that it was completed while Pope Alexander III. was still simply professor of theology at Bologna,—in other words, prior to 1150. The labours of Gratian are said to have been rewarded with the bishopric of Chiusi, but if so he appears never to have been consecrated; at least his name is not to be found in any authentic list of those who have occupied that see. The year of his death is unknown.

For some account of the *Decretum Gratiani* and its history see CANON LAW. The latest edition is that of Friedberg (*Corpus Juris Canonici*, Leipsic, 1876). Compare Schulte, *Zur Geschichte der Literatur über das Decret Gratians* (1870), *Die Glosse zum Decret Gratians* (1872), and *Geschichte der Quellen und Literatur des Kanonischen Rechts* (1875).

GRATIUS FALISCUS, a Roman poet, contemporary with Virgil and Ovid, and author of a poem on hunting (*Cynegeticon*), of which somewhat more than 536 lines have been preserved. Of his personal history nothing is known; but it has been doubtfully conjectured from his cognomen that he was a native of Falerii. The only reference to him to be met with in any writer of antiquity (Ovid, *Pont.*, iv. 16, 34) is of the most incidental kind, and his poem seems very early to have fallen into comparative oblivion. Our knowledge of it is derived chiefly from a manuscript of the 10th century, preserved at Vienna, but partly also from one of nearly the same age at Paris. It describes, somewhat after the manner of Xenophon, various kinds of game, the means to be employed for their pursuit and capture, the best breeds of horses and dogs, and in doing so it seldom rises above the dull level of the driest technicality, although occasionally there are faint reminiscences of Virgil.

The editio princeps of this author was published in Venice [illegible] [illegible] by Stern (1832) and Haupt (1838) in their editions of Ovid's *Halieutica*, as well as by

Burmann (1731) and Wernsdorf (1780) in the *Poetae Latini Minores*, and by Weber in the *Corpus Poetarum Latinorum*. The most recent editions are those of Stern (1832) and Haupt (1838). A rendering into English verse was published by Christopher Wase in 1654; there is also a German translation by Perlet (1826).

GRATTAN, HENRY (1746-1820), Irish statesman and orator, was born 3d July 1746. His father, a Protestant, was for many years recorder of the city of Dublin, and from 1761 to 1766 its representative in the Irish parliament; and his mother was a daughter of Thomas Marlay, chief justice of Ireland. Both at school and at Trinity College, Dublin, which he entered in 1763, young Grattan greatly distinguished himself, especially in the study of the classics; and several well authenticated anecdotes indicate also that the more prominent moral characteristics displayed in his public career had begun to assert their strength at a very early period. While still attending the university he discarded the Tory principles of his father, who, dying in 1766 before his irritation had time to moderate, testified his resentment by depriving him of the paternal mansion, and of all property not secured by settlement. Having inherited, however, a small inalienable patrimony he resolved to study for the bar, and in 1767 he entered the Middle Temple, London. He was called to the Irish bar in 1772, but never obtained a large practice; and indeed from the time that he left the university he seems to have concentrated his attention chiefly on politics and the study of popular oratory. He early acquired a passionate admiration of the great orators of Greece and Rome, and while in London he spent the most of his evenings in the galleries of the House of Commons or at the bar of the Lords, anxious to profit by every opportunity of obtaining an insight into the art of eloquence, his enthusiasm for which had received additional stimulus from the genius of Lord Chatham. Of the eloquence of Chatham he has given a detailed and graphic description in one of his letters, and he also wrote an admirable portraiture of his character, which was inserted as a note in the political publication *Barataria* conducted by Sir Hercules Langrishe. The knowledge obtained from the study of the best specimens of ancient and modern oratory, and that gained from witnessing the debates in the English parliament, Grattan began sedulously to apply to the purposes of his own discipline. By the constant practice of recitation to imaginary audiences, and by taking part frequently in private theatricals, he succeeded in overcoming to a remarkable extent his great physical defects, so as to acquire a clear and rounded articulation, an emphasis in some respects admirably consonant with his meaning, and a certain ease in a style of elocution which was effective partly by reason of its very singularity. At the same time, by practising the habit of writing out the principal passages of his speeches, and subjecting them to a constant mental revision, he attained to the possession of a diction which for clearness, epigrammatic vigour, polished beauty of phrase, and the power of illuminating a whole subject by sudden flashes of meaning conveyed in a single sentence, is unsurpassed in modern oratory. He was equally diligent also in perfecting his political knowledge by a careful study of the history and political constitution both of ancient and modern nations; and the minor accomplishment of proficiency as a pistol shot, at that time essential to every Irish politician who would be prepared for all emergencies, was cultivated by him with the same dogged perseverance which he displayed in other matters.

When therefore, under the auspices of Lord Charlemont, Grattan in 1775 entered the Irish parliament, he had already all his powers under full command, and had so trained and disciplined his natural genius that it was able to exert its influence with untrammelled freedom. The period at which he began public life was one of the most critical in his country's history; and it is within the limits of strict truth to affirm that he inaugurated a new era in her political condition, and that, whether for good or for evil, and whether by the direct success of his efforts or by the modifying or opposing influences they called into exercise, he has had a greater share than any other individual in determining her present relation to the United Kingdom. Through the writings of Molyneux and Swift, the beginnings of a true national sentiment had been previously awakened; and the first step in the path of constitutional reform had been taken, when by the advocacy of Flood the Octennial Bill of 1768 was passed, which limited the duration of parliaments to eight years, instead of as formerly making their continuance depend upon the life of the sovereign; but Flood himself—whose friendship and influence were a powerful element in determining Grattan to adopt a political career—had, like less formidable agitators, succumbed to the intrigues of the "castle," and, although possessed of a private fortune which placed him beyond the suspicion of being governed chiefly by mercenary considerations, had consented to hamper his political action by accepting a sinecure office; and it seemed as if the germs of a better future had already begun to rot in a soil of such political corruption. The difficulty of the task which Grattan had set before him was also increased by a peculiarity in the case of Ireland which requires to be emphasized. Her political constitution, and, with the exception of the restrictions which paralysed her trade, the laws which were inflicting upon her such moral and physical misery, did not nominally differ to any great extent from those of the country by which she was in reality governed. She possessed intact her separate nationality; she was blessed with the boon of a national parliament; she had a legal administration of her own, including the right of trial by jury; and she enjoyed something resembling the privileges of municipal government. She possessed these things, however, scarcely more than in form; and she possessed them in such a form that, instead of being the guarantees of her liberty, they increased her sense of bondage, and directly fostered discontent and chronic mutiny. Though the Test Act and the penal laws were actually enforced with less rigour than in England, yet from the numbers who came within their sweep their disastrous influence was incalculably increased. They excluded four-fifths of her otherwise eligible population from the jury box and from municipal and parliamentary suffrage; they had produced confiscations on almost a national scale with all the evils consequent on absenteeism; and from their operation there had resulted an ignorance, a poverty, a violation of the rights of conscience, not confined to a few thousands, helplessly dispersed throughout the kingdom, but afflicting the great mass of the people, and both by their direct and their reflex action poisoning the springs of the whole national life. Her judges besides were liable to dismissal at pleasure, and her parliament had no independent authority, and by its very constitution was subject to corrupt influences far exceeding those in operation in the English parliament, and such as virtually to deprive it of independence of vote, almost as completely as it had been deprived of the power of legislation. Still that parliament constituted a kind of centre for political discussion and for the propagation and diffusion of political ideas, and it was by means of it that Grattan and his associates determined to work out the political and social regeneration of their country. Almost as soon as he entered parliament, Grattan became the acknowledged leader of the opposition, not only from the influence exerted by his oratory within the House, but from its power to kindle the enthusiasm of the people, and to create out of the chaos of shapeless and discordant elements the united sympathy and purpose of a true national life. In this he received an assistance from external events which was embarrassing as well as helpful;—from the American rebellion, which was the result of a struggle for rights similar to those he was contending for; from the war with France, which led to the creation of a volunteer army in Ireland that became a kind of political convention; and ultimately from the French Revolution, which in Ireland, more than in any other country of Europe, aroused wild desires after political freedom.

In February 1778 Grattan moved an address to the crown, to the effect that the condition of Ireland was no longer endurable, and although the motion was supported by only a small minority, the discussion bore fruit in the same year by the concession of free export of all produce except woollens, and by the modification of the penal laws to the extent of allowing the Catholics to hold leases for 999 years. In the following year the volunteers by their determined attitude crowned with success his efforts, along with Flood and Burgh, to effect the total repeal of the restriction Acts, and the same year saw also the repeal of the Test Act. With a view to increase and take advantage of the rising tide of national sentiment, Grattan on April 19th 1780 moved his famous resolutions that the "king with the consent of the parliament of Ireland was alone competent to enact laws to bind Ireland, and that Great Britain and Ireland were indissolubly united, but only under a common sovereign;" but so satisfied was he with the tone of the debate that, unwilling needlessly to irritate or embarrass the English Government, he did not press his motion to a division. An agitation was, however, begun in the following year against Poyning's Act and the Mutiny Act, and Grattan besides supported the introduction of a bill permitting the Catholics to inherit and hold property on the same terms as other subjects. In order also to bring pressure to bear on the English Government, Grattan, Flood, and Charlemont met privately in the beginning of 1782, and drew up for the consideration of the volunteers' delegates two resolutions in reference to independence; and to these Grattan, on his own responsibility and without the knowledge of Flood and Charlemont, added a third in favour of the measure for the relaxation of the penal laws against the Catholics. All these resolutions were adopted by the delegates unanimously, and Grattan, strong in armed support, renewed his motion for a declaration of independence, which, although it was lost, aroused such general enthusiasm that, when on the 16th April he rose to move a Declaration of Rights, he in a brilliant oration congratulated his hearers and his country on the triumphant issue of the struggle, his first words being, "I am now about to address a free people." So completely did his eloquence rise to what was deemed the greatness of the occasion that its effect has seldom been equalled in the annals of oratory; and in the state of high wrought excitement that prevailed, the Government, then doubtful as to the result of the siege of Gibraltar by the French and Spaniards, did not dare to refuse the boon which had already been in reality appropriated without their permission, and on the 17th May resolutions were passed unanimously, pledging the English parliament to redress the grievances complained of. In recognition of Grattan's services the Irish parliament was prepared to have voted him a grant of £100,000, but he was with difficulty persuaded to accept half that sum, and only agreed to do so from the consideration that, by relieving him from the necessity of practising at the bar, it would enable him to devote the whole of his energies to politics. He determined, however, that this gift should not in any way bias his political action, and when Flood, supported by the volunteer convention, brought forward his motion for reform, he at the expense of his popularity moved its rejection,—a procedure which also gave rise to an extraordinary scene of mutual recrimination between the two orators. For the next ten years Grattan carried on the struggle for the reform of Irish abuses with almost no success; and his Place and Pension Bill, and bills to make the great officers of government responsible for their proceedings, to prevent revenue officers from voting at elections, and to abolish ecclesiastical tithes, were all rejected. Pitt, at one time disposed to promote emancipation, became lukewarm in his zeal after the rejection in 1785 of Mr Orde's bill for the removal of trade restrictions, which, on account of a clause binding the parliament to re-enact England's navigation laws, was opposed by Grattan as involving a principle that implied a revocation of the constitution; nor did the action of the Irish parliament in the regency dispute of 1789 tend to smooth the relations between the two countries. At last in 1793 parliamentary suffrage was conceded to the Catholics as a sop to the fury of the United Irishmen; but the concession served only to whet the appetite for further redress, and when the hope of obtaining this, after reaching the verge of certainty by the appointment of Fitzwilliam as lord lieutenant, was suddenly dashed by his recall, the spirit of brooding discontent increased until ultimately it resulted in the bloody rebellion of 1798. Previous to its occurrence Grattan had withdrawn from parliament. It has been surmised by Mr Froude that in urging on the question of emancipation Grattan wished to effect a complete separation from England, and perhaps calculated, though a Protestant, on obtaining as the reward of his services the first place in the new commonwealth; but besides that the conjecture is unnecessary, since it was quite a possible supposition that emancipation might have proved the best method of confirming the loyalty of the Catholics,—and it was most certainly a better method than union without emancipation,—it is without a shadow of proof to support it, and would also have implied treachery on his part of the blackest kind, while treachery of any kind is belied by the whole course of his political life. In 1800 Grattan, though in feeble health, entered the Irish parliament as member for Wicklow, specially to oppose the motion for union, a measure whose bitterness was not rendered less distasteful to him from the time, manner, and means employed for its accomplishment. He regarded its success as almost the nullification of Ireland's political freedom, and the indefinite postponement of the attempt to remedy her wrongs. Though knowing from the beginning that to contend against the influence of the Government was hopeless, he exerted all his eloquence in condemnation of the measure; and his last words in the Irish Parliament were—"I will remain anchored here with fidelity to the fortunes of my country, faithful to her freedom, faithful to her fall." In the course of these debates Grattan was three times virulently attacked by Mr Corry, chancellor of the exchequer, but at last retaliated with overwhelming effect. In the duel which followed Corry was wounded.

After the Union Grattan withdrew for a time from public life, but in order to lend his assistance to the passing of the Catholic Relief Bill, he in 1805 entered the English parliament as member for Malton, and in the following year he was returned by Dublin, which he had formerly represented in the Irish parliament. Although his speeches in the new arena did not detract from his fame, the union had effected so great a change in his political circumstances that the inspiration which had formerly given to his eloquence such a glow of confident ardour, and had roused his powers to such supreme efforts, was no longer present. He refused to take office in the Fox ministry, but he nevertheless gave the Whigs his support on all important occasions; and by voting with the Government on the Irish Insurrection Bill of 1807, he showed that his regard for the general welfare of the empire was unaffected by the great political disappointment of his life. After the rejection of the Catholic Relief Bill of 1813, which was accompanied by a clause reserving to the English sovereign the power of veto in the election of Catholic bishops, the Catholic board repudiated the proposed compromise and declined to entrust Grattan further with their cause. He, however, gave it the same energetic support as formerly, and after 1815 he never spoke in the English parliament on any other subject. In 1819 his motion was defeated by the small majority of two; and on the re-assembling of parliament in the following May, he undertook, contrary to the advice of his physician, a journey to London in order again to bring forward the subject, but died a few days after his arrival, 4th June 1820. He received the honour of a public funeral and a grave in Westminster Abbey, where he lies near the tombs of Pitt and Fox.

Lord Byron, who had heard Grattan only in the English House of Commons, says that he would have come near to his ideal of a perfect orator but for his harlequin manner; and he also states that Curran was in the habit of taking him off by bowing to the very ground and thanking God that he had no peculiarities of gesture or appearance. His features were large and plain, and he was low in stature and so awkwardly formed that probably he never could have acquired a very graceful gesture; but the gravity and impressiveness of his bearing banished all sense of the ridiculous, and perhaps even the oddness and violence of his attitudes assisted to dissipate the feeling in his hearers of his personal insignificance. His voice, though not harsh, was deficient both in mellowness and volume, and when not elevated by emotion into shrillness had a low drawling accent. He succeeded, however, by virtue of appropriate emphasis and of concentrated energy, in bringing home to his hearers all the various shades of the passion and purpose of his discourse, and this perhaps with greater vividness than if it had been accomplished by means of an elocution which, if less faulty, would not have expressed so well his own peculiar individuality. In private life he was simple, genial, and courteous, and the felicity of his language, flavoured by an enunciation and manner that were all his own, lent to his conversation a rare and peculiar charm.

His speeches suffer much from imperfect reporting, but their leading characteristics can be determined with considerable accuracy. Great labour, direct and indirect, was bestowed on their preparation, and few speeches show so many traces of art; but it is art transfused and palpitating with enthusiasm, and therefore, though defective in ease and simplicity, they cannot be charged with artificiality or affectation. In regard to the chief fault of his style,—the excessive use of epigram,—it must be remembered that he made it supply the place both of wit and of direct argument; and that it never wearied his audience by a monotony of stilted smartness, but, by its incisive vigour and its startling originality, rendered his speeches perhaps unequalled for sustained brilliancy and interest. His oratorical triumphs were won, not by the stately marshalling of arguments and illustrations towards a climax, but by sudden surprises from so many directions, and so closely following each other that resistance to his attacks soon became impossible. In regard to subject-matter his speeches do not suffer from comparison even with those of Burke. His favourite method of enforcing his arguments was by illustrations either of similarity or of contrast drawn from history or from contemporary events; and while in this way he exhibited in every possible light the plausibility of his contentions, he gave dignity and elevation to his theme by removing it from the narrow sphere of party politics, and connecting it with principles of universal and permanent consequence. Much of the effect of his eloquence was due to the boldness of his statements and of his allusions and imagery, a boldness which, though often amounting to hardihood, never overstepped the boundaries between the sublime and the ridiculous. In remarkable contrast to other Irish orators, and especially to his great contemporary Curran, he possessed neither wit nor humour, and this no doubt accounts for the sustained and pitiless vehemence of his invectives against opponents who had thoroughly roused his anger. These attacks were rendered the more formidable from his power of delineating character by epithets, the graphic force of which had an almost electrical effect. This power he exercised, however, more frequently for purposes of laudation than censure, and perhaps the finest examples of it in his speeches are two short incidental allusions to Fox and Burke. A remarkable union of boldness with moderation and restraint characterized his statesmanship as it did his oratory, for while he embraced within his scheme of reform the whole circle of Ireland's wrongs and disabilities, and was prepared to face the consequences of all constitutional changes, however great, which justice seemed to demand, his unswerving aim, in the face both of strong provocation from the Government and of the powerful assaults of popular clamour, was not to loosen but to cement the ties which bound Ireland to Great Britain. That his political conduct was governed too much by abstractions, and had too little regard to expediency, is a conclusion which has been both affirmed and denied, but in any case it will be admitted by most that his beneficial influence on Irish politics has been less felt by the direct accomplishment of his aims than through the moral effect of his enlightened and incorruptible patriotism, and the gradual change which has taken place in the mental attitude of English statesmen towards his country.

Grattan's *Speeches, with prefatory observations, the whole comprising a brief review of the most important political events in the history of Ireland* were published at Dublin in 1811. His *Speeches in the Irish and in the Imperial Parliament*, edited by his son, in 4 volumes, appeared at London in 1822, and his *Miscellaneous Works* also in the same year. See his *Memoirs* by his son Henry Grattan, Esq., M.P., in 5 volumes, London, 1839-46; Lecky's *Leaders of Public Opinion in Ireland*, 2d edition, 1872: and, among various notices by contemporaries, especially that in vol. vii. of the *Dublin University Magazine*, which, notwithstanding political bias, gives a remarkably unprejudiced representation of his character and abilities, and that by Lord Brougham in the 1st vol. of his collected works. The political events of the period are of course graphically narrated by Mr Froude in his *English in Ireland*, vols. ii. and iii., but his principal design is to show the pernicious effects of Grattan's efforts. Among the ablest criticisms of Mr Froude's work is that by W. E. H. Lecky in *Macmillan's Magazine* for January 1873 and June 1874. (T. F. H.)

GRATZ, or GRAZ,[1] the capital of the Austrian crownland of Styria, is situated in the broad and fertile valley of the Mur, and the beauty of its position has given rise to the punning French description, *La ville des Graces sur la rivière de l'Amour*. From Vienna it is distant about 90 miles as the crow flies, and about 139 miles by rail. Its latitude is 47° 49′ N., its longitude 15° 27′ E., and its height above the sea 1499 feet. The main town lies on the left bank of the river, at the foot of the Schlossberg or castle-hill, but two of the principal suburbs, Lend and Gries, occupy an extensive area on the right bank, and communication is maintained by four bridges besides the railway bridge. Among the numerous churches of the city the most important is the Gothic cathedral of St Ægidius, founded by the emperor Frederick III. in 1450–1462, on the site of a previous church mentioned as early as 1157. It has been several times modified and redecorated, more particularly in 1718. The present copper spire dates from 1663. The interior, which measures 200 feet in length by 92 feet in breadth, is richly adorned with stained glass windows of modern date, costly shrines, paintings, and tombs. In the immediate neighbourhood of the cathedral is the mausoleum church of St Catherine's, erected by Ferdinand II. as a burial-place for himself and his family. It has an imposing façade with Corinthian columns, two cupolas, and a tower. Worthy of mention also are the church of the Sacred Blood, which has been the municipal church since 1585, and which possesses an altar-piece by Tintoretto; the Augustinian church, commonly called Stiegenkirche, appropriated to the service of the university since 1827; and the church of St Anthony of Padua, connected with the lunatic asylum, and popularly known as the Narrenthurmkirche. Besides the old imperial castle, formerly the residence of the Styrian princes, and now the seat of the statthalterei, Gratz contains the palace of the prince-bishop of Seckau, the palace of Count Attem, with a fine picture-gallery, and the old palace of the archduke John, now in possession of the counts of Meran. The Landhaus, where the estates hold their sittings, was erected in the 16th century; among its curiosities are the Styrian hat and the great silver cup called the *Landschadenbund*. The rathhaus, built by Stadler between 1802 and 1807, is of interest mainly for its collection of instruments of torture. At the head of the educational institutions is the university, founded in 1586 by Charles Francis, and restored in 1827 after an interruption of forty-five years. The old buildings dating from between 1573 and 1609 are being replaced by a fine modern erection. Of greater celebrity than the university is the Joanneum, originally instituted in 1811 by the archduke John Baptist as a national museum, but now developed into a complex organization for the higher education, with a regular professorate, a library of 50,000 volumes, archives peculiarly rich in Oriental MSS., a botanical garden, and other auxiliary departments. Mohs, Schrötter, and Unger are among the eminent names associated with its chairs. The Styrian hospital, founded in 1788, the town hospital, the civic hospital, the military hospital, the children's hospital, and the lunatic asylum are among the principal benevolent institutions. An official money-lending establishment has been in existence since 1755. Of the minor institutions of various kinds which prove the prosperity of the town the list would be a long one. An active trade, fostered by abundant railway communication both with north and south, is combined with no small manufacturing industry in the departments of iron and steel wares, paper, chemicals, sugar, vinegar, liqueurs, watches, and mathematical instruments. Few towns are better supplied with public pleasure grounds and holiday resorts. The Schlossberg, which rises 380 feet above the valley, was laid out by General Welden shortly after the destruction of the castle; and a great park of 42 acres has been made almost to encompass the inner city. The Calvarienberg lies in the north-west of the town; and not far off is the castle of Eggenberg. The population of Gratz, in spite of a high rate of mortality which prevailed for some time, amounted in 1869 to 81,119, exclusive of the garrison of 4000 men. In 1875 the total, civil and military, was estimated at 90,000.

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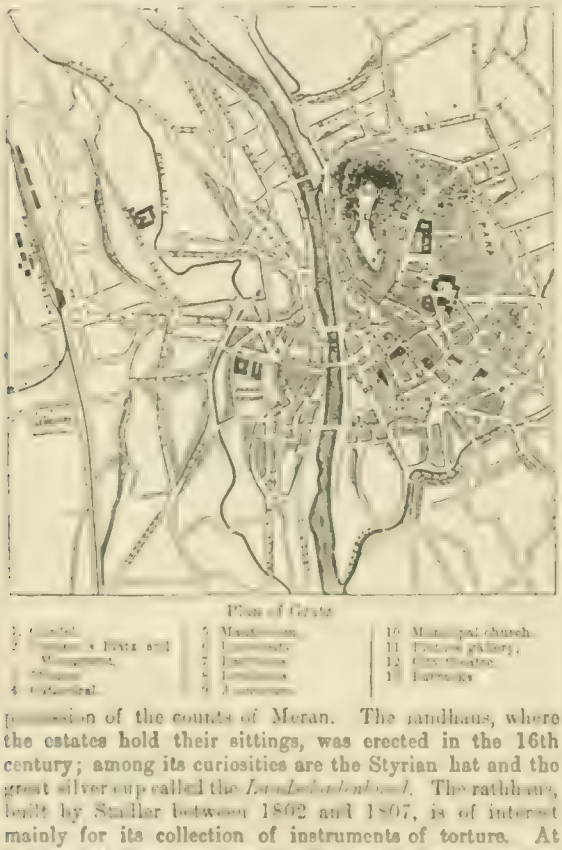
[1] The name was frequently written Grätz, Gretz, or Grez, but in 1843 it was decided, through the influence mainly of Hammer-Purgstall, that the official form should be Graz, in accordance at once with the local pronunciation and the derivation of the word, which was originally, it is believed, the Slavonic for "little castle," Gradats or Gratsa in Servian, and Hradek in Bohemian.



Plan of Gratz.

1. [illegible]
2. [illegible] and [illegible].
3. [illegible]
4. Cathedral.
5. Mausoleum.
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]
10. Municipal church.
11. Picture gallery.
12. City theatre.
13. Barracks.

History.—Gratz may possibly have been a Roman site, but the first mention of it under its present name is in a document of 881 A.D. Ottacar V. of Traungau chose it as his residence in 1056, and in 1163 it is designated for the first time the *Landesfürstliche Stadt*. Its privileges were confirmed by King Rudolf in 1281. Surrounded with walls and fosses in 1435, it was able in 1481 to defend itself against the Hungarians under Matthias Corvinus, who attempted to get possession of his promised bride at refuge within. In 1529 and 1532 the Turks attacked it with as little success. As early as 1530 the Lutheran doctrine was preached in Gratz by Seifried and Jacob von Eggenberg, and in 1540 Eggenberg founded the Paradies or Lutheran school in which Kepler afterwards taught. But Charles II. burned 20,000 Protestant books in the square of the present lunatic asylum, and succeeded by his oppressive measures in bringing the city again under the authority of Rome. New fortifications were constructed in the end of the 16th century by Franz von Poppendorf, and in 1644 the town afforded an asylum to the family of Ferdinand III. The French were in possession of the place in 1797 and again in 1805; and in 1809 Marshal Macdonald, having in terms of the peace of Vienna entered the citadel which he had vainly besieged, blew it all up with the exception of the bell-tower and the citizens' or clock tower.

See [illegible], *Topographische Runde der Hauptstadt Gratz*, Gratz, 1868; [illegible], *Gratz und seine Umgebungen*, Gratz, 1827; [illegible], *[illegible] in Gratz*, Gratz, 1843; Schreiner, *[illegible]*, *[illegible] der Stadt Gratz und seine Umgebung*, Gratz, 1843; [illegible], *[illegible] Gratz*, 1856; Ilwof and Peters, *Graz: Geschichte und Topographie*, Gratz, 1875.

GRAUBUNDEN. See Grisons.

GRAUDENZ (Polish *Grudziadz*), a town of Prussia, chief town of a circle in the province of West Prussia, government district of Marienwerder, is situated on the right bank of the Vistula, which is here crossed by a railway bridge, 18 miles S.S.W. of Marienwerder and 40 miles N.N.E. of Thorn. It has a Protestant and a Catholic church, a garrison church, two synagogues, a royal gymnasium, a Catholic normal school, an Evangelical normal school, a city school of the middle grade, a higher female school, three hospitals, three orphanages, and a reformatory. The industries include ironfounding, brewing, dyeing, wool-spinning, and the manufacture of tapestry, cigars, shoes, and brushes. The population of the town in 1875 was 14,522, and including the fortress, 16,615.

Graudenz was founded about 1250, and received town rights in 1291. At the peace of Thorn in 1466 it came under the lordship of Poland. From 1655 to 1659 it was held by Sweden, and in 1772 it came into the possession of Prussia. The fortress of Graudenz, which since 1873 has been used merely as a barracks and a military depot and prison, is situated on a steep eminence about 1½ miles north of the town and outside its limits. It was completed by Frederick the Great in 1776, and has been rendered famous through its defence by Courbière against the French in 1807.

GRAUN, Carl Heinrich (1701-1759), a celebrated composer, was born May 7, 1701, at Wahrenbrück in Saxony, the youngest of three brothers, all more or less musical. His father held a small post under Government, but he gave his children a careful education. Graun's beautiful soprano voice was noticed at the school where he was educated, and soon secured him an appointment in the choir of the city of Dresden. His masters were Grundig and Petzold, and at an early age he composed a number of sacred cantatas and other pieces for the church service. He completed his studies under Schmidt, and profited much by the Italian operas which were performed at Dresden under Lotti, the celebrated composer. After his voice had changed to a tenor, he made his début at the opera of Brunswick, in a work by Schurmann, an inferior composer of the day; but not being satisfied with the arias assigned him he re-wrote them, so much to the satisfaction of the court that he was commissioned to write an opera for the next season. This work, *Pollidoro* (1726), and five other operas written for Brunswick, spread his fame all over Germany. Other works, mostly of a sacred character, including two settings of the *Passion*, also belong to the Brunswick period. It was there that Frederick the Great, at that time crown prince of Prussia, heard the singer, and immediately engaged him for his private chapel at Castle Reinsberg. There Graun remained for five years, and wrote a number of cantatas, mostly to words written by Frederick himself in French, and translated into Italian by Boltarelli. On his accession to the throne in 1740, Frederick sent Graun to Italy to engage singers for a new opera to be established at Berlin. Graun remained a year on his travels, earning universal applause as a singer in the chief cities of Italy.. After his return to Berlin he was appointed royal chapel-master, with a salary of 2000 thalers (£300). In this capacity he wrote twenty-eight operas, all to Italian words, of which the last, *Merope* (1756), is perhaps the most perfect. But of infinitely greater importance than these is his oratorio the *Death of Jesus*, which is still annually performed at Berlin. It is here that Graun shows his skill as a contrapuntist, and his originality of melodious invention. In the Italian operas he imitates the florid style of his time, but there also considerable dramatic power is occasionally shown in the recitatives. Graun died on the 8th of August 1759, at Berlin, in the same house in which, thirty-two years later, Meyerbeer was born.

GRAVELINES (Flemish *Gravelinghe*, German *Gravelingen*), a fortified seaport town of France, in the department of Nord and arrondissement of Dunkirk, is situated near the mouth of the Aa, 11 miles S.W. of Dunkirk. The principal buildings are a church of the 16th century, the magazine, and the town hall. The harbour is only accessible at flood tide, but there is a considerable shipping trade in fish, apples, vegetables, and eggs. Shipbuilding is also carried on, and there are salt refineries, sail and linen manufactories, saw mills and meal mills. The fortifications were constructed anew by Vauban in the reign of Louis XIV. For its defence the land, to the distance of a mile all round, can be laid under water at pleasure. The population in 1876 was 4182.

Gravelines was formed in 1160 by Count Thierry of Flanders, was conquered by the English in 1383, and came into the possession of the duke of Burgundy in 1405. It is celebrated for the victory gained by the Spanish under Egmont over the French under Marshal de Thermes, 13th July 1558. It was taken by the duke of Orleans in 1644, retaken by Archduke Leopold in 1652, and again taken by the French under Vauban in 1658, after which it was confirmed to France by the treaty of the Pyrenees in 1659.

GRAVESEND, a municipal and parliamentary borough, river-port, and market-town in the county of Kent, England, is situated on the right bank of the Thames opposite Tilbury Fort, 30 miles below London by the river, and 24 miles by rail. It extends about 2 miles along the river bank, occupying a slight acclivity which reaches its summit at Windmill Hill, whence extensive views are obtained of the river, with its windings and shipping. The older and lower part of the town is irregularly built, with narrow and inconvenient streets, but the upper and newer portion contains several handsome streets, squares, and terraces. Gravesend is the boundary of the port of London. It has three piers, the town pier, erected in 1836, and belonging to the corporation, the terrace pier, built about 1840, and a new pier and station lately erected by the London, Tilbury, and Southend Railway Company. The town is a favourite resort of the inhabitants of London, both for excursions and as a summer residence. The principal buildings are the town-hall, a neat and conspicuous Doric edifice erected in 1836; the parish church of Gravesend, erected on the site of an ancient building destroyed by fire in 1727; Milton parish church, in the Late Decorated style, erected in the time of Edward II.; the county courts, the clubhouse of the Royal Thames Yacht Club, the custom-house, the assembly-rooms, the workmen's hall, the free grammar school, the almshouses for aged persons, and the dispensary and infirmary. East of the town are the earthworks designed to assist Tilbury Fort in obstructing the passage of an enemy's force. They were originally constructed on Vauban's system in the reign of Charles II., and some years ago they were strengthened at the cost of nearly £150,000. Gravesend has some import trade in coal and timber, and fishing, especially of shrimps, is carried on extensively. The principal other industries are boat-building, ironfounding, brewing, and soap-boiling. Fruit and vegetables are largely grown in the neighbourhood for the London market. Since 1867 Gravesend has returned a member to parliament. The municipal borough includes the parishes of Gravesend and Milton. The population of the municipal borough in 1871 was 21,265, and of the parliamentary 27,493.

Gravesend occurs in Domesday Book under the name Gravesham. It was burnt by the French in 1377. In 1573 it obtained a charter of incorporation from Queen Elizabeth, who also renewed the right, first conferred by Richard II., of regulating the "Long Ferry" (or passage from London) and enacting a fee from the "barges, till-boats, light-horsemen (hobellers), and wherries" on the river.

GRAVINA, a city of Italy, in the province of Bari, is situated on a hill to the left of the river Gravina, 7 miles from Altamura, and 37 S.W. of Bari. It is surrounded by tower-flanked walls, and has a cathedral, and a castle which belongs to the Orsini family, of which the eldest branch still keeps the title of duke of Gravina. A great cattle fair is held in the town on April 20; a fine breed of horses is raised in the neighbourhood; nitre is collected from the tufa rock of the district; and cheese, macaroni, and earthenware are manufactured. Population in 1871, 14,194.

GRAVINA, GIOVANNI VINCENZO (1664–1718), an Italian litterateur and jurisconsult, was born at Roggiano, a small town near Cosenza in Calabria, January 20, 1664. He was descended from a distinguished family, and under the direction of his maternal uncle, Gregorio Caloprese, who possessed some reputation as a poet and philosopher, received a learned education, after which he studied at Naples civil and canon law. In 1689 he came to Rome, where in 1695 he united with several others of literary tastes in forming the Academy of Arcadians. A schism occurred in the academy in 1711, and Gravina and his followers founded in opposition to it the Academy of Quirina. From Innocent XII. Gravina received the offer of various ecclesiastical honours, but declined them from a disinclination to enter the clerical profession. In 1699 he was appointed to the chair of civil law in the college of La Sapienza, and in 1703 he was transferred to the chair of canon law. He died at Rome January 6, 1718. He was the adoptive father of Metastasio.

Gravina is the author of a number of works of great erudition, the principal being his *Origines Juris Civilis*, completed in 3 vols. in 1713, and his *De Romano Imperio*, 1712. A French translation of the former appeared in 1775, of which a second edition was published in 1822. His collected works were published at Leipsic in 1737, and at Naples with notes by Mascovius, in 1756.

GRAVITATION

I. Gravitation at the Surface of the Earth.

It is a matter of universal experience all over the earth that a heavy body tends to fall to the ground. Let us inquire into this in the first place by taking such a general view of the phenomenon as would be presented to an imaginary spectator who was sufficiently removed from the earth to be able to take a general view.

Fig. 1 represents a section of the earth by a plane which is drawn through its centre O. Then, the earth being sufficiently near a sphere for our purpose, we may regard the section PQRS as a circle, where the points P, Q, R, S are the intersections of the lines OA, OB, OC, OD with the surface of the earth. If a stone be dropped from a point A above the surface of the earth, it will fall to the ground at P. The spectator would also notice that, if a stone were dropped from B or C or D, it would fall upon the ground at the points Q, R, S respectively. From A the stone would appear to fall downwards, from C it appears to move upwards, from B the spectator would see the stone moving to the left, while from D it appears to move to the right. One feature of these motions could not fail to be noticed: they all tend to the centre of the earth. The spectator might therefore sum up his experience in the following statement:—

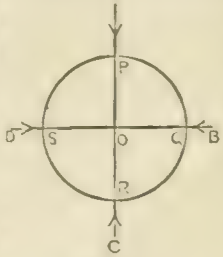


Fig. 1

A body dropped from a point above the surface of the earth always falls in a straight line which is directed towards the centre of the earth.

§ 1. *Attraction.*—The familiar instance of the action of a magnet upon a piece of iron will suffice to illustrate what is meant by the word *attraction*. In virtue of certain properties possessed by the iron and the magnet, they are drawn together. The magnet draws the iron, and the iron draws the magnet. This particular kind of attraction is of a very special character. Thus, for example, the magnet appears to have no appreciable influence on a piece of wood or a sheet of paper, and has indeed no considerable influence on any known substance except iron.

By the attraction of gravitation, every body attracts every other body, *whatever be the materials of which each is composed*. In this we see a wide difference between the attraction of gravitation and that form of attraction which is known as magnetic attraction. Nor is the contrast between the intensities of these two different attractions less striking. The keeper of a magnet is drawn to the magnet by two different forces of attraction. The first of these is the gravitative attraction, which, so far as we know at present, would be equally exerted, whether the magnetism were present or not. The second is the magnetic attraction. The latter is enormously greater than the former; in fact, [illegible] intensity and dimensions, the intensity of the attraction of gravitation will not be nearly so much as a millionth part of the magnetic attraction.

The intensity of the attraction of gravitation is indeed so small that, with one conspicuous exception, we can only become aware of its existence by refined and elaborate measures. That any two objects—for example, two books lying on the table—do actually attract each other, there can be no doubt whatever; but the intensity of the force is so small that the attractive force cannot overcome the friction of the table, and consequently we do not find that the books are drawn together. It has, however, been found that the intensity of the attraction of gravitation between two masses is directly proportional to the product of those masses. Hence though the force is so small as to be almost inappreciable between two bodies of moderate dimensions, yet when the masses of the two bodies, or of even one of them, are enormously great, the intensity of the force will be sufficiently large to be readily discernible. In this way it is that the existence of the attraction of gravitation has been made known to us, and is, in fact, identified with our daily experienc,—indeed with our actual existence. The mass of the earth is so enormous that the attraction of gravitation which exists between it and an object near the surface is readily appreciable. It is this attraction of gravitation between the earth and any object which constitutes that force which is referred to when we speak of the *weight* of the body. It is the attraction of gravitation which causes bodies to fall to the surface of the earth; and it is easy to show that the facts already presented with respect to the direction in which a falling body moves are readily explained by the supposition that the motions are due to an attractive influence exerted by the earth, or, to speak more correctly, to a mutual attraction subsisting between the earth and the body.

Let O be the centre of the earth, supposed to be a sphere, and let A be the position of a body above its surface. Then, when the body is released, the attraction must evidently cause the body to move along the line OA. The line OA, in fact, is directed along a diameter of the sphere, and there is really no reason why the stone should move to one side of the line more than to another. We thus see that attraction would always tend to draw objects in a direction pointing towards the centre of the earth. The observed facts are therefore explained by the supposition that the earth possesses a power of attraction.

§ 2. *Movement of a Falling Body.*—Our knowledge of the force of gravitation being ultimately founded on observation and experiment, it will be convenient at this point to describe the experiments by which a knowledge of the laws of motion of a falling body may be ascertained. We shall first describe these experiments, and then we shall discuss the laws to which we are conducted by their aid.

A beginner is apt to be surprised when he is told that a heavy body and a light body will fall to the ground in the same time if let drop from the same height. Yet nothing can be easier than to prove this important fact experimentally. Take a piece of cork in one hand and a bullet in the other, and drop these two objects at the same moment from the same height. They will reach the ground together. Nor will the results be different if we try a stone and a piece of wood. If, however, one of the objects were a feather and the other were a stone, then no doubt the latter would reach the ground long before the former. But this arises from a cause quite different from gravity. It is the resistance of the air which retards the motion of the feather. Even the stone is retarded to a certain extent by the resistance of the air, but the feather, on account of its greater surface in proportion to its mass, is much more retarded. If we could get rid of the influence of the air, the stone and the feather would be found to fall to the ground in the same time. This can actually be verified by performing the experiment (or a similar one) in a space from which the greater portion of the air has been withdrawn by the aid of an air-pump. But the same thing can also be shown in a much more simple manner

Lay a small flat feather upon the top of a penny piece held horizontally. Then let the penny fall; it will be followed with equal rapidity by the feather, which will be found to remain in contact with the penny throughout the entire descent. In this case the penny piece displaces the air, and thus to a great extent shields the feather from the resistance to which it would be exposed without such protection; it is thus found that the two objects fall to the ground from the same height at the same time.

The various experiments to which we have referred suffice to establish the very important result that *the time occupied by a body in falling to the surface of the earth, if dropped from a point above it, is independent of the mass of the body as well as of the materials of which the body is composed.*

There are, no doubt, certain apparent exceptions to the generality of this statement. The law, as we have stated it, does surely not apply to the case of a balloon or a live bird. In each of these cases the air is made, directly or indirectly, to supply a force which overcomes the force of gravity and neutralizes its effects; but *if there were no air*, then the balloon and the bird would fall to the ground in precisely the same time as a 56 lb weight would do when dropped from the same height. It will not be necessary for us to introduce any further reference to the resistance of the air, and we shall discuss the phenomena presented by falling bodies as they would occur in a space from which the air has been removed.

We have by these considerations cleared the way for a very important quantitative determination. Taking a given interval of time,—for example, one second,—we see that the height through which a heavy body will fall in one second depends neither upon the mass of the body nor on the materials of which it is composed. This is therefore a constant at any given place on the earth's surface for every description of body, and it is of fundamental importance to determine that quantity accurately. By an indirect method, founded on pendulum observations, it is possible to determine this quantity with far greater accuracy than would be attainable by actually making the experiment. The value as thus found is slightly different at different parts of the earth though constant at each one. At any part of the United Kingdom it may be taken as 16·1 feet.

When the distance which the falling body moves over in the first second has been ascertained, it is possible to find the distance which will be accomplished in two seconds, or indeed in any number. The difficulty of the question arises from the circumstance that, as the velocity of the falling body is gradually increasing, the distance moved over in the second second is greater than it was in the first, and generally that the distance in any second is greater than the distance accomplished in any previous second. Imagine the "lift" in a hotel to be a room 16·1 feet high; then when the lift is at rest, a stone will take one second to fall from the top of the room to the floor. But now suppose the experiment to be repeated, when the lift is either ascending or descending. It will be found that no matter what be the velocity of the lift, provided it remains uniform for a second, and no matter whether the lift be ascending or descending, the stone will still take exactly one second to fall from the ceiling to the floor.

To illustrate the important conclusions which can be drawn from this experiment, let us make some suppositions with reference to the velocity of the lift. Suppose that the lift is descending with a velocity of 5 feet per second. Then since it is found that the stone will reach the floor in one second, it is manifest that during that second the stone must actually have fallen through a distance equal to the height of the room augmented by the 5 feet through which the floor of the room has descended. The total distance travelled by the stone is therefore 16·1 + 5 = 21·1 feet. It is, however, to be observed that at starting the stone must necessarily have had the same velocity as the lift, *i.e.*, 5 feet per second. The observed facts can therefore be explained by supposing that the stone retained its initial velocity of 5 feet per second, and that gravity acted upon the stone so as to draw it 16·1 feet nearer the earth than it would have been had gravity not acted. On the other hand, suppose that at the time when the experiment was made the lift was ascending with an uniform velocity of 5 feet per second. Then the actual distance travelled by the stone in falling will be less than the height of the ceiling by the distance through which the floor has been raised, *i.e.*, 16·1 − 5 = 11·1 feet. Observation nevertheless shows that the time occupied in falling from the ceiling to the floor is still one second. The observed facts can be explained by remembering that at the moment of starting, the stone must actually have had the same velocity as the lift, *i.e.*, an upward velocity of 5 feet per second. If therefore gravity had not acted, the stone would in one second have ascended through a vertical distance of 5 feet. The observations are therefore explained by supposing that gravity in this case also draws the body 16·1 feet nearer the earth in one second than the body would have been had gravity not acted.

By suitable contrivances it is possible to ascertain that a body dropped from rest will in a time of two seconds move over a space of 64·4 feet. We have already seen that during the first second the body will fall 16·1 feet. It follows that in the second second the space described by a body falling freely from rest is 64·4 − 16·1 = 48·3. It is thus obvious that the space described in the second second is three times as great as the space described in the first second. To what is this difference to be ascribed? At the commencement of the first second the body was at rest; at the conclusion of the first second the body had attained a certain velocity, and with this velocity the body commenced its motion during the second second. The total distance of 48·3 feet accomplished during the second second is partly due to the velocity possessed by the body at the *commencement*, and partly to the action of gravity *during* that second. By the principle just explained, we are able to discriminate the amounts due to each cause. It appears, from the experiments already referred to, that during the second second as during the first the effect of gravity is simply to make the body 16·1 feet nearer the earth than it could otherwise have been. But the body moves altogether 48·3 feet in the second second, and as the action of gravity during that second will only account for 16·1 feet, it follows that the residue, amounting to 48·3 − 16·1 = 32·2 feet, must be attributed to the velocity accumulated during the first second.

We are therefore led to the very important result that a body falling freely from rest in the United Kingdom will have acquired a velocity of 32·2 feet per second when one second has elapsed. It need not be a matter for surprise that, though at the close of the first second the velocity acquired is 32·2, the distance moved over during that second is only 16·1. It will be remembered that the body starts from rest, and that while in the act of falling its velocity is gradually increasing. The body, therefore, moves much further in the last half of the second than it did in the first half, and consequently the total distance travelled must be less than the distance which would have been accomplished had the body been moving during the whole second with the velocity acquired at its termination.

It might not be easy to arrange a direct experiment to show how far the body will fall during the third second; we can, however, deduce the result by reasoning from what we have already learned. Let us suppose that the lift already referred to is descending with an uniform velocity of 32·2 feet per second. A body let drop from the ceiling during the motion, will, as before, reach the floor in one second. The body will therefore have acquired, *relatively to the moving lift*, a velocity of 32·2 feet per second. But the lift is itself in motion with a velocity of 32·2 feet per second. The *actual velocity* of the body must be measured by its velocity relatively to the lift, added to the velocity of the lift itself. It therefore appears that the body which, when it commenced to fall, had a velocity of 32·2 feet per second, acquires an equal amount during its fall, so that at its close the body actually had a velocity of 32·2 + 32·2 = 64·4 feet per second. A body falling freely from rest acquires a velocity of 32·2 feet in the first second; it follows that at the close of the first second the body is in the same condition as if it were let fall from the ceiling of the lift, under the circumstances just described. The motion during the third second is therefore commenced with the velocity of 64·4 feet, and in consequence of this initial velocity alone a distance of 64·4 feet will be accomplished in the third second. To this must be added 16·1 feet, being the additional distance due to the action of gravity, and therefore we have for the distance through which a body falling freely from rest will move in the third second, 64·4 + 16·1 = 80·5. Similar reasoning will show that the velocity acquired at the close of the third second is 64·4 + 32·2 = 96·6. With this velocity the fourth second is commenced, and therefore the distance accomplished during the fourth second is 96·6 + 16·1 = 112·7.

The results at which we have arrived may be summarily stated in the following propositions:—

A body falling freely from rest acquires a velocity which is equal to the product of 32·2 and the number of seconds during which the motion has lasted.

A body falling freely from rest moves over spaces proportional to the consecutive odd numbers (1, 3, 5, 7, &c.) in each of the consecutive seconds during which the motion lasts.

A body falling freely from rest will, in a given number of seconds, move over a distance which is found by multiplying the square of the number of seconds by 16·1.

§ 3. *Values of g.*—The velocity acquired by a body in one second is usually denoted by the symbol *g*. The following are values of *g* at different parts of the earth (adapted from Everett *On C.G.S. Units*, p. 12):—

	Latitude.	Value of *g* in Feet per Second.	Length in Feet of Pendulum beating Seconds.
Equator	0° 0′	32·091	3·2514
Latitude 45°	45 0	32·173	3·2597
Munich	48 9	32·181	3·2607
Paris	48 50	32·183	3·2609
Greenwich	51 29	32·191	3·2616
Göttingen	51 32	32·191	3·2616
Berlin	52 30	32·194	3·2619
Dublin	53 21	32·196	3·2621
Manchester	53 29	32·196	3·2622
Belfast	54 36	32·199	3·2625
Edinburgh	55 57	32·203	3·2629
Aberdeen	57 9	32·206	3·2632
Pole	90 0	32·255	3·2682

The value of *g* in feet at a station of which the latitude is λ, and which is *h* feet above the level of the sea, is in feet

$$g = 32\cdot 1723 - 0\cdot 0821 \cos 2\lambda - 0\cdot 000003h.$$

The length of the pendulum in feet which vibrates in one second is

$$l = 3\cdot 2597 - 0\cdot 0083 \cos 2\lambda - 0\cdot 0000003h.$$

g is really the excess of gravitation over the centrifugal force arising from the earth's rotation. The value of *gravitation alone* is given by the following expression:—

$$32\cdot 229 - 0\cdot 026 \cos 2\lambda.$$

§ 4. *Algebraical Formulæ.*—The employment of the symbols and operations of algebra will enable us to express very concisely the results at which we have arrived.

Let *v* denote the velocity acquired in *t* seconds by a body which has been dropped from a state of rest. Let *s* denote the number of feet over which the body has moved. The laws we have arrived at may be thus expressed:—

$$v = gt\,; \qquad s = \cdot 5gt^2.$$

From these equations we can eliminate *t* and obtain

$$v^2 = 2gs.$$

This expresses the velocity acquired in terms of the distance through which the force has acted.

We have hitherto considered the movement of a falling body which was simply *dropped*. It remains to determine the effect on the movement of the body which would be produced by a certain initial velocity. Let us for simplicity take the case of a body thrown vertically downwards, and calculate the distance through which the body will move in a certain time, as well as the velocity which it will acquire. In the act of throwing the hand moves with a certain velocity, and the body when released starts off with that velocity. It will thus be observed that the act of throwing is merely to impart initial velocity to the body. Let v' be the initial velocity with which the body leaves the hand. Then the velocity of the body at the moment of starting is precisely the same as it would have been had it been dropped from rest $v' \div g$ seconds previously. The velocity acquired at the end of *t* seconds is therefore the same as would have been acquired by a body which fell from rest for a period of $(v' \div g + t)$ seconds; whence we have

$$\begin{aligned} v &= g(v' \div g + t) \\ &= v' + gt. \end{aligned}$$

The distance must obviously be equal to the difference between the distance through which the body would drop from rest in $(v' \div g + t)$ seconds and the distance through which a body would drop from rest in $v' \div g$ seconds; whence

$$\begin{aligned} s &= \cdot 5g(v' \div g + t)^2 - \cdot 5g(v' \div g)^2 \\ &= \cdot 5g(v'^2 \div g^2 + 2v't \div g + t^2) - \cdot 5g(v'^2 \div g^2) \\ &= v't + \cdot 5gt^2. \end{aligned}$$

The case of a body projected vertically upwards seems at first to present somewhat greater difficulties, but this is not really the case. Such problems can always be readily solved by the help of the following general principle:—

A body moving vertically for t seconds will, at the end of that time, be ·5gt² feet nearer the earth than it would have been had gravity not acted.

If the body be projected vertically upwards with an initial velocity v', then, if the influence of gravity were suspended, the body would in *t* seconds ascend to a height $v't$ in accordance with the first law of motion. The effect of gravity will be to reduce the height actually obtained by the amount $\cdot 5gt^2$. Whence we have

$$s = v't - \cdot 5gt^2$$

This expression may be written in the form

$$s = v'^2 \div 2g - \cdot 5g(t - v' \div g)^2.$$

It is therefore obvious that the greatest altitude *h* is attained when

$$t = v' \div g\,;$$

in which case

$$h = v'^2 \div 2g,$$

or

$$v'^2 = 2gh.$$

As an illustration we may take the case of a body thrown vertically upwards with an initial velocity of 40 feet per second, and inquire where that body will be at the end of two seconds. Had gravity not acted, the body would, in two seconds, have ascended to a height 2 × 40 = 80 feet. The action of gravity will reduce this by $\cdot 5g2^2 = 2g$ feet, and hence the actual height of the body will be $80 - 2g$ feet, = 15·6 if *g* be taken at 32·2.

§ 5. *Motion of a Projectile.*—We have hitherto referred only to the motion of a falling body in a vertical line; it will now be necessary to examine some cases in which the motion of the body is not so restricted. From a point on the mast of a steamer 16·1 feet above the deck a ball is dropped, which falls upon the deck at a certain point. When the steamer is at rest the time taken by the ball to fall will of course be one second, and its path will be vertical; but when the steamer is moving with uniform velocity it is found that the ball still falls precisely on the same spot of the deck as when the steamer was at rest, and that the time occupied in the descent is still one second. It is obvious that in this case the ball does not move in a straight line at all, but in a curved path due to the motion of the vessel compounded with the actual falling motion. We therefore see that the effect of the motion of the vessel on the ball was to project that ball with a certain initial horizontal velocity, but that notwithstanding that initial velocity the ball still reaches the deck in one second. We are therefore led to the general conclusion that

A body projected horizontally will, at the end of t seconds, have fallen through a space of 16·1 t² feet.

An experiment illustrating this result may be made in an exceedingly simple manner. Take a marble in each hand, and throw one of the marbles horizontally at the same time as you drop the other from the same height, you will find that the two marbles reach the ground together. Suppose for simplicity that the height at the moment when the marbles are released is 4 feet, then the time taken by one of the marbles in falling is half a second. But as both marbles reach the ground together, the experiment has really proved to us that a body at the height of 4 feet from the ground will if projected *horizontally* reach the ground in half a second. This is equally true whatever be the magnitude of the velocity, *i.e.*, whether it be 5, 10, or any other number of feet per second.

We have now studied the effect of gravity upon a body which has been projected either in a vertical line or in a horizontal line. We have found that in each case the effect of gravity is to bring the body $\cdot 5gt^2$ feet nearer the surface of the earth in t seconds than it would have been had gravity not acted. We are therefore tempted to inquire whether the same statement would not be true for a body projected in any direction. In every way in which this suggestion can be tested it has been found to be verified, and there cannot therefore be the slightest doubt that it is true.

To illustrate this principle we may apply it to the case of a body projected in any direction, and deduce the form of the path in which the body moves. Let O (fig. 2) be the point from which the body is projected, and let OP be the direction in which the body would move after projection if it were not for gravitation. In consequence of the first law of motion, we should find that if it had not been for the action of gravity the ball would reach P_1 in one second, P_2 in two seconds, &c., where $OP_1 = P_1P_2 = P_2P_3 \ldots$ Gravitation will, however, make the body swerve from the direction OP_1P_2, &c., so that at the end of one second the body is really found at the point A_1, at the end of two seconds at A_2, at the end of three seconds at A_3, &c. The curve drawn through the points A_1, A_2, A_3, &c., which is actually described by the body, can be readily constructed. Take, for example, $t = 3$. If gravity had not been acting, the body would in three seconds have reached the point P_3. We can find where the body actually is by taking a point A_3, which is vertically beneath P_3 at the distance $16 \cdot 1 \times 3^2$ feet. Similarly we can find where the body is after any other specified number of seconds, and thus we obtain the points A_1, A_2, &c.

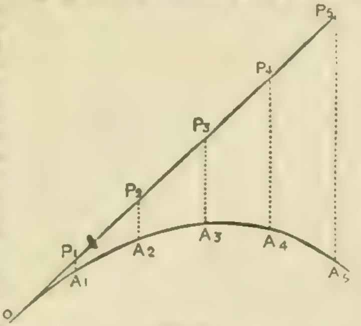


Fig. 2.

The equation of the curve is thus found. Take the line OP as the axis of x, and let x denote the number of seconds during which the motion has lasted; then, if y denote the vertical distance through which the body has been deflected by gravity, we must have

$$y = v'x - \cdot 5gx^2.$$

This curve, being of the second degree, represents a conic section; and as the highest terms form a perfect square, the conic section must be a parabola.

II. The Centre of Gravity.

§ 6. *Centre of Gravity of a Plate.*—In studying the effect of gravity upon a body which is at rest, it will be convenient to commence with a simple illustrative experiment which can be easily tried. Out of a piece of cardboard or tin plate a figure of any shape, ABCDE (fig. 3), is to be cut. A few holes, A, B, C, D, E, are to be punched quite at random in this plate. In the wall is a nail, and the plate can be suspended by passing the nail through any of the holes A, B, and C. From the nail is suspended, in front of the plate, a cord AH, which is kept in the vertical direction by the plummet attached to it at H. As the plate is not supported in any other way, it hangs quite freely from the nail; and if it be displaced and then released, it will, after a few oscillations, settle down again in the position which it occupied at the first. In order to mark this position, it is desirable to draw a line on the plate in the direction AP, indicated by the plummet line which is hanging in front. If the plate be blackened, this can be neatly done by chalking the plummet line and then giving it a flip against the plate.

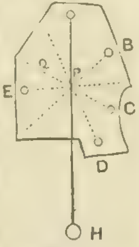


Fig. 3.

When the line has been drawn the plate may be removed from the nail, and again suspended by one of the other holes in its margin, for example B. The plate again assumes a definite position, and again the line and plummet is to be hung on, and a second line drawn as before. The two lines drawn in the plate intersect at a point P. When the plate is hung from a third hole, C, and a third plummet line is drawn, a very remarkable result is perceived. It is found that the line drawn on the third occasion passes *through the intersection of the two former lines*,—that is to say, all the three lines pass through the point P. Repeating the operation, with other holes, D, E, &c., it is found that all the lines drawn in the way we have described possess the remarkable property of passing through one definite point of the plate. It is therefore manifest that the point P possesses a very special property, for it is always situated vertically beneath the point of suspension when the plate is hanging at rest.

If a hole be actually punched at the position of the point P, and if the plate be suspended by passing this hole over the nail, we then find that *the plate will remain at rest in any position whatever.* This peculiarity of the point P will be more readily perceived if we make a hole in the plate at a point Q near to P. When the plate is suspended from Q it will only be at rest in one position, *i.e.*, when P is vertically beneath Q.

It must surely be regarded as a matter worthy of careful notice that any plate of any figure, regular or irregular, should contain one specific point which enjoys the unique properties which the experiments show to be possessed by the point P. This point has received a name; it is called the *centre of gravity.*

§ 7. *Centre of Gravity of a Rigid Body.*—In the illustration we have just given, we have spoken merely of a thin plate, because the experiments were more easily conducted in a body of this nature than in one of entirely irregular form. It must not, however, be supposed that a thin plate of uniform thickness is the only kind of body which possesses a point having the properties we have described. No matter what be the shape or materials of which a rigid body is composed, it possesses a centre of gravity. Let ADBC (fig. 4) be a body of any kind, and let it be suspended by a cord from a point A. Then when the body is at rest it assumes a certain position. We may suppose that a vertical hole AB is drilled through the body in the direction of the cord by which the body is suspended. If we now suspend the body by another point on its surface, C, the body will come to rest in the position which is represented in fig. 5. It will be found that these two straight holes intersect in the interior of the body at G. In fact, if we thrust a knitting needle through one of the holes, and then attempt to thrust a second knitting needle through the other hole, we shall find that the way is stopped in the interior of the body by the first knitting needle. If the body be now suspended from any other point on its surface, and if a similar hole be made through the point and in the direction of the string by which the body is suspended, it will be found that this hole also passes through the intersection of the two former holes. From each and every point of suspension the same result is obtained, and thus we are led to the conclusion that in a rigid body of any shape or materials whatever there is one point which possesses the remarkable property thus stated:—

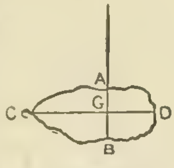


Fig. 4.

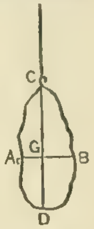


Fig. 5.

When a body suspended by a cord from a fixed point is at rest, there is one special point which is always vertically beneath the point of suspension, whatever may be the point of the body to which the cord is attached. This point is called the centre of gravity.

In the case of a homogeneous body of regular shape, the centre of gravity is determined from the most simple considerations of symmetry. In the case of a sphere it is obvious that the centre of gravity must lie at the centre, for there is no other point symmetrically related to the figure. In the case of a parallelepiped the centre of gravity is also situated at the centre of volume. This is found by joining the opposite corners of the figure, and thus making a diagonal; joining another pair of opposite corners we have a second diagonal; and the intersection of these two lines gives the centre of gravity of the mass.

§ 8. *Gravitation of a Rigid Body reduced to One Force.*—A body of any description may be considered to be composed of an innumerable multitude of small particles of matter. Each of these particles is acted upon by the attraction of the earth. Each particle is therefore urged towards the earth by a certain force which tends towards the earth's centre. The centre of the earth being nearly 4000 miles distant, the directions of these forces may, for all practical purposes, be regarded as parallel. Even if two particles were a mile distant, the inclination of the directions of the two forces is under a minute. We may therefore treat the forces as parallel without making any appreciable error. Two parallel forces may be compounded into a single force which is parallel to the two components. The forces acting on the two particles of the body may therefore be replaced by a single force. This force may be similarly compounded with the force acting on a third particle of the body, this resultant with the force on a fourth particle, and so on until all the particles have been included. We thus come to the important conclusion that the whole effect of gravity upon a body of any shape is to produce a single force which acts vertically downwards. It remains to be shown that *the direction of this force passes through the centre of gravity of the body*. Suspend a body of any shape by a cord, then when the body is at rest the centre of gravity must lie vertically beneath the point of suspension. If the direction of that one force which constitutes the effect of gravity does not pass through the centre of gravity, then its line of action cannot coincide with the direction of the cord of suspension; but it is impossible that two forces should equilibrate unless their lines of action are coincident, whence we are led to the important conclusion that the effect of the attraction of the earth upon a rigid body is to produce a single force which passes through the centre of gravity of the body and acts vertically downwards.

III. Universal Gravitation

§ 9. *Law of Gravitation between Two Masses.*—Investigations of the motions of the planets have conducted us to the conclusion that each planet is attracted towards the sun by a force which varies according to the inverse square of the distance. We likewise see that each of the satellites appears to be attracted towards the corresponding primary planet by a force which obeys the same law. We are therefore tempted to generalize these results into the proposition that *any two masses in the universe attract each other with a force which varies according to the inverse square of the distance*. Observations of the most widely different character have combined to show us that this law, which was discovered by Sir Isaac Newton, is true. It is called *the law of Gravitation*.

We suppose that the distance between the two bodies is so exceedingly great compared with their dimensions that we may practically consider each of the bodies as a particle.

Let m, m' be the masses of the two bodies, and let r be the distance. The force with which m attracts m' is equal in magnitude though opposite in direction to the force with which m' attracts m. The reader may perhaps feel some difficulty at first in admitting the truth of this statement. We speak so often of the effects which the attraction of the sun produces on the planets that it may seem strange to hear that each planet reacts on the sun with a force precisely equal and opposite to the force with which the sun acts upon the planets. We can, however, by the aid of a simple illustration, shew that such is really the case. Suppose the sun and the earth to be placed *at rest* in space, and abandoned to the influence of their mutual gravitation. It is evident that the two bodies would begin moving towards each other, and would after a certain time come into collision. If, however, the earth and the sun had been separated by a rigid rod, it would then be impossible for the two bodies to move closer to each other, so we must consider whether any other motion could be produced by their mutual attraction. As the two bodies were initially at rest, it is clear that there will be no tendency of the rod to move out of the line in which it was originally placed, and consequently if the rod began to move at all it must move in that line, and carry with it the earth at one end, and the sun at the other. As, however, the earth and the sun would remain separated at a constant distance, the statical energy due to their separation would remain constant, and therefore if they began to move we should have the kinetic energy of their motion created out of nothing, which is now well known to be impossible. It therefore follows that, under the circumstances we have assumed, the rod would remain for ever at rest. But what are the forces which act upon the rod? At one end of the rod the earth presses upon it with a force which is equal to the attraction of the sun upon the earth. At the other end the sun presses upon the rod with a force which is equal to the attraction of the earth upon the sun. But, since the rod remains at rest, these two forces must be equal and opposite, and hence the force with which the sun attracts the earth must be equal and opposite to the force with which the earth attracts the sun.

If we express the gravitation of two masses in the form

$$f(m, m') \div r^2,$$

then m and m' must enter symmetrically into the expression, for if the two masses were interchanged the gravitation must not be altered.

We should here also advert to a circumstance connected with gravitation which is of the very highest importance. Suppose we take two different masses, for simplicity, two pounds, separated at a definite distance (for simplicity, one foot); then the gravitation of these two masses towards each other is a certain definite force, which we shall subsequently consider. What we want here to lay especial stress upon is that the force appears to be the same whatever be the material of which the two masses are composed. Thus two pounds of iron at a distance of one foot attract each other with the same force as a pound of iron would attract a pound of lead at the same distance. The significance, or perhaps it should be said the vast importance, of this statement is apt to be lost sight of from its somewhat peculiar nature. It must never be forgotten that, when it is asserted that two masses are equal to each other, what is really meant is that, if equal forces were to act upon each of the masses for the same time, the masses would receive the same velocity. As this test of the equality of masses is not practically convenient the weighing scales have come into use for the purpose; and though it appears to be true that when two masses have equal "weights," as tested by the scales, then the masses are themselves equal, yet this is so far from being an obvious or necessary truth that it really is the most remarkable phenomenon connected with gravitation. The expression for the gravitation of two attracting masses must therefore depend solely upon their masses, upon their distance, and upon some specific constant which is characteristic of the intensity of gravitation.

Experiment shews that the gravitation of a body towards the earth is directly proportional to its mass, and hence we see that the expression

$$f(m, m') \div r^2$$

must be proportional to m, and as $f(m, m')$ must be unaltered by the interchange of m and m', it appears finally that the gravitation of the two masses is

$$c\,m\,m' \div r^2,$$

whence c is a numerical constant which is equal to the gravitation of two units of mass placed at the unit of distance. To form a definite conception of the intensity of this force, we take some specific instances. It can be shown that two masses A and B, each containing 415,000 tons of matter, and situated at a distance of one statute mile apart, will attract each other with a force of one pound. If the masses of A and B remain the same, and if the distance between them be increased to two miles, then the intensity of the force with which the two masses gravitate together is reduced to one quarter of a pound. If either of the masses were doubled, the distance being unaltered, then the force would be doubled. If both the masses were doubled, then the force would be quadrupled.

§ 10. *Motion of a Planet round the Sun.*—The effect of gravitation when the bodies are in actual motion must next receive our attention. It may so happen that in consequence of the attraction of gravitation one of the bodies will actually describe a circle around the other, so that, notwithstanding the effect of the attraction, the distance between the two bodies remains constant. We shall first explain, by elementary considerations, how it is possible for a planet to continue to revolve in a circular or nearly circular orbit about the sun in its centre; and then we shall proceed to the more exact consideration of the form of the orbit, and the laws according to which that orbit is described.

Let S represent the sun (fig. 6), and let T be the initial position of the planet. If the planet be simply released, it will immediately begin to fall along the line TS into the sun. If, on the other hand, the planet were initially projected along the line TZ perpendicular to TS, the attraction of the sun at S will deflect the planet from the line TZ which it would otherwise have followed, and compel the planet to move in a curved line. The particular form of curve which the planet will describe depends upon the initial velocity. With a small initial velocity the deflecting power of the sun will have a more speedy effect than is possible when the initial velocity is considerable. The rapidly curving path TX will therefore correspond to a small initial velocity, while the flatter curve TY may be the orbit when the initial velocity is considerable. As the movement proceeds, the velocity of the planet will generally alter. If the planet were moving along the curve TY, it is at every instant after leaving T going farther away from the sun. It is manifest that the planet is then going against the sun's attraction, and therefore its velocity must be diminished. On the other hand, when the planet is moving along the curve TX, it is constantly getting nearer the sun, and the effect of the sun's attraction is to increase the velocity. It is therefore plain that for a path somewhere between TX and TY the velocity of the planet must be unaltered by the sun's attraction. With centre S and radius ST describe a circle, and take a point P on that circle exceedingly near to T. With a certain initial velocity it is possible to project the planet so that it shall describe the arc TP. The attraction of the sun always acts along the radius, and hence in describing the arc TP the planet has at every instant been moving perpendicularly to the sun's attraction. It is evident that under such circumstances the sun's attraction cannot have altered the velocity, for it would be impossible to give a reason for the velocity having been accelerated which could not be rebutted by an equally valid reason for the velocity having been retarded. We thus see that the planet reaches P with an unchanged velocity, and at that point the direction of the motion is perpendicular to the radius. It is therefore clear that after passing P the planet will again describe a small portion of the circle, which will again be followed by another, and so on, *i.e.*, the planet will continue to move in a circular orbit. We have therefore shown that, if a planet were originally projected with a certain specific velocity

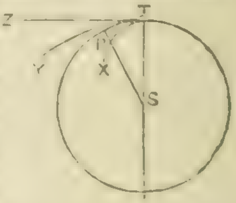


Fig. 6.

in a direction at right angles to the radius connecting the planet and the sun, then the planet would continue for ever to describe a circle around the sun.

§ 11. *On the Elliptic Motion of the Planets.*—The laws of the motions of the planets were discovered by Kepler by means of calculations founded upon observations. These laws may be thus stated:—

1. *Each planet moves in an ellipse in one focus of which the sun is situated.*

2. *The radius vector drawn from the sun to the planet sweeps over equal areas in equal times.*

3. *The squares of the periodic times of the motions of the planets round the sun are proportional to the cubes of their mean distances.*

These three laws form the foundation of that branch of astronomy which is called Physical Astronomy, and they are generally known as *Kepler's Laws*.

The sun and the planets are all very nearly spherical, and for the present, whenever we speak of the motion of the sun or the planets, we are to understand the motions of the centres of the corresponding spheres. Indeed the diameters of these spheres are so small in comparison with the distances at which they are separated from each other, that we may generally regard them as mere physical points. Thus though the diameter of the sun is ten times greater than the diameter of the greatest planet, Jupiter, yet the sun's diameter is only the forty-second part of its distance from the nearest planet, Mercury, and it is less than the three-thousandth part of its distance from the outermost planet, Neptune.

The orbits of the planets are so little eccentric that at a first glance the majority of them appear to be circular. Among the larger planets the orbits of Mercury and of Mars have the greatest eccentricity, being about $\frac{1}{5}$ and $\frac{1}{11}$ respectively. Next to these comes the orbit of Saturn, which has an eccentricity of $\frac{1}{18}$. Next in order come Jupiter, Uranus, the Earth, Neptune, and Venus, with eccentricities of $\frac{1}{21}$, $\frac{1}{21}$, $\frac{1}{60}$, $\frac{1}{115}$, $\frac{1}{147}$ respectively. The orbits of some of the minor planets are, however, much more eccentric.

§ 12. *The Hodograph.*—In discussing the actual motion of a planet around the sun, it is very convenient to introduce the elegant conception of the hodograph. The use of this curve is originally due to Bradley, but for its practical development we are principally indebted to Sir W. R. Hamilton. Let AB (fig. 7) be a portion of the path of a particle P acted upon by any forces. From any point O draw radii vectores OR_1, OR_2, OR_3, OR_4 (fig. 8), parallel to the tangents to the curve AB drawn at the points P_1, P_2, P_3, P_4, and equal to the velocities at those points. Then the curve $R_1R_2R_3R_4$ is the hodograph of the orbit of P. To each position P of the particle in the path there is a corresponding point R in the hodograph; and simultaneously with the motion of P in its orbit we have the motion of R in the hodograph.

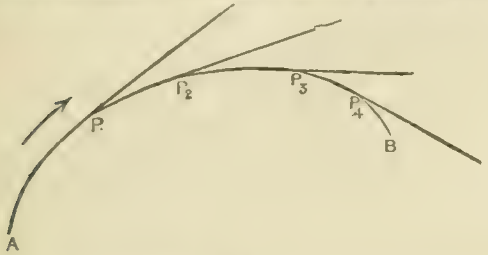


Fig. 7.

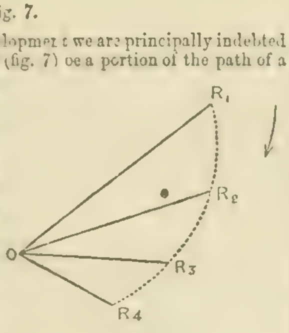


Fig. 8.

The utility of the hodograph depends upon the theorem that *the force which acts upon the particle is at any time equal and parallel to the velocity of the corresponding point in the hodograph.* This theorem is thus proved. Let P_2 and P_3, and therefore R_2 and R_3, be very close together. The velocity imparted to the particle in passing from P_2 to P_3 in the small time δt must, when compounded with the velocity OR_2, produce the velocity OR_3. This increment of velocity must therefore be equal and parallel to R_2R_3. If therefore v denote the velocity of R, we have $v\delta t$ for the velocity acquired in the time δt. The force acting on P must therefore, by the second law of motion, be equal to v and parallel to the line R_2R_3, which ultimately coincides with the tangent. The theorem is therefore proved.

Kepler's second law states that in the movement of a planet around the sun the radius vector from the sun to the planet describes equal areas in equal times. It can be shown that when this is the case the force which acts upon the planet must necessarily be directed towards the sun. Let the planet be supposed to move from P to P′ (fig. 9) in the time δt with the velocity v. Then, since equal areas are described in equal times, we must have the area OPP′ equal to $h\delta t$, where h is a constant which represents the area described in the unit of time. Let fall OT perpendicular upon the tangent at P, then $v \cdot OT = 2h$. We therefore infer that the velocity of a planet is inversely proportional to the perpendicular let fall from the centre of the sun upon the tangent to the orbit. Produce OT to Q, so that OT × OQ is constant; the radius vector OQ will therefore be proportional to the velocity; and as OQ is perpendicular to the tangent at P, it follows that the locus of Q must be simply the hodograph turned round through 90°. Draw two consecutive tangents to the orbit, and let Q_1 and Q_2 be the corresponding points (fig. 10). Then since $OT_1 \times OQ_1 = OT_2 \times OQ_2$, the quadrilateral $T_1Q_1Q_2T_2$ is inscribable in a circle, and therefore the angles OQ_1Q_2 and OT_2T_1 are equal; whence it is easily seen that Q_1Q_2 is perpendicular to OP. It follows from the principle of the hodograph that the force on P must be directed along OP.

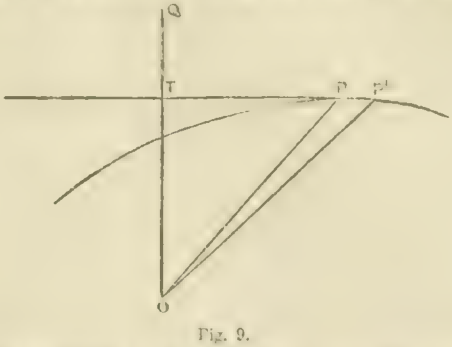


Fig. 9.

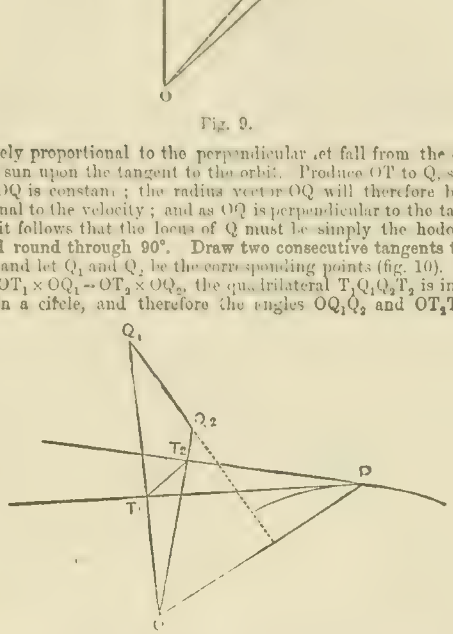


Fig. 10.

Let F (fig. 11) be the focus of the ellipse in which, according to Kepler's first law, the planet is moving, then, from a well-known property of the ellipse, the foot of the perpendicular FT let fall from F on the tangent drawn to the ellipse at the point P lies on the circle of which the diameter is the axis major of the ellipse. The line FT cuts the circle again at Q, and as FT × FQ is constant, the radius vector FQ must be constantly proportional to the velocity, and therefore the hodograph will be the circle TAQ turned round through 90°. We have already shown that the tangent to the hodograph is parallel to the force. The line CQ must therefore be parallel to FP. If θ be the angle PFC, then, in consequence of the law of equal description of areas in equal times, $FP^2 d\theta \div dt$ must be constant, and therefore $d\theta \div dt$ must vary inversely as FP^2; but the velocity of Q will be proportional to $d\theta \div dt$; hence the velocity of Q, and therefore the force, will be inversely proportional to FP^2. In this way it is shown that the planets are attracted by the sun with a force which varies inversely as the square of the distance.

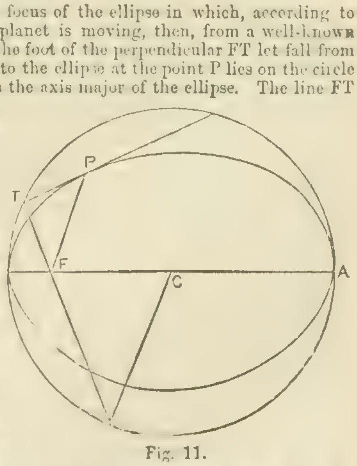


Fig. 11.

§ 13. *The Problem of Three Bodies.*—We have pointed out that the motion of a planet is determined by the mutual attraction which exists between the planet and the sun. It follows, however, as a necessary consequence from the law of universal gravitation, that each planet is attracted not only by the sun but by every other planet, and indeed, so far as we know, by every other body in the universe. The effect of the attraction of the sun preponderates so enormously over the other attractions that the obedience of the planets to Kepler's laws, which would be perfect were the sources of disturbance absent, is still so nearly perfect that the departure therefrom can only be perceived either by very accurate or by very long-continued observations. The refinements of modern observations have, however, brought to light a very large number of *perturbations*, as they are called, in the motions of the planets and their satellites, which are due to the interference of other bodies. The explanation of these different perturbations by the law of universal gravitation has proved in the great majority of cases triumphantly successful.

In any problem where perturbations are involved, we have at least three bodies, viz., the principal body S, a body P which circulates around S, and a disturbing body P′. If we had only the two bodies S and P to consider, then P would describe around S a conic section, of which S was the focus, and the radius vector SP would sweep over equal areas in equal times. By the introduction of the third body P′, which attracts both the former bodies S and P, the motion is deranged, the orbit which P describes is no longer a conic section, and its radius vector has ceased to describe equal areas in equal times. The *general* case of this problem, as we have here described it, is one of excessive complexity. It is, however, a fortunate circumstance that, up to the present time, astronomers have had but little occasion to attack the problem in its *general* form.[1] In the solar system we have a great number of different problems of perturbations to discuss, but there is one feature common to all these problems. This feature is that *the perturbing force is very small in comparison with the primary force, by which the motion of the disturbed body is controlled.* In consequence of this peculiarity, the problems of perturbations in the solar system become greatly simplified. The circumstances of the orbits of the planets and their satellites are also happily such as to furnish additional facilities in the solution of the problems of perturbations. The eccentricities of the orbits are small, and in nearly every case the inclinations are small also. The problems of perturbations in the solar system are consequently adapted for the methods of successive approximation; but we should perhaps warn the reader that, even with the assistance so fortunately rendered by the circumstances of the case, the problems are still among the most difficult to which analysis has ever been applied.

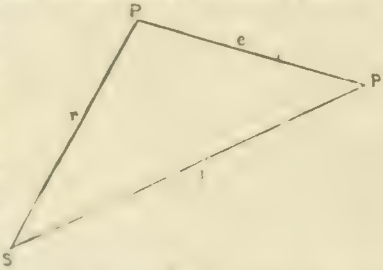


Fig. 12.

Let S, P, P′ (fig. 12) denote the three bodies of which the masses are M, m, m′. Let the distances SP, SP′, PP′ be denoted by r, r′, ρ respectively; then if ε denotes, as before, the gravitation between two units of mass separated by the unit of distance, we have

on S the forces $\epsilon\frac{Mm}{r^2}$ and $\epsilon\frac{Mm'}{r'^2}$ along SP and SP′ respectively;

on P the forces $\epsilon\frac{Mm}{r^2}$ and $\epsilon\frac{mm'}{\rho^2}$ along PS and PP′ respectively;

on P′ the forces $\epsilon\frac{Mm'}{r'^2}$ and $\epsilon\frac{mm'}{\rho^2}$ along P′S and P′P respectively.

In the problem of the perturbation of a planet which is moving around the sun, the *absolute* motion of the planet in space is not what we are concerned with; what we do require is the *relative motion of the planet with respect to the sun.*

Suppose that we apply *to each unit of mass* of the three bodies, forces equal to $\epsilon m r^{-2}$ parallel to PS and $\epsilon m' r'^{-2}$ parallel to P′S, then it is clear that, from the second law of motion, each unit of mass of the system will receive in a small time, as far as these forces are concerned, equal and parallel velocities, and therefore the relative motions of the three bodies will not be altered by the introduction of these forces.

But these forces will, so far as the body S is concerned, amount to $\epsilon Mm \div r^2$ and $\epsilon Mm' \div r'^2$ in the directions PS and P′S respectively, and will therefore neutralize the attractions of P and P′ upon S. It follows that, so far as the relative motions only are concerned, we may consider the body S as fixed, while the body P is acted upon by the forces

$$\epsilon m(M+m) \div r^2 \text{ on PS}$$
$$\epsilon mm' \div \rho^2 \text{ on PP}'$$
$$\epsilon mm' \div r'^2 \text{ parallel to P}'\text{S},$$

with of course similar expressions for the forces on P′.

The problem of perturbation is therefore reduced to the determination of the motion of P in obedience to these forces, while S regarded as fixed.

It is plain that, in order to find the motion of P, we should know the motion of P′, which is itself disturbed by P; but as the effect of the perturbation is small, we may, without appreciable error, use the place of P′, derived on the supposition that the motion of P′ is undisturbed, for the purpose of calculating disturbances caused by P′ in the motion of P. We shall therefore suppose that the orbit of P′ is an ellipse which is described around the focus S in consequence of an attractive force $\epsilon m'(M+m') \div r'^2$ directed towards S.

In computing the disturbed motion of P we transform the three given forces into three equivalent forces, which will be more convenient for our purpose. We take first a force T directed along the radius vector; secondly, a force V perpendicular to the radius vector, and lying in the plane of the orbit; and, thirdly, a force W, which is normal to the plane of the orbit. T is to be regarded as positive when it endeavours to increase the distance between P and S; V is to be regarded as positive when it tends to move P to the same side of the line PS as that in which the direction of its motion tends to carry it; and W is to be regarded as positive when it tends to raise P to the *north* of the plane of its orbit.

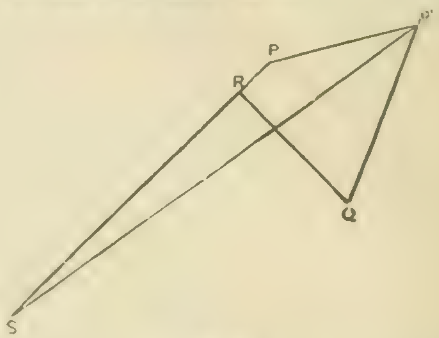


Fig. 13.

From P′ (fig. 13) let fall a perpendicular P′Q upon the plane of the undisturbed orbit of P, and let fall from Q a perpendicular QR upon the line SP. The force along PP′ can be resolved into a component parallel to QP′ and another parallel to QP; and the latter can again be decomposed into components parallel to RQ and RP. Hence we have, as the equivalents to the force on PP′, the following three forces which form parts of T, V, W respectively:—

$$+\frac{\epsilon mm'}{\rho^3}\text{PR}; \qquad -\frac{\epsilon mm'}{\rho^3}\text{QR}; \qquad +\frac{\epsilon mm'}{\rho^3}\text{QP}'.$$

In a similar manner we find for the components of the force parallel to SP′ the following three forces which form parts of T, V, W respectively:—

$$-\frac{\epsilon mm'}{r'^3}\text{SR}; \qquad +\frac{\epsilon mm'}{r'^3}\text{QR}; \qquad -\frac{\epsilon mm'}{r'^3}\text{QP}'.$$

Hence we deduce the following expressions:—

$$\text{T} = -\frac{\epsilon m(M+m)}{r^2} - \frac{\epsilon mm'}{\rho^3}\text{PR} - \frac{\epsilon mm'}{r'^3}\text{SR}.$$

$$\text{V} = -\frac{\epsilon mm'}{\rho^3}\text{QR} + \frac{\epsilon mm'}{r'^3}\text{QR}.$$

$$\text{W} = +\frac{\epsilon mm'}{\rho^3}\text{QP}' - \frac{\epsilon mm'}{r'^3}\text{QP}'.$$

Let the line SO, from which the longitudes are reckoned, be drawn in the plane of the undisturbed orbit of P. Let the longitudes of P and P′ be l, l′ respectively, and let the angle P′SQ or the latitude of P′ be denoted by b′, then we have

$$\text{QP}' = r'\sin b', \quad \text{SQ} = r'\cos b'.$$
$$\text{RQ} = \text{SQ}\sin(l'-l) = r'\cos b'\sin(l'-l).$$
$$\text{SR} = \text{SQ}\cos(l'-l) = r'\cos b'\cos(l'-l).$$
$$\text{PR} = r - r'\cos b'\cos(l'-l).$$

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[1] There can be little doubt that in the case of multiple stars the problem of three or more bodies would often have to be faced in all its complexity, but the observations which would be required are entirely wanting, and probably unattainable.

With these substitutions, we have for the values of T, V, W, the following expressions:—

$$T = -\frac{\epsilon m(M+m)}{r^2} + \epsilon m m'\left(\frac{1}{\rho^3} - \frac{1}{r^3}\right) r' \cos b' \cos(l'-l) - \frac{\epsilon m m'}{\rho^3} r$$

$$V = -\epsilon m m'\left(\frac{1}{\rho^3} - \frac{1}{r^3}\right) r' \cos b' \sin(l-l').$$

$$W = \epsilon m m'\left(\frac{1}{\rho^3} - \frac{1}{r^3}\right) r' \sin b'.$$

It will be noticed that the first term of the expression for T consists of the force which corresponds to the purely elliptic motion. The two remaining terms in T, as well as the whole of V and W, depend upon the disturbing force, as is evident from the circumstance that they contain m' as a factor, and would vanish if m' were equal to zero. As b' is small, we may neglect its squares and higher powers, so that

$$\cos b' = 1 \text{ and } \sin b' = b'$$

When these substitutions are made, we see that the expressions for T and V are both independent of b'; and consequently we may, so far as these forces are concerned, consider the motions of the disturbing and the disturbed body to take place in the same plane.

The expression for W contains, however, the first power of the latitude of the disturbing body. This is of course connected with the circumstance that it is only in consequence of the disturbing force W that the disturbed body is induced to leave the plane of its undisturbed motion at all.

§ 14. *Calculation of Disturbed Motion.*—Observation has shown that, notwithstanding the perturbations, the orbit of each planet differs but little from a circle, of which the sun is the centre. It is further shown by observation that, though the rate at which a planet moves in its orbit is not quite constant, it is still very nearly so. We may make a similar statement with reference to the motion of the moon around the earth. The orbit of the moon is nearly a circle, of which the earth is the centre, and the velocity of the moon in its orbit is nearly constant. These features of the motions of the planets and the moon enable us to replace the more exact formulæ by approximate expressions which are much more convenient, while still sufficiently correct.

Let ρ, θ be the polar coordinates of a celestial body which moves nearly uniformly in a nearly circular orbit. The form of the orbit may be expressed by an equation of the type

$$f(\rho, \theta) = 0.$$

It will, however, be more convenient to employ two equations, by means of which the coordinates are each expressed directly in terms of the time. We thus write two equations of the form

$$\rho = f_1(t), \quad \theta = f_2(t);$$

and by elimination of t from these equations the ordinary equation in polar coordinates is ascertained. With reference to the forms of the functions f_1 and f_2, we shall make an assumption.

Let χ_1, χ_2, &c., be arbitrary angles; ω_1, ω_2, &c., arbitrary angular velocities; a_1, a_2, &c., *small* arbitrary linear magnitudes; and η_1, η_2, &c., *small* numerical factors. a is an arbitrary linear magnitude, and ω is an arbitrary angular velocity. We shall *assume* that

$$\begin{aligned}\rho &= a + a_1 \cos(\omega_1 t + \chi_1) + a_2 \cos(\omega_2 t + \chi_2) +, \&c.\\ \theta &= \omega t + \eta_1 \sin(\omega_1 t + \chi_1) + \eta_2 \sin(\omega_2 t + \chi_2) +, \&c.\end{aligned}$$

To justify our employment of these equations it would really be sufficient for us to state that, as a matter of fact, the motions of all the heavenly bodies which are at present under consideration are capable of being expressed in the forms we have written. It may, however, facilitate the reader in admitting the legitimacy of this assumption, if we point out how exceedingly plausible are the *a priori* arguments which can be adduced in its favour.

The orbits of the celestial bodies are approximately circular, and consequently ρ must remain approximately constant. The value of ρ is, in fact, incessantly fluctuating between certain narrow limits which it does not transcend. Thus ρ is what is called a *periodic function of the time*. It is necessary that the mode in which the time t enters into the expression for ρ must fulfil the condition of confining ρ within narrow limits, *notwithstanding the indefinitely great increase of which t is susceptible*. It is obvious that this condition is fulfilled in the form we have assumed for ρ. Under all circumstances

$$\begin{aligned}\rho &\ngtr a \mp a_1 \mp a_2 \mp, \&c.;\\ \rho &\nless a \pm a_1 \pm a_2 \pm, \&c.;\end{aligned}$$

and as a_1, a_2, &c., are small quantities it appears that ρ is necessarily restricted to narrow limits.

By similar reasoning we can justify the equation for θ, for we can show that the angular velocity of the celestial body to which it refers must be approximately uniform.

By differentiation,

$$\frac{d\theta}{dt} = \omega + \eta_1\omega_1 \cos(\omega_1 t + \chi_1) + \eta_2\omega_2 \cos(\omega_2 t + \chi_2) +, \&c.$$

Under all circumstances we must have

$$\frac{d\theta}{dt} \ngtr \omega \mp \eta_1\omega_1 \mp \eta_2\omega_2 \mp, \&c.;$$

$$\frac{d\theta}{dt} \nless \omega \pm \eta_1\omega_1 \pm \eta_2\omega_2 \pm, \&c.;$$

and as η_1, η_2, &c., are all small quantities, it is obvious that $\frac{d\theta}{dt}$ is confined within narrow limits, notwithstanding the indefinite augmentation of the time.

In addition to the reasons already adduced in justification of the expressions of ρ and θ, it is to be remarked that the number of disposable constants a_1, a_2, &c., χ_1, χ_2, &c., η_1, η_2, &c., ω_1, ω_2, &c., a, ω is practically indefinite, and that consequently the equations can be compelled to exhibit faithfully the peculiarities of *any* approximately circular orbit described by a particle moving with approximate uniformity.

§ 15. *Determination of the Forces.*—The orbit which is described by a planet or other celestial body being given by the equations

$$\begin{aligned}\rho &= a + \Sigma a_1 \cos(\omega_1 t + \chi_1),\\ \theta &= \omega t + \Sigma\eta_1 \sin(\omega_1 t + \chi_1),\end{aligned}$$

it is a determinate problem to ascertain the forces by which the motion of the planet is controlled. In making this calculation we shall assume that the squares and higher powers, and also the products of the small quantities a_1, a_2, &c., η_1, η_2, &c., may be discarded. T is to be computed from the well-known formula

$$T = m\left(\frac{d^2\rho}{dt^2} - \rho\frac{d\theta^2}{dt^2}\right);$$

where we have

$$\frac{d\rho}{dt} = -\Sigma a_1\omega_1 \sin(\omega_1 t + \chi_1);$$

$$\frac{d^2\rho}{dt^2} = -\Sigma a_1\omega_1^2 \cos(\omega_1 t + \chi_1);$$

$$\frac{d\theta}{dt} = \omega + \Sigma\eta_1\omega_1 \cos(\omega_1 t + \chi_1);$$

$$\frac{d\theta^2}{dt^2} = \omega^2 + 2\Sigma\eta_1\omega\omega_1 \cos(\omega_1 t + \chi_1);$$

$$\rho\frac{d\theta^2}{dt^2} = a\omega^2 + \Sigma(2\eta_1 a\omega\omega_1 + a_1\omega^2) \cos(\omega_1 t + \chi_1);$$

whence by substitution

$$T = -ma\omega^2 - \Sigma m(a_1\omega_1^2 + 2\eta_1 a\omega\omega_1 + a_1\omega^2) \cos(\omega_1 t + \chi_1).$$

To compute V, the force perpendicular to the radius vector, we proceed as follows:—

$$\rho^2 = a^2 + \Sigma 2aa_1 \cos(\omega_1 t + \chi_1);$$

$$\frac{d\theta}{dt} = \omega + \Sigma\eta_1\omega_1 \cos(\omega_1 t + \chi_1);$$

whence we find

$$\rho^2\frac{d\theta}{dt} = a^2\omega + \Sigma(2aa_1\omega + \eta_1 a^2\omega_1) \cos(\omega_1 t + \chi_1).$$

Differentiating we have

$$\frac{d}{dt}\left(\rho^2\frac{d\theta}{dt}\right) = -\Sigma(2aa_1\omega\omega_1 + \eta_1 a^2\omega_1^2) \sin(\omega_1 t + \chi_1).$$

Substituting this in the ordinary formula

$$V = \frac{m}{\rho}\frac{d}{dt}\left(\rho^2\frac{d\theta}{dt}\right)$$

we have finally

$$V = -\Sigma m(2a_1\omega\omega_1 + \eta_1 a\omega_1^2) \sin(\omega_1 t + \chi_1).$$

Let us assume, for the sake of brevity,

$$\lambda_1 = \omega_1 t + \chi_1; \quad \lambda_2 = \omega_2 t + \chi_2; \quad \&c.$$

$$\begin{aligned}aF_1 &= a_1(\omega^2 + \omega_1^2) + 2\eta_1 a\omega\omega_1; & aG_1 &= 2a_1\omega\omega_1 + \eta_1 a\omega_1^2;\\ aF_2 &= a_2(\omega^2 + \omega_2^2) + 2\eta_2 a\omega\omega_2; & aG_2 &= 2a_2\omega\omega_2 + \eta_2 a\omega_2^2;\\ &\&c. & &\&c.\end{aligned}$$

then the result to which we have been conducted may be thus stated:—

If a body be moving in a nearly circular orbit under the influence of a radial force equal to

$$ma\omega^2 - ma\Sigma F_1 \cos\lambda_1$$

and a force perpendicular to the radius vector equal to

$$-ma\Sigma G_1 \sin\lambda_1,$$

then the path which the body describes is defined by the equations

$$\begin{aligned}\rho &= a + \Sigma a_1 \cos\lambda_1;\\ \theta &= \omega t + \Sigma\eta_1 \sin\lambda_1.\end{aligned}$$

§ 16. *Deductions from these Expressions.*—We proceed to point out a few of the more remarkable deductions from this theorem.

If as a first approximation we neglect entirely the small quantities a_1, a_2, &c., η_1, η_2, &c., we have

$$r = a; \quad \theta = \omega t; \quad T = -ma\omega^2; \quad V = 0.$$

In this case the orbit described by the body is a circle of which the radius is a. The angle made by the radius vector to the particle with a fixed axis is proportional to the time. It follows that the velocity with which the particle moves in its orbit is uniform. Since the angle swept out by the particle in one unit of time is equal to ω, it follows that the angular velocity of the particle is equal to ω; since the radius is a, the actual velocity with which the particle is moving in its orbit is $a\omega$. In the case now under consideration, the force V perpendicular to the radius vector is constantly equal to zero. Hence the total force which acts upon the particle is always directed along the radius vector, and is equal to $-ma\omega^2$. The sign $-$ merely expresses that the force which acts upon the particle must be constantly directed *towards* the centre.

Let p denote the periodic time of the motion of the particle in its orbit. Then we must find the angular velocity by dividing the angle 2π described in the time p by the time p, whence

$$\frac{2\pi}{p} = \omega.$$

By substituting this value for ω in the expression for T, we deduce

$$T = -ma\frac{4\pi^2}{p^2}.$$

This proves that the force must vary directly as the radius of the orbit of the particle and inversely as the square of the periodic time in which the orbit is described.

Let us next consider the case in which a_1 and η_1 are retained, while the remaining quantities a_2, a_3, &c., η_2, η_3, &c., are all equal to zero. The formulæ then are:

$$r = a + a_1 \cos \lambda_1\,; \qquad T = -ma\omega^2 - mE_1 \cos \lambda_1\,;$$
$$\theta = \omega t + \eta_1 \sin \lambda_1\,; \qquad V = -mG_1 \sin \lambda_1\,;$$

where $E_1 =$ [illegible]; $G_1 =$ [illegible].

It is clear in the first place that the orbit is not a circle, for as λ_1 increases with t, it will follow that $\cos \lambda_1$ may vary between the limits $+1$ and -1, so that the radius vector r may also vary between the extreme values $a + a_1$ and $a - a_1$. As a_1 is extremely small, it appears that the orbit is still nearly circular with a radius a, but that the particle may sometimes be found at a distance a_1 on the inside or outside of the circle.

We find similarly that the angular velocity with which the radius vector travels round is not quite uniform. The average angular velocity is no doubt ω, but the actual position of the radius vector differs by the quantity $\eta_1 \sin \lambda_1$ from what it would have been had its motion been uniform. As $\eta_1 \sin \lambda_1$ must vary between the limits $+\eta_1$ and $-\eta_1$, it follows that the radius vector can never be at an angle greater than η_1 from its mean place, *i.e.*, the place which it would have occupied had it continued to move uniformly.

The orbit is completely defined by the two equations—

$$\theta = \omega t + \eta_1 \sin (kt + \chi_1)\,;$$
$$r = a + a_1 \cos (kt + \chi_1).$$

If from these two equations the time t could be eliminated, the result would be the equation in polar coordinates of the path which the particle describes. Owing, however, to the fact that the quantity t occurs separately, and also under the form of a sine and cosine, this elimination would be transcendental.

If, however, we take advantage of the smallness of η_1 and a_1, we may determine the path with accuracy for all practical purposes.

As θ is nearly equal to ωt, we may assume for t as the first approximation the value $\theta \div \omega$. If we consider the squares or higher powers of a_1 and η_1 negligible, this value of t may be substituted for t under the sine and cosine, and we have

$$r = a + a_1 \cos\left(\frac{k\theta}{\omega} + \chi_1\right)$$

This [illegible] revolving about the [illegible] of the circle of which the radius is a.

We must now briefly consider the case where the motion of the particle is not restricted to a plane. Suppose a third axis to be drawn through the point O perpendicular to the plane which contains the other two axes. Let z be the coordinate of the particle parallel to the axis [illegible] referred to two other rectangular axes. We shall suppose that the motion of the particle is such that the coordinate z can be expressed by the equation

$$z = h_1 \sin \beta_1 + h_2 \sin \beta_2 + , \&c.,$$

where h_1, h_2, &c., are lines of constant length, β_1, β_2, &c., are angles of the form $p_1 t + \xi_1$, $p_2 t + \xi_2$, &c.; p_1, p_2, &c., ξ_1, ξ_2, &c., are constants [illegible].

Let W denote the force which acts upon the particle P in a direction normal to the axis of [illegible]. Then we have

$$W = m\frac{d^2z}{dt^2}.$$

Differentiating the equation

$$z = h_1 \sin \beta_1 + h_2 \sin \beta_2 + , \&c.,$$

we have
$$\frac{dz}{dt} = h_1 \cos \beta_1 \frac{d\beta_1}{dt} + h_2 \cos \beta_2 \frac{d\beta_2}{dt} + , \&c.\,;$$

but
$$\frac{d\beta_1}{dt} = p_1\,; \quad \frac{d\beta_2}{dt} = p_2, \&c.\,;$$

whence
$$\frac{dz}{dt} = p_1 h_1 \cos \beta_1 + p_2 h_2 \cos \beta_2 + , \&c.$$

Differentiating again

$$\frac{d^2z}{dt^2} = -p_1^2 h_1 \sin \beta_1 - p_2^2 h_2 \sin \beta_2 - , \&c.\,;$$

whence, finally,

$$W = -mp_1^2 h_1 \sin \beta_1 - mp_2^2 h_2 \sin \beta_2 - , \&c.$$

§ 17. *The Motion of the Moon.*—One of the most important problems to which we may apply the expressions to which we have been conducted is to an examination of the disturbances which the moon experiences in its motion round the earth. The moon would describe a purely elliptic motion around the earth in one of the foci were it not that the presence of the sun disturbs the motion and produces certain irregularities. Notwithstanding the vast mass of the sun, these disturbing causes still only slightly derange the moon's motion from what it would be were these disturbing causes absent. The reason of this is that the sun is about 400 times as far from the earth as the moon, and consequently the difference of the effects of the sun upon the earth and the moon is comparatively small.

In applying the formulæ to the case of the moon we denote by

S, P, P′ the earth, the moon, and the sun respectively;
M, m, m' signify the masses of the earth, moon, and sun;
r, r' are the distances of the moon and the sun from the earth;
ρ is the distance from the moon to the sun;
l, l' are the longitudes of the moon and the sun measured in the moon's orbit.
T, V, W are the forces acting upon the moon, whereof T is along the radius vector, V is perpendicular to the radius vector, and W is perpendicular to the plane of the moon's orbit.

Since $r \div r'$ is very nearly equal to $1 \div 400$, we may regard this fraction as so small that its squares and higher powers are negligible. Hence, since $\cos b' = 1$,

$$\rho = r'\left(1 - 2\frac{r}{r'}\cos(l - l') + \frac{r^2}{r'^2}\right)^{\frac{1}{2}}$$
$$= r'\left(1 - \frac{r}{r'}\cos(l - l')\right);$$

whence
$$\rho^{-3} = r'^{-3}\left(1 + 3\frac{r}{r'}\cos(l - l')\right),$$

or
$$\frac{1}{\rho^3} - \frac{1}{r'^3} = 3\frac{r}{r'^4}\cos(l - l').$$

With these substitutions we have after a few simple transformations,

$$T = -\frac{\epsilon(M + m)}{r^2} + \frac{1}{2}\frac{\epsilon m' r}{r'^3}\Big(1 + 3\cos 2(l - l')\Big);$$
$$V = -\frac{3}{2}\frac{\epsilon m' r}{r'^3}\sin 2(l - l');$$
$$W = 3\frac{\epsilon m' r}{r'^3}\cos(l - l')\sin b'.$$

§ 18. *The Evection.*—The inequality in the motion of the moon which is known as the evection is independent both of the eccentricity of the orbit of the moon and of that of the earth. As we shall at present only discuss inequalities in longitude and radius vector, and as we shall neglect small quantities of an order higher than the second, we may assume that the plane of the orbit of the sun coincides with the plane of the orbit of the moon.

The radius vector and the longitude may be expressed by the formulæ

$$r = a + a'_1 \cos \lambda_1\,;$$
$$l = \omega t + \eta_1 \sin \lambda_1.$$

We shall assume that

$$2(l - l') = \lambda_1\,;$$

and since

$$r^{-2} = a^{-2}(1 - 2a'_1 \cos \lambda_1),$$

we have

$$T = -\frac{\epsilon(M + m)}{a^2} + \frac{1}{2}\frac{\epsilon m' a}{r'^3}$$
$$+ \left(2a_1\frac{\epsilon(m + M)}{a^3} + \frac{3}{2}\frac{\epsilon m' a}{r'^3}\right)\cos \lambda_1\,;$$

but from § 15, ω being the mean motion of the moon,

$$T = -ma\omega^2 - mE_1 \cos \lambda_1,$$

whence, by identifying the two expressions we have from the portions independent of the time,

$$a\omega^2 = \frac{\epsilon(M + m)}{a^2} - \frac{1}{2}\frac{\epsilon m' a}{r'^3}.$$

This is a very important formula, inasmuch as it gives the relation between the mean motion ω and the mean distance a in the disturbed orbit.

Suppose that there were no disturbing influence, and that a satellite moved uniformly around the earth in a circular orbit of radius a_0 with a mean motion ω_0, then we have

$$\epsilon(M + m) = \omega_0^2 a_0^3.$$

Assume also that the earth moves uniformly round the sun in a circular orbit of radius a' with a mean motion n, then

$$\epsilon m' = n^2 a'^3.$$

or, since M is negligible in comparison with m,

$$m = n^2a^3.$$

With these substitutions, and making $w = n'^2 \div n^2$, we have finally

$$n^2a^3 = n_0^2a_0^3\left(1 - \frac{1}{2}w\right).$$

If we identify the coefficients of $\cos \lambda_1$ in the two expressions for T, we have

$$-maF_1 = 2f_1\frac{m(M+m)}{a^2} + \frac{3}{2}\frac{mn'^2}{a^3};$$

whence, by substitution and by neglecting small quantities,

$$f_1(n^2 + n_1^2) + 2g_1nn_1 = -2f_1n^2 - \frac{3}{2}wn^2.$$

We have also for V the two expressions

$$-\frac{3}{2}\frac{mn'^2r}{r^3}\sin\lambda_1,$$

and $$-maG_1\sin\lambda_1;$$

whence by identifying the coefficients

$$2f_1nn_1 + g_1n_1^2 = \frac{3}{2}wn^2,$$

where n_1 denotes the rate at which λ_1 alters.

Solving the two equations, we deduce the following expressions:—

$$f_1 = -\frac{3w}{2}\frac{n^2(n_1 + 2n)}{n_1^3 - n^2n_1}; \quad g_1 = \frac{3w}{2}\frac{n^2(n_1^2 + 2nn_1 + 3n^2)}{n_1^2(n_1^2 - n^2)}.$$

We can now calculate the value of f_1 and g_1 numerically. For

$$\frac{n_1}{n} = 2\frac{n - n'}{n} = 2\frac{365{\cdot}256 - 27{\cdot}322}{365{\cdot}256} = 1{\cdot}8504,$$

and also $$w = \frac{1}{178{\cdot}72};$$

from these we deduce

$$f_1 = -0{\cdot}007204$$
$$g_1 = +0{\cdot}01024 = 35'{\cdot}20.^1$$

The results at which we have arrived may be thus summarily stated, using, however, a more accurate value of g_1 than that which is found by this method:—

If we suppose the orbit of the moon to coincide with the plane of the ecliptic, and if we neglect the ellipticity of the orbit of the earth around the sun and that of the moon around the earth; if n' denotes the mean motion of the earth around the sun, and n the mean motion of the moon around the earth; and, finally, if n and a be connected by the equation

$$n^2a^3 = 0{\cdot}9972(M + m);—$$

then we have for the motion of the moon the equations

$$r = a\left(1 - 0{\cdot}007204\cos(2nt - 2n't)\right),$$
$$l = nt + 39'30''\sin(2nt - 2n't).$$

We thus see that the motion of the moon, on the hypothesis which we have assumed, is different from a uniform circular motion. The distance from the moon to the earth is sometimes 1-139th part greater or less than its mean value. And the longitude of the moon is sometimes 39′ 30″ in advance of or behind what it would be on the supposition that the moon was moving uniformly.

When the distance is the greatest, we have $\cos(2nt - 2n't) = -1$; whence

$$2nt - 2n't = \pi \text{ or } 3\pi;$$

and it follows that the distance of the moon from the earth is greatest at quadratures. When the distance is least, then

$$\cos(2nt - 2n't) = +1,$$

whence

$$2nt - 2n't = 0 \text{ or } 2\pi;$$

consequently the moon is nearest to the earth at syzygy. It thus appears that the orbit of the moon as modified by the disturbing influence of the variation resembles an oval of which the earth is the centre, and of which the minor axis is constantly in the line of syzygies.

The mean longitude of the moon and the true longitude coincide when

$$\sin(2nt - 2n't) = 0.$$

This condition is fulfilled both at syzygy and quadrature; consequently the mean place of the moon and its true place coincide when the moon is either in syzygy or in quadrature. The true place of the moon is at its greatest distance in advance of the mean place when

$$\sin(2nt - 2n't) = 1.$$

This condition is fulfilled at the middle points of the first and third quadrants, while at the middle points of the second and fourth quadrants

$$\sin(2nt - 2n't) = -1;$$

and therefore the moon is behind its mean place in the second and fourth quadrants.

After new moon, the distance between the moon and the earth gradually increases, and the apparent velocity of the moon also increases until, when the moon is three or four days old, it has advanced 39′ beyond its mean place; the velocity then begins to diminish, though the distance goes on increasing, until at first quarter the distance has attained a maximum. After first quarter the distance diminishes, and the moon falls behind its mean place, the maximum distance of 39′ behind the mean place being reached about 11 days after new moon. At full moon the distance has become a minimum, and the mean place and true place coincide. At 18 days the true place has again gained 39′ on the mean place, but the distance increases, and at third quarter the distance is again a maximum, and the true and the mean place coincide. After passing third quarter the distance diminishes, and the true place falls behind the mean place, the difference attaining a maximum on the 26th day, after which the true place gains on the mean place, with which it coincides at new moon, when also the distance is again a minimum.

Since the amount of this irregularity in longitude is so considerable, being in fact larger than the diameter of the moon itself, it is very appreciable even in comparatively coarse observations. It was discovered by observation by Tycho Brahe, by whom it was named the *variation*.

It would lead us too far to endeavour to trace out any of the other irregularities by which the motion of the moon is deranged. We have taken the variation merely as an illustration of one of the numerous corrections which the law of gravitation has explained. The accordance which subsists between the values of these corrections as computed by theory and as determined by observation affords the most conclusive evidence of the truth of the law of universal gravitation. (R. S. B.)

GRAVITY, SPECIFIC. See HYDRODYNAMICS.

GRAY, the chief town of an arrondissement in the department of Haute-Saône, is situated on the declivity of a hill on the left bank of the Saône, 37 miles S.W. of Vesoul by rail. Its streets are narrow and steep, but it possesses broad and beautiful quays, and the Allée des Capucins is a fine promenade. The principal buildings are the old castle of the duke of Burgundy, the church in the style of the Renaissance, the communal college (with a library of 15,000 volumes and a natural history museum), the theatre, and the barracks. The town possesses very large flour-mills, and among the other industries are ship-building, dyeing, tanning, haircloth-weaving, plaster-casting, and the manufacture of machinery, oils, and starch. There is also a considerable trade in iron, corn, provisions, vegetables, wine, and wood. The population in 1876 was 7305. Gray was founded in the 7th century. Its former defensive works were destroyed by Louis XIV. in 1688. During the Franco-Prussian war General von Werder concentrated his army corps in the town, and held it for a month, making it the *point d'appui* of movements towards Dijon and Langres, as well as towards Besançon.

GRAY, DAVID (1838–1861), Scottish poet, was the son of a hand-loom weaver, and was born at Merkland, a small village on the banks of the Luggie, about 8 miles from Glasgow, January 29, 1838. His parents, observing his fondness for study and his exceptional cleverness, resolved to educate him for the church, and through their self-denial and his own exertions as a pupil teacher and private tutor, he was able, after receiving the rudiments of education at the parish school of Kirkintilloch, to complete a course of four sessions at the university of Glasgow. It soon, however, became evident that the vision of poetry and world fame had begun to lure him away from the path which his parents' desires had marked out for him. His most intimate companion at this time was Robert Buchanan, the now

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[1] When the approximation is carried sufficiently far it is found that the coefficient of the variation is 39′ 30″.

well-known poet; and in May 1860 the two agreed to proceed to London, with the indefinite purpose of finding some kind of employment in connexion with literature. Shortly after his arrival in London Gray introduced himself to Mr Monckton Milnes, now Lord Houghton, with whom he had previously corresponded, who, though unsuccessful in his application for a place for Gray's poem, "The Luggie," in the *Cornhill Magazine*, gave him some light literary work. He also showed him great attention when a cold which had seized him assumed the serious form of consumption, and procured him the means of staying for a time in the south of England; but as the disease made rapid progress, an irresistible longing seized Gray to return to Merkland, where he arrived in January 1861, and died on the 3d December following, having the day before had the gratification of seeing a printed specimen copy of his poem *The Luggie*. He was buried in the Auld Aisle Churchyard, Kirkintilloch, where in 1865 a monument was erected by "friends far and near" to his memory.

The *Luggie*, the principal poem of Gray, is a kind of reverie in which the scenes and events of his childhood and his early aspirations are mingled with the music of the stream which he celebrates. The series of sonnets *In the Shadows*, composed during the latter part of his illness, possess, without the smallest taint of morbidness, a touching and solemn beauty in keeping with the circumstances in which they were written. Most of his poems necessarily bear traces of immaturity, and lines may frequently be found in them which are mere echoes from Thomson, Wordsworth, or Tennyson, but they possess, nevertheless, the distinct individuality of true genius. They nearly all have a direct or indirect reference to phases of outward nature, and they give evidence of an underlying wealth of imagination and sentiment, of a true and vigorous power of conception, and of a gift of clear and strong, yet subtle and tender, musical utterance, which apparently only required to have been mellowed by time and experience in order to have fashioned a poetry which would have given him an enduring name in English literature.

The Luggie and other Poems, with an introduction by R. Monckton Milnes, and a brief memoir by James Hedderwick, was published in 1862, and a new and enlarged edition of Gray's *Poetical Works*, edited by the late Sheriff Glassford Bell, appeared in 1874. See also the "[illegible] David Gray," published originally in *Cornhill Magazine*, and reprinted in *David Gray and other Essays*, by Robert Buchanan, 1868, and the poem on David Gray, reprinted there from *Idyls and Legends of Inverburn*.

GRAY, JOHN EDWARD (1800-1875), a distinguished English naturalist, born at Walsall, Staffordshire, in 1800, was the eldest of the three sons of Mr S. F. Gray, of that town, druggist and writer on botany, author of the *Supplement to the Pharmacopœia*, &c., and grandson of Mr S. Gray, who translated for Lee the *Philosophia Botanica* of Linnæus, and assisted in the composition of the *Introduction to Botany*. Gray studied at St Bartholomew's and other hospitals for the medical profession, but was attracted to the more enlivening pursuit of botany, on which he wrote and lectured. At an early age he assisted his father by collecting notes on botany and comparative anatomy and zoology in Sir Joseph Banks's library at the British Museum, aided by Dr W. E. Leach, assistant-keeper. The systematic synopsis of the *Natural Arrangement of British Plants*, 2 vols., 1821, was prepared by him, his father writing the preface and introduction only. The work, which introduced the natural system of plants on Jussieu's plan to the students of English botany, gave offence to the Linnean Society, who rejected Gray's application for a fellowship in 1822. Chafed at this unmerited rebuff, he turned to the study of zoology, working on [illegible], *Mollusca*, and *Papilionidæ*, [illegible] by Dr Leach at the British Museum. In December 1824 Gray obtained the post of assistant in that institution; and from that date to December 1839, when Mr J. G. Children retired from the keepership, he had so zealously applied himself to the study, classification, and improvement of the national collection of zoology that he was selected as the fittest person to be entrusted with its charge. Immediately on his appointment as keeper, Gray took in hand the revision of the systematic arrangement of the collections; scientific catalogues followed in rapid succession; the department was raised in importance; its poverty as well as its wealth became known, and whilst increased grants, donations, and exchanges made good many deficiencies, great numbers of students, foreign as well as English, availed themselves of its resources to enlarge the knowledge of zoology in all its branches. Gray found the representatives of the animal kingdom confusedly huddled together in old Montagu House; and the science of zoology was just then emerging from infancy, with little public support to foster it. But, in spite of numerous obstacles, he worked up the department, within a few years of his appointment as keeper, to such a state of excellence as to make it the rival of the cabinets of Leyden, Paris, and Berlin; and later on it was raised under his management to the dignity of the largest and most complete zoological collection in the world. The extensive acquaintance which he had obtained with practical zoology, his love of the subject, close application, and original views, his skill and accuracy of observation, his readiness to impart the information he had acquired to any one who sought it, and above all his marvellous industry, place Gray in the foremost rank of naturalists. It has been said that he tried to accomplish too much, that he wrote hurriedly and paid little attention to anatomy; but it must be remembered that he laboured for the past generation, not among the one-subject men of the present age. He did his work nobly, though somewhat roughly; and it will ever be appreciated by generous men of science. His eagerness for controversy, and the outspoken plainness with which he asserted his views, sometimes brought him into unpleasant relations with those he had to do with. Of this the catalogue dispute with Panizzi, and the gorilla dispute with Du Chaillu, Owen, and others, are well-known instances. Although seized with paralysis in 1870, Gray continued to discharge the functions of keeper of zoology, and to contribute papers to the *Annals of Natural History*, his favourite journal, and to the transactions of a few of the learned societies. At Christmas 1874, having completed half a century of official work, he resigned office; and on the 7th of March 1875 this indefatigable naturalist expired.

Gray was elected a fellow of the Royal Society in 1832; in 1852 the honorary degree of doctor of philosophy of the university of Munich was conferred upon him, in recognition of his formation of the largest zoological collection in Europe; and in 18[illegible] the king of Würtemberg, desiring to mark the estimation in which he held Gray, who had declined an offer of knighthood, bestowed upon him the gold medal of merit. He was a president of the Entomological Society, vice-president of the Zoological and Microscopic Societies, fellow of the Geographical and Palæontological Societies, in the formation of which he took part; he was president of the Botanical Society, and also a fellow of the Linnean and Geological Societies; he founded the Greenwich Society of Useful Knowledge; and he was an honorary or corresponding member of numerous foreign societies and academies. He was deputy chairman of the section of the animal and vegetable substances of the Exhibition of 1851, and a juror of the educational section of the Exhibition of 1862. He took an active part in questions of public importance of his own time, such as [illegible], postage stamps, [illegible] sanitary and municipal organization, the decimal system, [illegible] the opening of public [illegible], &c.

His works, [illegible] commenced to publish in 18[illegible], [illegible] the period of his death. He began with an [illegible] in Comparative Anatomy and Zoology in 18[illegible], and ended with a paper "On the Mahogany River Hog [illegible]," [illegible] the three species of the genus [illegible] *A. N. H.*, [illegible] 1875. The titles of the books, memoirs, and miscellaneous papers written by him, accompanied by a few notes, fill a privately printed list of 56 octavo pages. The more important of the books, besides those already mentioned, are—*Synopsis of the species of the class Mammalia*, 1827 (Griffith's *Cuvier*, vol. v.); *Illustrations of Indian Zoology*, 2 vols., 1830-35; *A Synopsis of the species of the class Reptilia*, 1830 (*Cuvier*, ix.); *Zoological Miscellany*, 1831-45; *Spicilegia Zoologica*, 1831; *A Descriptive Catalogue of Recent and Fossil Shells*, 1832; Turton's *Manual of the Land and Freshwater Shells of the British Islands* (new ed.), 1840; *List of the Specimens of Mammalia in the British Museum*, 1843; *Catalogue of Tortoises, &c.*, 1844; *Systematic Catalogue of British Land and Freshwater Shells*, 1844; *Catalogue of Specimens of Lizards*, 1845; *Gleanings from the Menagerie and Aviary at Knowsley Hall* (superintended at the request of the late earl of Derby), 1846-50; *List of the genera of recent Mollusca*, 1847; *List of Osteological Specimens*, 1847, *of British Sponges, Radiated Animals (Centronia), of British Radiata*, separate, 1848; *Catalogue of Mollusca*, 1849-50; *Catalogue of Reptiles (Snakes)*, 1849; *Catalogue of Fish (Chondropterygia)*, 1850; *Catalogue of Mammalia (Cetacea, Seals, Hoofed Quadrupeds)*, 1850-1852; *Catalogue of Amphibia*, 1850; *Catalogue of Bivalve Mollusca*, 1850-53; *List of Fish (Cartilaginous), of British Fish*, separate, 1851; *List of British Mollusca and Shells*, 1851; *Catalogue of Echinidæ or Sea-Eggs*, 1851; *Catalogue of Phaneropneumona* (with L. Pfeiffer), 1852; *Catalogue of Fish collected and described by L. T. Gronow*, 1854; *Catalogue of Shield Reptiles*, 1855-72; *Catalogue of the recent Echinida*, 1855; *Catalogue of Pulmonata* (with L. Pfeiffer), 1855; *Guide to the collection of Mollusca*, 1856; *Catalogue of Apodal Fish, by Dr J. J. Kaup*, translated and edited by Gray, 1856; *Catalogue of Auriculidæ*, 1857; *Systematic arrangement of figures of Conchifera and Brachiopoda*, 1857; *List of Mollusca*, 1858; *Handbook of British Waterweeds, or Algæ* (with W. Carruthers), 1864; Salisbury's *Genera of Plants*, edited by Gray, 1866; *Catalogue of Seals and Whales*, 1866-71; *Synopsis of Species of Starfish*, 1866; *Synopsis of species of Whales and Dolphins*, 1868; *Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia*, 1869; *Catalogue of Monkeys, Lemurs, and Fruit-eating Bats*, 1870; *Tortoises, Terrapins, and Turtles*, 1872 (re-edited); *Hand-list of Seals, Morses, Sea-Lions, and Sea-Bears*, 1874.

GRAY, THOMAS (1716-1771), the author of the celebrated *Elegy written in a Country Churchyard*, was born in Cornhill, London, December 26, 1716. His father, Philip Gray, an exchange broker and scrivener, was a wealthy and nominally respectable citizen; but he treated his family with brutal severity and neglect, and the poet was altogether indebted for the advantages of a learned education to the affectionate care and industry of his mother, whose maiden name was Antrobus, and who, in conjunction with a maiden sister, kept a millinery shop. A brother of Mrs Gray was assistant to the master of Eton, and was also a fellow of Pembroke College, Cambridge. Under his protection the poet was educated at Eton, and thence went to Peterhouse, Cambridge, attending college from 1734 to September 1738. At Eton he had as contemporaries Richard West, son of the lord chancellor of Ireland, and Horace Walpole, son of the triumphant Whig minister, Sir Robert Walpole. West died early in his 26th year, but his genius and virtues and his sorrows will for ever live in the correspondence of his friend. In the spring of 1739 Gray was invited by Horace Walpole to accompany him as travelling companion in a tour through France and Italy. They made the usual tour, and Gray wrote remarks on all he saw in Florence, Rome, Naples, &c. His observations on arts and antiquities, and his sketches of foreign manners, evince his admirable taste, learning, and discrimination. Since Milton, no such accomplished English traveller had visited those classic shores. In their journey through Dauphiné, Gray's attention was strongly arrested by the wild and picturesque site of the Grande Chartreuse, surrounded by its dense forest of beech and fir, its enormous precipices, cliffs, and cascades. He visited it a second time on his return, and, in the album of the mountain convent he wrote his famous Alcaic Ode. At Reggio the travellers quarrelled and parted. Walpole took the whole blame on himself. He was fond of pleasure and amusements, "intoxicated by vanity, indulgence, and the insolence of his situation as a prime minister's son,"—his own confession,—while Gray was studious, of a serious disposition, and independent spirit. The immediate cause of the rupture is said to have been Walpole's clandestinely opening, reading, and resealing a letter addressed to Gray, in which he expected to find a confirmation of his suspicions that Gray had been writing unfavourably of him to some friends in England. A partial reconciliation was effected about three years afterwards by the intervention of a lady, and Walpole redeemed his youthful error by a life-long sincere admiration and respect for his friend. From Reggio Gray proceeded to Venice, and thence travelled homewards, attended by a *laquais de voyage*. He arrived in England in September 1741, having been absent about two years and a half. His father died in November, and it was found that the poet's fortune would not enable him to prosecute the study of the law. He therefore retired to Cambridge, and fixed his residence at the university. There he continued for the remainder of his life, with the exception of about two years spent in London, when the treasures of the British Museum were thrown open. At Cambridge he had the range of noble libraries. His happiness consisted in study, and he perused with critical attention the Greek and Roman poets, philosophers, historians, and orators. Plato and the *Anthologia* he read and annotated with great care, as if for publication. He compiled tables of Greek chronology, added notes to Linnæus and other naturalists, wrote geographical disquisitions on Strabo, and, besides being familiar with French and Italian literature, was a zealous archæological student, and profoundly versed in architecture, botany, painting, and music. In all departments of human learning, excepting mathematics, he was a master. But it follows that one so studious, so critical, and so fastidious could not be a voluminous writer. A few poems include all the original compositions of Gray—the quintessence, as it were, of thirty years of ceaseless study and contemplation, irradiated by bright and fitful gleams of inspiration. In 1742 Gray composed his *Ode to Spring*, his *Ode on a Distant Prospect of Eton College*, and his *Ode to Adversity*,—productions which most readers of poetry can repeat from memory. He commenced a didactic poem, *On the Alliance of Education and Government*, but wrote only about a hundred lines. Every reader must regret that this philosophical poem is but a fragment. It is in the style and measure of Dryden, of whom Gray was an ardent admirer and close student. His *Elegy written in a Country Churchyard* was completed and published in 1751. In the form of a sixpenny *brochure* it circulated rapidly, four editions being exhausted the first year, and within the same period it also appeared in three magazines—the *Magazine of Magazines* for February, the *London Magazine* for March, and the *Grand Magazine of Magazines* for April. This popularity surprised the poet. He said sarcastically that it was owing entirely to the subject, and that the public would have received it as well if it had been written in prose. The solemn and affecting nature of the poem, applicable to all ranks and classes, no doubt aided its sale; it required high poetic sensibility and a cultivated taste to appreciate the rapid transitions, the figurative language, and lyrical magnificence of the odes; but the elegy went home to all hearts; while its musical harmony, originality, and pathetic train of sentiment and feeling render it one of the most perfect of English poems. No vicissitudes of taste or fashion have affected its popularity. When the original manuscript of the poem was offered for sale in 1854, it brought the almost incredible sum of £131. The two great odes of Gray, the *Progress of Poetry* and *The Bard*, were published in 1757, and were but coldly received. His name, however, stood high, and, on the death of Cibber the same year, he was offered the laureateship, which he wisely declined. He was ambitious, however, of obtaining the more congenial and dignified appointment of professor of modern history in the university of Cambridge, which fell vacant in 1762, and, by the advice of his friends, he made application to Lord Bute, but was unsuccessful. Lord Bute had designed it for the tutor of his son-in-law, Sir James Lowther. No one had heard of the tutor, but the Bute influence was all-prevailing. In 1765 Gray took a journey into Scotland, penetrating as far north as Dunkeld and the Pass of Killiecrankie; and his account of his tour, in letters to his friends, is replete with interest and with touches of his peculiar humour and graphic description. One other poem proceeded from his pen. In 1768 the professorship of modern history was again vacant, and the duke of Grafton bestowed it upon Gray. A sum of £400 per annum was thus added to his income; but his health was precarious—he had lost it, he said, just when he began to be easy in his circumstances. The nomination of the duke of Grafton to the office of chancellor of the university enabled Gray to acknowledge the favour conferred on himself. He thought it better that gratitude should sing than expectation, and he honoured his grace's installation with an ode. Such occasional productions are seldom happy; but Gray preserved his poetic dignity and select beauty of expression. He made the founders of Cambridge, as Mr Hallam has remarked, "pass before our eyes like shadows over a magic-glass." When the ceremony of the installation was over, the poet-professor went on a tour to the lakes of Cumberland and Westmoreland, and few of the beauties of the lake-country, since so famous, escaped his observation. This was to be his last excursion. While at dinner one day in the college hall he was seized with an attack of gout in his stomach, which resisted all the powers of medicine, and proved fatal in less than a week. He died on the 30th of July 1771, and was buried, according to his own desire, beside the remains of his mother at Stoke Pogis, near Slough in Buckinghamshire, in a beautiful sequestered village churchyard that is supposed to have furnished the scene of his elegy.[1]

The literary habits and personal peculiarities of Gray are familiar to us from the numerous representations and allusions of his friends. It is easy to fancy the recluse poet sitting in his college-chambers in the old quadrangle of Pembroke Hall. His windows are ornamented with mignonette and choice flowers in China vases, but outside may be discerned some iron-work intended to be serviceable as a fire-escape, for he has a horror of fire. His furniture is neat and select; his books, rather for use than show, are disposed around him. He has a harpsichord in the room. In a corner of one of the apartments is a trunk containing his deceased mother's dresses, carefully folded up and preserved. His fastidiousness, bordering upon effeminacy, is visible in his gait and manner,—in his handsome features and small well-dressed person, especially when he walks abroad and sinks the author and hard student in "the gentleman who sometimes writes for his amusement." He writes always with a crow quill, speaks slowly and sententiously, and shuns the crew of dissonant college revellers who call him "a prig," and seek to annoy him. Long mornings of study, and nights feverish from ill-health, are spent in those chambers; he is often listless and in low spirits; yet his natural temper is not desponding, and he delights in employment. He has always something to learn or to communicate, some sally of humour or quiet stroke of satire for his friends and correspondents, some note on natural history to enter in his journal, some passage of Plato to unfold and illustrate, some golden thought of classic inspiration to inlay on his page, some bold image to tone down, some verse to retouch and harmonize. His life is on the whole innocent and happy, and a feeling of thankfulness to the Great Giver is breathed over all.

Various editions of the collected works of Gray have been published. The first, including memoirs of his life and his correspondence, edited by his friend, the Rev. W. Mason, appeared in 1775. It has been often reprinted, and forms the groundwork of the editions by Mathias (1814) and Mitford (1816). Mr Mitford, in 1843, published Gray's correspondence with the Rev. Norton Nicholls, and in 1854 his correspondence with Mason, from which Mason had made only a partial selection in his memoirs of Gray. A second edition of the correspondence with additional notes was published in 1855.[2] (R. CA.)

GRAYLING (*Thymallus*) are fishes belonging to the family of *Salmonidæ*, which resemble the vendace and gwyniad (*Coregonus*) in having scales of considerable size, and a narrow mouth with very small teeth. They are distinguished by their large, wing-like, dorsal fin. Only a few species are known, which inhabit clear streams of the north of Europe, Asia, and North America. The best known are the "Poisson bleu" of the Canadian voyageurs, and the European species, *Thymallus vulgaris* (the *Asch* or *Aesche* of Germany, *Ombre* of France, and *Temola* of Upper Italy). This latter species is esteemed on account of its agreeable colours (especially of the dorsal fin), its well-flavoured flesh, and the sport it affords to anglers. It is very fastidious in the choice of the rivers it inhabits. In England it is found in the Test, the Avon, the Dove, the Lug, the Wye, the Irvon, the Teme, the Clun, the Hodder, the Trent, the Dee, the Wiske, the Wharfe, the Ure, the Ribble, and the Derwent; but it is not found either in Scotland or in Ireland. It is more generally distributed in Scandinavia and Russia, and the mountain streams of central Europe southwards to the Alpine waters of Upper Italy. Specimens attaining to a weight of four pounds are very scarce. See ICHTHYOLOGY.

GRAZALEMA (the Roman *Lacidulermium*), a town of Spain, in the province of Cadiz, is situated on the great road from Cadiz to Ronda, 60 miles E.N.E. of Cadiz. It stands in a very strong position on a rocky hill, and to capture it was reckoned one of the chief feats of the *esforzado* Rodrigo Ponce de Leon. It possesses three hermitages, a parish church, and a convent. The manufactures are chiefly woollen, linen, leather, and soap, and there is considerable trade in sheep and swine from the neighbouring sierra of the same name. Inscriptions and other Roman antiquities still exist in the town. The population is about 6000.

GRAZZINI, ANTONFRANCESCO (1503-1583), an Italian author, was born at Florence, March 22, 1503, of good family both by his father's and mother's side. Of his youth and education all record appears to be lost, but he probably began early to practise as an apothecary. In 1540 he was one of the founders of the Academy of the Humid (degli Umidi), and about forty two years afterwards he took a prominent part in the formal establishment of the more famous Accademia della Crusca. In both societies he was known as *Il Lasca* or *Leuciscus*, and this pseudonym is still frequently substituted for his proper name. His temper was what the French happily call a difficult one, and his life was consequently enlivened or disturbed by various literary quarrels. His Humid brethren went so far as to expel him for a time from the society,—the chief ground of offence being apparently his ruthless criticism of the "Arameans," a party of the academicians who maintained that the Florentine or Tuscan tongue was derived from the Hebrew, the Chaldee, or some other branch of the Semitic. He was readmitted in 1566, when his friend Salviati was "consul" of the academy. His death took place on February 18, 1583. Il Lasca ranks as one of the great masters of Tuscan prose. His style is copious and flexible: abundantly idiomatic, but without any affectation of being so, it carries with it the force and freshness of popular speech, while it lacks not at the same time a flavour of academic culture. His principal works are *Le Cene*, a collection of stories in the manner of Boccaccio, and a number of prose comedies, *La Gelosia*, *La Spiritata*, *I Parentadi*, *La Strega*, *La Sibilla*, *La Pinzochera*, *L'Arzigogolo*. The stories, though of no special merit as far as the plots are concerned, are told with verve and interest. A number of miscellaneous poems, a few letters, and *Four Orations to the Cross* complete the list of Grazzini's extant works.

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[1] A claim has been put up for the churchyard of Grantchester, about two miles from Cambridge, the great bell of St Mary's serving for the "curfew." But Stoke Pogis is more likely to have been the spot, if [illegible] individual locality were intended. The poet often visited the village, his aunt and mother residing there, and his aunt was interred in the churchyard of the place. Gray's epitaph on his mother is distinguished, not only by the tenderness with which he always regarded her memory, but by the style and cast of thought. It runs thus:—"Beside her friend and sister here sleep the remains of Dorothy Gray, widow, the careful tender mother of many children, one of whom alone had the misfortune to survive her. She died March 11, 1753, aged 72." [illegible] to read the *Elegy*, which was perhaps an [illegible] for his maternal love and affection. Mrs Gray's will commences in a [illegible] strain:—"In the name of God, amen. This is the last will and testament of Dorothy Gray to her son Thomas Gray." They were all in all to each other. The father's cruelty and neglect, the [illegible], the sacrifices made by the mother to maintain her son at the university, her pride in the talents and position of that son, and the [illegible] gratitude and affection of the latter [illegible]—these form an affecting but noble record in the history of genius.

[2] A volume of the original autograph letters of Gray addressed to Dr Thomas Wharton, fellow of Pembroke Hall, Cambridge, and later of London and Old Park, near Darlington, was added in 1877 to the Egerton Library of manuscripts in the British Museum.

He also edited the works of Berni, and collected *Tutti i Trionfi, Carri, Mascherate, e Canti Carnascialeschi, andati per Firenze dal tempo del magnifico Lorenzo de' Medici fino all' anno* 1559. In 1868 Adamo Rossi published in his *Ricerche per le biblioteche di Perugia* three "novelle" by Grazzini, from a MS. of the 16th century in the "Comunale" of Perugia; and in 1870 a small collection of those poems which have been left unpublished by previous editors appeared at Poggibonsi, *[illegible] inedite*. See Pietro Fanfani's "Vita del Lasca," prefixed to his edition of the *Opere di A. Grazzini*, Florence, 1857.

GREAT BRITAIN AND IRELAND. THE UNITED KINGDOM OF, has been since January 1, 1801, the official title of the political unity composed of England, Scotland, and Ireland. Great Britain was employed as a formal designation from the time of the union of the kingdoms of England and Scotland in 1707. Although the name (which apparently had its origin in Britannia Major, the name given to the island to distinguish it from Britannia Minor or Brittany) had, in earlier times, been often used both by English and by foreign writers, especially for rhetorical and poetical purposes, it was not till after the accession of James I. that it became a recognized part of the royal style. Its adoption was due to the king himself, who was anxious to give expression to the fact that he was sovereign of the undivided island, and not only of England or Scotland. As early as 1559 the Scottish Congregation had formally proposed through Maitland the union of the two crowns, and the adoption of the name of Great Britain for the common country (Teulet, i., "Mém. Caillé à M. de la Mothe," Dec. 20). But in England the innovation at first met with great opposition. Various objections, sentimental and practical, were urged against it in parliament; and the judges, when appealed to by the king, declared that the adoption of the title would invalidate all legal processes. At length, on the 20th October 1604, the king, weary of the discussion, cut the knot by assuming the title by royal proclamation, and in due course the inscription "J. D. G. Mag. Brit. F. et H. Rex" appeared on his coins. The proclamation declared that Great Britain was "the true and ancient name which God and time have imposed upon this Ile, extant and received in histories, in all mappes and cartes wherein this ile is described, and in ordinary letters to ourselfe from divers foreign princes, warranted also by authentical charters, exemplifications under seals, and other records of great antiquitie." In November 1604 we find the king instructing the Lords Commissioners of the Gunpowder Plot to try and discover if the prisoner was the author of a most "cruel pasquil" against him for assuming the name of Britain. For further details see *Calendar of State Papers, Domestic Series*, and Spedding, *Letters and Life of Lord Bacon*, vol. iii.

GREAVES, JOHN (1602-1652), a mathematician and antiquary, was the eldest son of John Greaves, rector of Colemore, near Alresford in Hampshire, and was born in 1602. He was educated at Balliol College, Oxford, and in 1630 was chosen professor of geometry in Gresham College, London. After travelling in Europe, he in 1637 visited the East, where he collected a considerable number of Arabic, Persic, and Greek manuscripts, and made a more accurate survey of the pyramids of Egypt than any traveller who had preceded him. On his return to Europe he visited a second time several parts of Italy, and during his stay at Rome instituted inquiries into the ancient weights and measures. Soon after his arrival in England, he was appointed to the Savilian professorship of astronomy at Oxford, but he was deprived of his Gresham professorship for having neglected its duties. In 1648 he lost both his fellowship and his Savilian chair on account of his adherence to the royalist party. But his private fortune more than sufficed for all his wants till his death in 1652.

Besides his papers in the *Philosophical Transactions*, the principal works of Greaves are *Pyramidographia, or a Description of the Pyramids in Egypt*, 1646; *A Discourse on the Roman Foot and Denarius*, 1649; and *Elementa Linguæ Persicæ*, 1649. His miscellaneous works were published in 1737 by Dr Birch, with a biographical notice of the author. See also Smith's *Vitæ quorundam erudit. virorum*, and Ward's *Gresham Professors*.

GREBE (French *Grèbe*), the generally accepted name for all the birds of the Family *Podicipedidæ*,[1] belonging to the group *Pygopodes* of Illiger, members of which inhabit almost all parts of the world. Some systematic writers have distributed them into several so-called genera, but, with one exception, these seem to be insufficiently defined, and here it will be enough to allow but two—Latham's *Podiceps* and the *Centropelma* of Messrs Sclater and Salvin. Grebes are at once distinguishable from all other Water-Birds by their

Great Crested Grebe.

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[1] Often, but erroneously, written *Podicipidæ*. The word *Podiceps* being a contracted form of *Podicipes* (cf. Gloger, *Journal für Ornithologie*, 1854, p. 426, note), a compound of *podex*, *podicis*, and *pes*, *pedis*, its further compounds must be in accordance with its derivation.

very short body, and the peculiar structure of their feet, which are not only placed far behind, but have the tarsi flattened and elongated toes furnished with broad lobes of skin.

In Europe we have five well-marked species of *Podiceps*, the commonest and smallest of which is the very well-known Dabchick of our ponds, *P. fluviatilis* or *minor*, the Little Grebe of ornithologists, found throughout the British Islands, and with a wide range in the Old World. Next in size are two species known as the Eared and Horned Grebes, the former of which, *P. nigricollis*, is a visitor from the south, only occasionally showing itself in Britain, while the latter, *P. auritus*, has a more northern range, breeding plentifully in Iceland, and is a not uncommon winter-visitant. Then there is the larger Red-necked Grebe, *P. griseigena*, also a northern bird, and a native of the subarctic parts of both Europe and America, while lastly the Great Crested Grebe, *P. cristatus*, or Gaunt—known as the Loon on the meres and broads of East Anglia, and some other parts of England, is also widely spread over both Worlds, and though apparently not found within the tropics, is known in the extreme south as a native of Australia and New Zealand. North America is credited with seven species of Grebes, of which three (*P. cristatus*, *P. griseigena*, and *P. auritus*) are admitted to be specifically inseparable from those already named, and two (*P. occidentalis* and *P. californicus*) appear to be but local forms; the remaining two (*P. dominicus* and *P. ludovicianus*) may, however, be accounted good species, and the last differs so much from other Grebes that many systematists make it the type of a distinct genus, *Podilymbus*. South America seems to possess four or five more species, one of which, the *P. micropterus* of Mr Gould (*Proc. Zool. Society*, 1858, p. 220), has been deservedly separated from the genus *Podiceps* by Messrs Sclater and Salvin (*Exot. Ornithology*, p. 189, pl. xcv.), owing to the form of its bill, and the aborted condition of its wings, which seem to render it absolutely flightless. Lake Titicaca in Bolivia is, so far as is known at present, its only habitat. Grebes in general, though averse from taking wing, have much greater power of flight than would seem possible on examination of their alar organs, and are capable of prolonged aerial journeys. Their plumage is short and close. Above it is commonly of some shade of brown, but beneath it is invariably white, and so glossy as to be in much request for muffs and the trimming of ladies' dresses. Some species are remarkable for the crests or tippets, generally of a golden-chestnut colour, they assume in the breeding season. *P. auritus* is particularly remarkable in this respect, and when in its full nuptial attire presents an extraordinary aspect, the head (being surrounded, as it were, by a *nimbus* or aureole, such as that with which painters adorn saintly characters), reflecting the rays of light, glitters with a glory that passes description. All the species seem to have similar habits of nidification. Water-weeds are pulled from the bottom of the pool, and piled on a convenient foundation, often a seminatant growth of bog-bean (*Menyanthes*), till they form a large mass, in the centre of which a shallow cup is formed, and the eggs, with a chalky white shell almost equally pointed at each end, are laid—the parent covering them, whenever she has time to do so, before leaving the nest. Young Grebes are beautiful objects, clothed with black, white, and brown hair, disposed in streaks, and their bill often brilliantly tinted with orange or yellow. When taken from the nest and placed on dry ground, it is curious to observe the way in which they progress—using the wings almost as fore-feet, and suggesting the notion that they must be quadrupeds instead of birds. In water, however, they equal if not surpass their parents in the power of diving, which is a special accomplishment of all Grebes. (A. N.)

GRECO, El. Domenico Theotocopuli, commonly called El Greco, was a native of Greece, where he was born about the year 1545. He appears to have studied art at Venice, where it is alleged that Titian was his master. The date of his removal to Spain is unknown; but in 1577 we find him at Toledo, engaged on one of his most admired paintings, that on the parting of the raiment of Jesus. Until now he had been content to follow closely in the footsteps of the Venetian school, and he is generally admitted in his earlier works frequently to have approached the style of some of its best representatives; but in 1579, having been summoned, along with other artists of repute, by Philip II. to contribute to the decoration of the Escorial, he began to aim at greater originality of style with very unfortunate results. The first work in his new manner, having for its subject the martyrdom of St Maurice, was executed in 1579; in this, as in all his subsequent productions, a dull ashen monotony of colour combines with stiff and unnatural drawing to produce an effect which is at no time very pleasant, and is sometimes absolutely repulsive. El Greco, however, continued to be held in considerable repute in the peninsula; sonnets in his honour are to be found in the writings both of Gongora and Pallavicino; and he became the founder of a school in which many of the disciples excelled their master. He practised sculpture and architecture as well as painting, and is said by Pacheco to have written with great learning and ability upon all these arts; none of his books, however, have come down to our time. He died at Toledo in 1625.

GREECE

PART I.—GEOGRAPHY AND STATISTICS.

Plates I. and II.

GREECE is a European kingdom, occupying the southern portion of the most easterly of the three peninsulas which Europe projects into the Mediterranean. By its own inhabitants it is called Hellas, as it was also in antiquity, and the name Greece, by which in one form or other it is known in most European languages, was given to it by the Romans, and was not used by any Greek writer, so far as we know, before Aristotle. Why the Romans called it so is an obscure point, but the most probable and usually accepted explanation is that they gained their first knowledge of the country from a tribe in the north-west of Greece who were called Græci (Γραικοί), and that they accordingly gave the name of that tribe to the whole country. The name Greece or Hellas has been applied at different times to territory of widely different extent. At first Hellas denoted nothing but the spot in Thessaly where the tribe of Hellenes dwelt, and in later times, after Philip of Macedon obtained a seat at the Amphictyonic council, it meant the whole peninsula south of the Balkan mountains (Hæmus) including Macedonia and Thrace; but at the period of its greatest distinction it excluded these two regions, and was restricted to the part of the peninsula to the south of the Cambunian range and the islands of the surrounding seas. Its ancient limits, however, cannot be rigidly defined, for (1) its northern frontier seems never to have been precisely settled, some writers excluding Thessaly which was generally taken in, and others including part of Epirus which was generally left out; and (2) the name Hellas expressed not so much a geographical as an ethnological unity. It was the country of the Hellenes. Wherever Greeks settled

Extent of ancient Greece. Plate I.

there was Hellas, and a Greek colony in Sicily or Africa was thought to participate as essentially in all that constituted Hellas as either Attica or Lacedæmon. Still the name was usually applied to the land which formed the geographical centre of the race, of which the greatest length was 250 miles and the greatest breadth 180, and which had an area, exclusive of Epirus (4690 square miles) but including Eubœa (1410 square miles), of 21,121 square miles. This territory comprised (1) Northern Greece, all north of the Maliac (Zeitoum) and Ambracian (Arta) Gulfs; (2) Central Greece, extending from these gulfs to the isthmus of Corinth; (3) the peninsula of the Peloponnesus (Morea) to the south of the isthmus; (4) the following islands:—Eubœa (Negropont) in the east, the Ionian Islands in the Ionian Sea on the west, Crete and Cyprus in the south, and the Cyclades and Sporades across the mouth of the Ægean from the south-east headlands of Attica and Eubœa. Continental Greece—i.e., all the country now specified, exclusive of the islands—consists of a series of natural cantons, hedged from one another and from the outer world by mountain ranges from 5000 to 8000 feet high, and so was almost by a physical necessity occupied in the times of its ancient political independence by seventeen separate states, none of which was larger than an ordinary English county. The whole eight states of the Peloponnesus covered less area than York and Lancaster together; and Attica, the most celebrated state of antiquity, was less than Cornwall. These states, which are noticed separately under the special headings, were—Thessaly in North Greece; Acarnania, Ætolia, Locris, Doris, Phocis, Megaris, Bœotia, and Attica in Central Greece; and Corinthia, Sicyonia, Achaia, Elis, Messenia. Laconia, Argolis, and Arcadia in the Peloponnesus.

Extent of Modern Greece. Plate II. Modern Greece is of smaller extent, and its limits are strictly determined by the arrangement between Great Britain, France, Russia, and Turkey, concluded at Constantinople on the 21st [9th] July 1832, which finally settled the question of frontier between Greece and Turkey. It left to Turkey the fertile Greek-speaking province of Thessaly and part of Acarnania, and fixed the northern boundary of Greece at a line running from the Gulf of Arta (Sinus Ambracius) to the Gulf of Volo (S. Pagasæus), keeping along the crest of the Othrys mountain range. The pass of K[illegible] was to belong entirely to Greece, and the fort of Punta (Actium) at the southern head of the Gulf of Arta was to continue to belong to Turkey, though Greek vessels were required to have free entry into the gulf. The Ionian islands, consisting of Corfu (Corcyra), Paxo (Paxos), Santa Maura (Leucas), Cephalonia, Thiake (Ithaca), and Zante (Zacynthus) on the west coast of Greece, and Cerigo (Cythera) on the south, which had remained under British protectorate for 50 years, were voluntarily ceded by Britain to Greece in 1864, after the accession of king George. Modern Greece is not more than two thirds the size of Scotland; it is 200 miles long from north to south, and 150 broad from east to west, and has an entire area of 19,353 square miles, of which 8288 square miles are in the Morea, 7558 in the northern part of continental Greece, 2500 in the islands of the Ægean, and 1007 in the Ionian Islands.

General physical features. Its most obvious geographical peculiarity is its remarkable richness in mountains, bays, and islands, which give it unexampled natural defences, unusual maritime facilities, and quite a peculiar variety of climate, vegetation, and scenery. In this respect it has gathered into a smaller page and expressed in distincter type the structural peculiarities of the continent to which it belongs. In the complexity of its make and the variety of its natural features Greece excels every country of Europe, as Europe excels every continent of the world. No part of Greece is 40 miles from the sea or 10 from the hills. Though not much more than half the size of Portugal, it has a coast line greater than that of Spain and Portugal together, and that coast line is broken everywhere into all manner of gulfs, and bays, and inlets, affording a rich supply of good natural harbours. The country is divided by its mountain chains into a number of independent parts, the capture of one of which by an enemy is but a single step towards possession of the whole. The small basins of arable land between these hills maintained comparatively isolated populations, on account of the difficulty of inland intercommunication, and naturally developed that individuality of character, that local patriotism, and that political independence, which marked the ancient Greek communities. And the great variety of pursuit, interest, and stimulus which the geographical features of the country created could not fail to conduce to the uncommon mental vigour, quickness, and versatility which the people exhibited. The Greeks therefore owed their greatness largely to the country it was their fortune to dwell in.

Mountains. The ruling feature in the mountain system of ancient Greece—and, to a certain extent, in modern Greece also—is the great chain of Pindus, which takes its rise in the Balkans (Hæmus), and runs like a backbone through the entire length of the northern half of the peninsula, throwing out various branches to the east and the west on its way. At about 40° N. lat. the Cambunians leave it and go east, forming the boundary between Macedonia (Roumelia) and Thessaly, and as they approach the coast they turn in a southerly direction at the lofty and famous Mount Olympus, the highest mountain in ancient Greece, and are continued at intervals, on the other side of the vale of Tempe, by Ossa (Kissovo), Pelion (Zagora), and the hills of Eubœa. At 39° the Othrys chain (Helloro), whose chief elevation is the conical Mount Veluchi (Tymphrestus), is sent out also to the east, and forms the northern bulwark of the present kingdom. A little further south the Œta range (Katavothra) goes in the same direction, and reaches the Gulf of Zeitoum (Maliac Gulf) at the celebrated pass of Thermopylæ. The Cambunian chain intersects Pindus at Mount Lacmon (Zygo), and thence westward the chain passes under the name of Tænarus and the Ceraunian Hills (Montes Acroceraunii) till it enters the sea at the Acroceraunian promontory (Cape Linguetta). From the point of junction with the Othrys, the Pindus chain is continued southwards in a series of separate peaks—Parnassus (Liakura), Helicon, Cithæron, Parnes, and Hymettus, on to the promontory of Sunium (Cape Colonna) in the south-east of Attica. Parnes divides Attica from Bœotia. The mountains of the Morea have no connexion with the mountain system of Northern Greece; they do not run in chains, but rather cluster in knots. The most important of these are Ziria (Cyllene), Khelmos, Olonos, and the range of Pentedaktylon (Taygetus), which stretches from the centre of Arcadia through the length of Laconia to Cape Matapan (Tænarum), and is the most imposing of all the mountains of Greece. The hegemony of Sparta in the Peloponnesus is attributed by some to its possessing both sides of this chain. Its highest point is Mount St Elias, called, like several other Greek mountains, after the prophet Elijah. None of the mountains of Greece is within the line of perpetual snow, though the tops of several are white for some months in the year. What is peculiar to Greece is not the presence of any one hill of preeminent height, but the great number it possesses of considerable and nearly equal elevation. Modern Greece has no summit so high as Olympus (9754 feet), but within its narrow area it has twenty-six hills above 3000 feet, of which eight are above 7000 feet, viz., Parnassus (8068), Taygetus (7904), Tymphrestus (7610), Œta (7071), the three summits of Cyllene in Arcadia (7[illegible]), and Corax in Ætolia. The noted fortified hills of Greece were Acrocorinthus (1686 feet) which guards the isthmus, Ithome (2631 feet) at Messene, Larissa (900 feet) at Argos, and the Acropolis (150) at Athens.

Rivers. Greece has few rivers, and these small, rapid, and, as a rule, turbid, as they could not help being in a country where they rise in high mountains and have no space to grow in before they reach the sea. They are either perennial rivers or torrents, the white beds of the latter being dry in summer, and only filled with water after the autumn rains. The chief rivers (none of which are navigable) are the Hellada (Spercheius) in Phthiotis, the Aspro Potamo (Achelous) in Ætolia, and the Roufia (Alpheus) and Vasiliko (Eurotas) in the Morea. Of the famous rivers of Athens, the one, the Ilissus, is only a chain of pools all summer, and the other, the Cephissus, though never absolutely dry, does not reach the sea, but is drawn off in numerous artificial channels to irrigate the neighbouring olive groves. The waters of both are clear and delicious to the taste. A frequent peculiarity of the Greek rivers is their sudden disappearance in subterranean chasms and reappearance on the surface again, such as gave rise to the fabled course of the Alpheus under the sea, and its emergence again in the fountain of Arethusa in Syracuse. Some of these chasms—"Katavothras"—are merely sieves with boulders and gravel in the bottom, but others are large caverns through which the course of the river may be easily followed. Floods are frequent, especially in autumn, and natural fountains abound and gush out even from the tops of the hills. A spring rises high up among the peaks of Helicon, and Peirene flows from the summit of Acrocorinthus. It is surprising that there are no waterfalls in Greece, the only one worth mentioning being the famous Styx in Arcadia, which has a fall of 500 feet. During part of the year it is lost in the snow, and it is at all times almost inaccessible. Lakes are numerous, but few are of any size, and many are only marshes in summer. The largest are Trichonis in Ætolia, Copais in Bœotia, and Stymphalus in Arcadia.

Plains. The valleys are generally narrow, and the plains small in extent, deep basins walled in among the hills or mere flats at the mouths of the rivers. The principal plains are those of Thessaly (which is not in modern Greece), Bœotia, Messenia, Argos, and Marathon. The bottom of these plains consists of an alluvial soil, the most fertile in Greece. In some of the mountainous regions, especially in the Morea, are extensive table-lands. The plain of Mantinea is 2000 feet high, and the upland district of Sciritis, between Sparta and Tegea, is in some parts 3000 feet.

Coast. Strabo said that the guiding thing in the geography of Greece was the sea, which presses in upon it at all parts with a thousand arms. From the Gulf of Arta on the one side to the Gulf of Volo on the other the coast is indented with a succession of natural bays and gulfs. The most important are the Gulfs of Ægina (Saronicus) and Lepanto (Corinthiacus), which come in between the Morea and the northern mainland of Greece,—the first from the Ægean, the second from the Ionian Sea,—and are only prevented from joining their waters by the high land of the narrow isthmus of Corinth, [illegible] wide. The outer portion of the Gulf of Lepanto is called the Gulf of Patras, and the inner part the Bay of Corinth, and a narrow bay on the north side of the inner gulf, called the Bay of Salona, penetrates northwards into Phocis as far as [illegible] the Gulf of Zeitun on the north-east coast of Greece. The width of the entrance to the gulf of Lepanto is subject to irregular changes, which are ascribed to the [illegible] of alluvial deposits by certain marine currents, and their removal again by others. At the time of the Peloponnesian war this channel was 1200 yards broad; in the time of Strabo it was only 850; and in our own day it has again increased to 2200. On the coast of the Morea there are several large gulfs, that of Arcadia (Cyparissus) on the west, Kalamatia (Messeniacus) and Kolokythia (Laconicus) on the south, and Nauplia (Argolicus) on the east. Then between Eubœa and the mainland lie the channel of Talanti (Euboicum Mare) and the channel of Egripo, which are connected by the strait of Egripo (Euripus). This strait, which is spanned by a bridge, is 120 feet wide, and is remarkable for the unexplained eccentricity of its tide, which has puzzled ancients and moderns alike. The current runs at the rate of 8 miles an hour, but continues only for a short time in one direction, changing its course, it is said, ten or twelve times in a day.

Volcanic action. There are no volcanoes on the mainland of Greece, but everywhere traces of volcanic action and frequently visitations of earthquakes, for it lies near a centre of volcanic agency, the island of Santorin, which has been within recent years in a state of eruption. There is an extinct crater at Mount Laphystium in Bœotia. The mountain of Methana, on the coast of Argolis, was produced by a volcanic eruption in 282 B.C. An earthquake laid Thebes in ruins in 1853, another destroyed every house in Corinth in 1858, and a third filled up the Castalian spring in 1870. There are hot springs at Thermopylæ and other places, which are used for sanitary purposes. Various parts of the coast exhibit indications of upheaval within historical times. On the coast of Elis four rocky inlets are now joined to the land, which were separate from it in the days of ancient Greece. There are traces of earlier sea-beaches at Corinth, and on the coast of the Morea, and at the mouth of the Hellada. The land has gained so much that the pass of Thermopylæ, which was extremely narrow in the time of Leonidas and his three hundred, is now wide enough for the motions of a whole army.

Geology. The whole chain of the Pindus and some of the mountains of the Morea are composed of Primitive rocks,—granite, serpentine, porphyry, mica, and other schists,—but greater part of the country consists of Secondary formations, especially of a compact grey limestone, which hardens often into the purest marble. All Parnassus and Helicon consist of this rock. In the vicinity of Athens the limestone rests on mica schist, which prevails also in other parts of Attica, and in Eubœa, Laconia, and the Cyclades. Clay slate is found in some districts, and coal, equal to two-thirds of an equal weight of Newcastle coal, is found at Kumi in Eubœa, and of an inferior quality at Marcopoulo in Bœotia. Greece is not rich in minerals. Gold exists, but not in sufficient quantity to cover the expense of working. Copper is abundant, and silver, lead, iron, emery, antimony, cobalt, manganese, sulphur, and salt are found. Gypsum and porphyry are quarried. Marble is abundant, the chief kinds being the white marble of Pentelicus, of which the Parthenon was made, the blue marble of Hymettus, the green and red marble of the Morea, and the green and white of Carystus. In Mount Taygetus are beds of verd-antique jasper.

Scenery. The scenery of Greece excites the warmest admiration of all travellers, mainly from three causes—(1) its unusually rich variety, (2) its exquisite sensibility to every [illegible] of the light of the sky; and (3) the graceful and almost severely classical outline of its hills.

Vegetation. The vegetation of Greece may be described as belonging to four distinct zones. [illegible] region of [illegible] only a few wild plants

Most travellers are struck with the comparative scarcity of wood in G[illegible]. But though most of the [illegible] forests have [illegible], [illegible] of the surface still [illegible] than travellers [illegible] [illegible] per cent. of it was [illegible], which is only [illegible] less than in Spain, and is 12 per cent. more than in [illegible]. [illegible] is the [illegible], but the [illegible], [illegible], and [illegible]. The [illegible] from [illegible] south where it [illegible] the [illegible] [illegible] Mount [illegible], which [illegible] of the [illegible] the [illegible] [illegible] Athens. [illegible] in the [illegible] woods.

Animals. [illegible] in Greece are the [illegible], lynx, [illegible], and [illegible]. The wild goat, [illegible], [illegible] Europe, [illegible] Greece [illegible] It is said that [illegible] the same island, except in the case [illegible] in the south and the rabbits [illegible]. The birds are the [illegible] vulture, hawk, owl, [illegible], [illegible] partridge, woodcock, [illegible], [illegible] Arabia. [illegible], [illegible] poultry. [illegible] snakes [illegible] mosquitoes and gnats are [illegible].

Climate. The [illegible] of Greece, which ancient writers praised for its [illegible], which [illegible] of heat [illegible] Spain, Italy, and [illegible] even [illegible] of the sea. This peculiarity is [illegible] country to the cold winds from the [illegible] the north, and to the [illegible] of Africa on the south. [illegible] contrasts [illegible] a natural [illegible] the [illegible]. The [illegible] is [illegible] the Messenian March he found [illegible] in [illegible], and [illegible] Arcadia, [illegible]. There is great diversity in the [illegible] parts of Greece. As a rule, rain is [illegible] east, which accounts in the [illegible] the barren aspect of those of [illegible] part of Greece, and Bœotia has still [illegible] it had of old; and, what is remarkable, [illegible] between the people of those two [illegible] was proverbial when both were Greek by blood, [illegible] when they are both certainly Albanian, the [illegible] present day being still quick and lively, and the [illegible] dull and phlegmatic. According to statistics kept by [illegible] Schmidt, director of the observatory of Athens, and published in his *Beiträge zur physikalischen Geographie von Griechenland* ([illegible]), there were in [illegible] only twenty-five days on which [illegible] rain fell at Athens to be measured by the rain gauge. The mean annual temperature of Greece is 61° Fahr. The coldest months of the year are January and February. Snow seldom falls at Athens. The corn is at a considerable height in March, and is cut in May. Vines and [illegible] in March, and almonds are [illegible] in flower. Winters are, however, [illegible] on the tablelands and in [illegible] of the plains of the interior which are shaded [illegible] high hills. Dr Clarke was informed that the [illegible] the foot of Cithæron, in Bœotia, were confined to their [illegible] weeks by snow. Kruse says the north wind [illegible] months of the year, but Schmidt's statistics show [illegible]; there are really both northerly and southerly [illegible], of which now the one is more prevalent and now the other. The [illegible] winds [illegible] they bring the birds of [illegible] of the south-east, and blow [illegible] April. The Etesian winds are periodi[illegible], which blow regularly about the time of [illegible], and temper the heat of that season in the whole [illegible] of the Archipelago. Chandler says they begin on the 1st [illegible]; and Kruse, on the other hand, [illegible] and blow for sixty-five days (*Hellas*, i. [illegible]); [illegible] borne out by Schmidt's figures, [illegible] the only winds which blew at Athens during July and August [illegible] and [illegible], and out of the sixty-two days the [illegible] blew for [illegible], and the south-west for twenty-[illegible],—the north-east blowing twenty-two days in July and [illegible] in August, and the [illegible] nine in July and nineteen in August. Malaria prevails largely from the neglect of drainage and the [illegible] creation of marshes in many parts, and [illegible] fever, which is very fatal among children [illegible] in the [illegible], and [illegible] a very [illegible] the growth of the population of the country.

The modern Greeks are of very composite origin, yet are an extremely compact and homogeneous people. Out of the million and a half which constitute the present population of the country, only 67,941 speak any other language than Greek, and only 16,054 profess any other religion than the Orthodox; and all draw well together, glorying with one another in the same memories of a common deliverance, and sharing in the same ambition of a great future. There are in the present bounds of Greece three distinct races, speaking different languages, wearing different costumes, observing different customs, and holding little social intercourse with one another. These races are the Greek, the Albanian, and the Wallachian. All three are probably much mixed in blood, and, in fact, the descent of each of them has been a very vexed problem in ethnology. But, on the whole, the suggestion of Freeman seems the most likely account of the matter,—that, taking them all in all, these three races are the direct representatives of the three races which occupied Greek territory at the time of its conquest by the Romans. Since that time their blood has certainly been mingled with other elements, but still substantially the base of the modern Greek is the ancient Greek, the base of the modern Albanian is the ancient Illyrian, and the base of the modern Wallachian is the ancient Thracian.

Of these races the least numerous in Greece is the Wallachian or Roumanian. They are found chiefly in the mountainous regions in the northern parts of Greece, on the slopes of Othrys, in the neighbourhood of Zeitoun, on the hills of Acarnania and Ætolia, and even so far south as the banks of the Bœotian Cephissus. They pursue a nomadic shepherd life, wear black shaggy *capotes* made to imitate sheep-skin, and speak Roumanian, a corrupted Latin,—the language of their race, and also Greek, the language of the country. They belong to the Greek Church, and sometimes marry Greek girls, but almost never give their own daughters in marriage to Greeks. In 1851 Finlay says there were 50,000 Wallachians in the modern kingdom of Greece; but they are rapidly becoming completely Hellenized, and in 1870 there were only 1217 Wallachians in Greece who did not speak Greek. Most of the brigands that used to infest Greece were Wallachians.

The Albanians, Skipetars (*i.e.*, Highlanders), or Arnaouts, occupy at present more than a fourth of modern Greece,—all Attica and Megaris (except the capitals), most part of Bœotia and part of Locris, the southern half of Eubœa, part of Ægina and Andros, the whole of the islands of Salamis, Poros, Hydra, and Spezzia, and considerable districts in Argolis, Sicyonia, Arcadia, Laconia, Messenia, and Elis. They speak a language of their own, which certainly belongs to the Aryan family, but philologists are at a loss whether to count it an independent member of the family, or merely a corruption of one of the better known branches. In districts where they exist in small bodies they are losing their own tongue and adopting Greek; but in places like Attica and Hydra, where they exist in larger numbers, they still keep it up, and if the men understand Greek the women do not. In 1851 Finlay states there were 200,000 Albanians in Greece, and in 1870 there were only 37,598 left who did not speak Greek. The Albanians who dwell in Greece all belong to the Greek Church. They are mostly agriculturists, and seem to care little for political or professional life. They wear a peculiar dress, which was adopted by them mostly from the Slavs, and was regarded as the national costume of Greece after the Revolution,—a red fez, a silk jacket embroidered with gold, a white fustanella or petticoat, and gaiters.

The rest of the population, comprising the great bulk of it, are Greeks,—a people speaking the Greek language, practising the Greek rite, and claiming descent from the ancient Greek race. This claim, which seems to rest naturally on the obvious evidence of language and feature, was warmly contested on historical grounds by Fallmerayer, who held that during the Slavonic occupation of the country the ancient Greeks were completely extirpated, and that the present inhabitants are merely Slavonians Byzantinized. But his arguments have been conclusively confuted by Hopf, Finlay, and others, and it may be said to be now universally admitted that, while the blood of the population contains a considerable Slav admixture, its base is still that of the ancient race of Hellas.

It is curious that the two sections of the population of Greece whom Fallmerayer credited with the purest Greek descent—the Mainotes and the Tshakones, who inhabit the two mountain ranges of Laconia—are thought by Hopf to be the only two remnants of the Slavs that still exist. The Tshakones, whose name is commonly supposed, contrary to all etymological analogy, to be a corruption of Lacones, speak a peculiar dialect of Greek, and still live very much by themselves. They now occupy only seven villages, and number 1500 families. The Mainotes, celebrated by Byron, live in Maina, on the western mountain chain of Laconia. They also speak a particular dialect, and are remarkable for their personal beauty and independent spirit. Their houses are fortified keeps, and they were never subdued by the Turks. They practise the vendetta, but are simple and truthful above their neighbours.

Other nationalities are represented in Greece, but so slightly as hardly to be worth mentioning. They numbered only 20,126 in all in 1870. The Jews, who were never favoured by the Greeks, are found only in the Ionian Islands, where they obtained a footing during the British protectorate, and numbered, in 1870, 2528. Important remains of the old Venetian colonists still exist in the Ionian and some of the other islands.

In physique, the Greeks are generally tall and well made, if perhaps rather meagre, with oval face, long and arched nose, fine teeth, and eyes full of animation. Obesity is unknown, and their form is supple, graceful in its movements, and remains erect and elastic till past the age of 70. The best physical types are to be found in the islands and in some parts of the Morea, and there, many travellers remark, you may meet every day in the streets or highways women and boys who might have formed the models of Phidias.

National character. The national character of the Greeks is a matter upon which authorities take very contrary views, some lauding them foolishly, and others depreciating them most unjustly. They seem to have the faults and the excellences of their famous ancestors. They have their quickness of parts and their [illegible] of character. They are inquisitive, full of mental activity, fond of excitement, as keen for discussion as in the days of Plato, and as eager after novelty as in those of Paul. Their thirst for knowledge is indeed quite remarkable, as well as their aptitude to learn. Boys will put themselves to any discomfort in order to get to school; students at the university never missed a day from their studies during the Revolution of 1863, but regularly attended the lectures with the arms of the national guard in their hands; and domestic servants are often found in spare hours learning their letters or doing their sums. [illegible] Turkish rule [illegible] —[illegible] under [illegible] the Turkish [illegible]. They are [illegible] temperate [illegible] [illegible] [illegible] Christian nations, and the chastest. Though they make a good deal of strong wine, they drink little, and they eat as sparingly as they drink. The common people live on one meal a day, and the richer on two, and an English labourer will consume at one meal what would serve a Greek family of six for the day. A little maize and vegetables steeped in oil make the staple fare. Their rate of illegitimacy is lower than that of any other European country, which may perhaps be ascribed to the fact that Greece is the only country in Europe where the males outnumber the females, and that this circumstance combines with the frugal habits of living of the people to encourage early marriages. In other countries from 3 to 22 per cent. of the births are illegitimate, in Greece only 1·40 per cent. are so. Two striking characteristics of the Greeks are their patriotism,—their local attachment to their country, which stands out in the stronger relief because it is a quality in which their neighbours the Turks are entirely wanting,—and their love not only of liberty but specially of equality. They are in spirit the most democratic European nation. They have no nobility,—as of old, to be a Greek is itself to be noble; and Mahaffy says that "every common muleboy is a gentleman (κύριος) and fully your equal, sitting in the room at meals, and joining in the conversation at dinner;" and such is their jealousy of social superiorities that he was often told by Greeks that the only reason why they tolerated a foreign king was that they could not endure to be under one of themselves. It is the same temper as ostracized Aristides, and doubtless it springs largely from their vanity and egotism which even the most favourable witnesses own to be among their prominent faults. They have a deep belief, which they take no pains to conceal, in their own superiority over other nations; and the point in which they conceive their superiority more especially to dwell is in their intellectual gifts. There are two other qualities in which the Greeks are strong and which, though they are often abused, are yet main agents in human advancement,—ambition and the love of money. These have given a stimulus to their commerce, and made them thrifty and saving. The faults of which the Greeks are [illegible] accused are cowardice and dishonesty, and both charges are equally unwarranted. Their bravery was proved on many a field during the War of Independence. Dishonesty is not a national vice, though it seems certainly to be characteristic of the class of Greeks who more than the rest are thrown under the observation of foreigners, particularly the low mongrel Greeks of the Levant ports and the [illegible] of Greece, who have consequently helped to blacken the reputation of their countrymen in general.

The Greeks have few peculiar customs worth noting. Their national costume is now giving place almost universally to the less picturesque dress of the Franks. They still adhere to the old Julian calendar, and their dates are accordingly [illegible] to old style. They marry early,—young women from [illegible] years of age to [illegible], and young men from [illegible] to twenty. The marriage is arranged by the parents of the parties, is in all cases a religious ceremony, and may be annulled by legal divorce. One is allowed to marry three times, but a fourth marriage is forbidden. The bride brings a dowry of house, furniture, or money; and many women and girls earn their whole dowry in [illegible] [illegible]. The [illegible] degrees are those of [illegible] law.

The population of Greece in 1870, when the last census was taken, was [illegible], [illegible] an increase of [illegible] per cent. [illegible] [illegible] The [illegible] most densely peopled portion of the kingdom, especially the Ionian Islands, which have a population of [illegible] or [illegible] to the square mile. [illegible] only [illegible] per square [illegible] [illegible] Greece [illegible] than any country of Europe, except Russia and Sweden. The population has doubled since 1832. It was then (exclusive of the Ionian Islands) only 612,608, and it is now (also excluding the Ionian Islands) 1,448,601. The males outnumber the females in Greece by 82,385. The only reason we have seen assigned for this is that large numbers of the women go out of the country as domestic servants, and are not counted in the census, while sailors, who are also at work out of the country, are counted. But this seems an inadequate explanation, for in 1870 the number of sailors not present in the country was only 5180. The disproportion between men and women appears, too, to be increasing, for there were 50,468 more men than women in Greece in 1870, when the whole population was 220,000 less than it was in 1879. The average birth rate for the four years 1870-73 was 1 in 34; the average death rate for the same period was 1 in 45. The largest towns in Greece are—Athens, with a population in 1870 of 59,000; Patras, with 26,000; Corfu, with 24,000; Hermopolis or Syra, 21,000; Zante, with 20,500; Chalcis, 11,000; Sparta, with 10,700; and Argos, with 10,600.

Administration. The kingdom of Greece is an hereditary constitutional monarchy, descending by primogeniture from male to male, female succession being only allowed in the event of the absolute failure of legitimate heirs male. The title of the sovereign at first (according to the convention of London, May 1832) was king of Greece, but it was altered by the conference of London, August 1863, to king of the Hellenes. The king attains his majority at eighteen years of age. Both he and the heir-apparent are required to belong to the Greek orthodox church, but a special exception is made for the present king, who is a Lutheran. The king receives an annual income of £52,179, of which £40,179 comes from the civil list, and £12,000 from personal donations of £4,000 from each of the three protecting powers. He has a palace in Athens—built by Otho at a cost of £500,000—and a summer residence at Corfu. The legislative power is shared by the king with a single chamber called the boule,—a house of representatives which is elected for four years by the people; its numbers cannot fall below 150, and amounted in 1872 to 188. The election is by universal (manhood) suffrage, protected by the ballot. The boule elects its own president, and its members are paid £9 a month during the session. The executive is vested in the king, who, however, is personally irresponsible, and rules by ministers chosen by himself and responsible to the legislature, in whose deliberations they also take part. They are seven in number, and their several departments of administation are—foreign affairs, home affairs, justice, finance, education and worship, army, and navy. A minister's salary is £428 a year. The king appoints all public officials,—civil, naval, and military,—sanctions and proclaims laws, calls and prorogues parliament, grants pardon or amnesty, coins money, and confers decorations. There are 18,860 public offices in the patronage of the ministry, and, as in America, a large number of them change hands with every change of administration. The effect of this in a country where politics is an open profession, and where there is a plethora of well-educated men who can find nothing to do, has been to poison political life to an unusual degree with the vice of place-hunting,—to create several active political parties in the state, which, instead of being the representatives of any policy or cause, tend too much to degenerate into mere rings of post-mongers, and conduce, by their constant strife, to an excessive frequency of ministerial crises which greatly checks the national progress of the country.

For purposes of local government Greece is divided into 13 nomarchies, under officers called nomarchs, whose duties correspond with those of the French prefects; the nomarchies are subdivided into 59 eparchies under eparchs, corresponding to French sub-prefects; and the eparchies are further subdivided into 351 demarchies, under demarchs or mayors. The following is a list of the nomarchies, with their areas, populations, and capitals:—

	Sq. Miles	Pop. in 1870.	Capitals.
A. In Northern Greece—			
1. Attica and Bœotia	2481	185,364	Athens.
2. Eubœa..........	1574	95,136	Chalcis.
3. Phthiotis and Phocis	2053	128,440	Lamia.
4. Acarnania and Ætolia	3025	138,444	Mesolonghi.
B. In Morea—			
5. Achaia and Elis	1908	181,632	Patras.
6. Arcadia........	2028	148,[illegible]	Tripolitza.
7. Laconia	1678	121,116	Sparta.
8. Messenia	1226	155,760	Kalamata.
9. Argolis and Corinthia	1448	136,081	Nauplia.
C. In the Islands—			
10. Cyclades	926	132,020	Syra.
11. Corfu	427	106,109	Corfu.
12. Cephalonia	302	80,543	Argostoli.
13. Zante	277	41,522	Zante.

The demarchs are elected by the people for four years; the nomarchs and eparchs are elected by the Government without fixed terms. The nomarchs are assisted in the administration of the province by a council elected by universal secret suffrage for four years, which manages the police, roads, and other local business, and imposes the assessments. The local accounts must be sent once a year to Athens to be audited by a court of Government officials. The demarchies vary in size, but, in 1861, out of 280 that then existed, only 57 were under 2000 in population, and only 7 above 10,000.

Judicial system. Greece has an admirable legal system, which is the one good thing it has got from the Bavarians. It is based on the old Roman law, with modifications drawn from the Bavarian and French. Liberty of person and domicile is inviolate; no one can be apprehended, no house can be entered, and no letter can be opened without a judicial warrant. Criminal and political offences and delinquencies of the press are tried by jury. The commercial code is identical with that of France. The civil law is administered by a supreme court of cassation (the Areopagus); 4 courts of appeal; 17 courts of first instance, with jurisdiction up to 500 drachmas; 191 judges of the peace, with jurisdiction up to 30 drachmas, or, with an appeal, to 300 drachmas; and 4 commercial courts (at Syra, Nauplia, Patras, and Corfu), with jurisdiction up to 800 drachmas. To be a judge, it is necessary to have graduated as doctor of laws at Athens or some other European university; a judge cannot hold any other salaried appointment at the same time except that of professor in the university. Judges are appointed by the crown, and are as yet removable. Criminal courts are held in connexion with those of the peace, of first instance, and of appeal; in the last the judicial authority is vested in a jury of twelve, with three accessory judges selected from those of the inferior courts, who apply the law in accordance with the jury's verdict. The crown is prosecutor in all criminal cases, and punishments are by fines, imprisonment, and, in the case of capital offences, death by guillotine. The prisons are extremely defective in construction and administration, except that of Corfu; improvements are often projected but constantly put off from want of funds to carry them out. There is no Habeas Corpus Act, and an accused person may be detained indefinitely before being brought to trial. Judicial commissions and extraordinary courts of judicature cannot be established under any pretext.

The courts of law are open to the public, except when the interests of good morals or public order demand the contrary. Naval and military offences are tried by naval and military courts, and offences of ministers of the crown by special courts, in accordance with the constitution of 1864.

Crime is proportionately less common in Greece than elsewhere, for the people are more temperate, and, on the whole, more contented. The peculiar Greek crime is—or, as we may happily now say, was—brigandage, the form of robbery which is natural to a mountainous and thinly-peopled country without roads. According to the latest consular reports, the country is at present completely free from brigands. But it will never be secure against their reappearance until it obtains good roads, which will operate against the brigands both by tending to increase the rural population and by affording better facilities for the capture of criminals.

Army. The strength of the Greek army on a peace footing was, at the census in 1870, 12,400, including upwards of 2000 gendarmes; but since the Servian war with the Turks in 1876 the Government has resolved to raise it to 24,376, exclusive of 2508 mounted gendarmes. This, with the national guard and the reserves and volunteers, would make their total strength on a war footing over 150,000. The national guard is composed of all citizens capable of serving and under the age of 50; it is designed for purposes of defence only. The reserves consist of those who have served out their time in the regular army. The army is recruited by lot from all capable of serving, with the alternative, which is largely used, of providing a substitute; and the period of service is three years in the line, three years in the first reserve, and six in the second.

Navy. The navy consists of two small ironclads and a few wooden gunboats and vessels for coast-guard purposes, which are manned by 2500 men, raised, as a rule, by conscription from the inhabitants of the coast, though volunteering is encouraged. The Greek flag is a white cross on blue ground—the Bavarian colours and the Greek cross.

Religion. The religion of the people and of the state is that of the Orthodox Greek Church. In fact, the Greek rite is not only the national religion, but perhaps the deepest and most creative factor in the nationality of Greece itself. Men of Greek blood who do not belong to the Greek Church do not identify themselves with the Greek people. The Moslems of Crete were the sternest oppressors the Greeks knew, and the Latins of Syros sided at the revolution with the Turks, yet both were of the purest Greek descent. And what makes the Greek and Skipetar and Wallach of the modern kingdom all equally Greek in their sympathies to-day is their common profession of the Greek rite. But all other religions are tolerated in Greece. There is a Moslem mosque at Chalcis; there is a Jewish synagogue at Corfu; and, whatever a man's religion may be, it entails on him in Greece no civil disabilities of any kind. A Catholic or a Mohammedan may rise to the highest offices of state, both Turks and Jews are at present members of municipal councils; and Jews and Catholics are buried in the same cemetery with the Orthodox at Athens. The Church of Greece, which became virtually independent at the time of the revolution, was organized upon the model of the Russian Church. Its supreme power is vested in a synod consisting of five members, who are appointed annually by the king, and the majority of whom must be prelates. The metropolitan archbishop of Athens is ex officio president; two royal commissioners attend and deliberate without voting, and the synod's resolutions require to be sanctioned by them in the king's name. In all purely spiritual matters the synod has entire independence, but on questions that are of a mixed nature, as marriage, divorce, excommunication of laymen, the appointment of feasts and fasts, and the religious censorship of the press and of religious pictures,—it can only act in concert with the Government. Excluding the Ionian Islands, which have five archbishops, there are eleven archbishops and thirteen bishops in Greece, who are chosen by the king out of a list of three candidates presented by the synod, and can only be deposed by common consent of king and synod, and in conformity with canon law. The clergy numbered 5102 in 1861. The immense majority of the population belongs to the Greek Church. In 1870 the number of other Christians in Greece was 12,585, most of whom were Roman Catholics; of Jews, 2582; and of all other religions, 917. There are two Roman Catholic archbishops and four bishops. The revenue from the property of the Greek Church in 1877 was £10,571. The prelates receive a salary from the state,—the bishops £145, and the archbishops £180. The inferior clergy receive none, but are entirely dependent on the fees they earn for various spiritual services and superstitious observances,—praying for the sick, exorcising the evil eye, consecrating a new house or fishing boat, or purifying one bought from a Turk. There are 1600 monks and 1500 nuns in Greece.

Education. Popular education is widely diffused in Greece. It was the first care of the newly-liberated people, and has been jealously fostered ever since, till they have now an exceedingly complete national system of education, which is perhaps the most striking product of the new kingdom. The latest statistics we have on the subject are those of the year 1872, given in Watson's report of that year (*Reports of H.M. Secretaries of Embassy and Legation*, No. i. 1872). From these figures we learn that there were then 1141 primary or demotic schools, 136 grammar or Hellenic schools, 7 gymnasia, and finally, the crown of the whole, the university of Athens; besides 6 nautical schools, a polytechnic school, 4 theological seminaries of the Greek Church, and various private institutions maintained by Catholic or Protestant societies. At the primary schools, the usual elementary branches only are taught,—reading, writing, arithmetic, the catechism, grammar, history, geography, natural history, agriculture, and drawing. In the Hellenic schools instruction is given besides in the least difficult of the ancient Greek authors; and in the gymnasia, a more thorough acquaintance is made with ancient Greek, and with Latin and French, mathematics, logic, astronomy, physics, and natural history. The teachers of the primary schools are educated at a training institution in Athens; those of the Hellenic schools must be licentiates of a university; and those of the gymnasia must have the degree of Ph.D. The primary schools are maintained at the expense of the communes, with a subsidy, in certain particular cases, from the state. The total amount spent by the communes for this object comes to about one-sixth part of their income, or over £40,000 in all, and the whole Government grant for primary education in 1872 was £4171. At these schools a small fee is charged, ranging from 1d. to 5d. a month, from all who are able to pay it. The grammar schools, the gymnasia, and the university are maintained entirely by the state, the expense in 1877 exceeding £55,000 for the two classes of secondary schools, and £18,000 for the university. At these schools and the university education is entirely free, and is further encouraged by the endowment of various exhibitions for meritorious pupils, won by competition. The university was erected at a cost of £40,000, raised by private subscription from Greeks all over the world, and is furnished with excellent laboratories and museums, a library of 150,000 volumes, medical hospitals, an astronomical observatory, and a botanical garden. It has 4 faculties—arts, medicine, law, and theology—52 professors, 12 fellows, and, after a curriculum of 4 years, confers the degrees of licentiate and doctor, which are indispensable for those who contemplate becoming lawyers, medical men, or teachers in the higher schools. It was opened in 1837 with 52 students; in 1854 it had 643; it now has 1400. In 1872 it had 1244,—of whom 26 were students of theology, 622 of law, 423 of medicine, 120 of arts, and 53 of pharmacy. The small number of theological students is partly accounted for by the existence of four other theological seminaries in Greece, supported by private funds,—one at Athens and three in the provinces,—and partly by the scandalous neglect of clerical education that obtains in Greece. In 1867 there were only 115 students at these four theological seminaries. A large proportion of the students at the university have always been foreign Greeks, for professional men are trained there not only for Greece itself but for the whole region of the Levant. Out of the 1244 students who attended in 1872, 240 were Greeks from foreign parts,—124 of these being students of medicine, 66 of law, and 6 of theology. No one is admitted as a student who has not completed his education at a gymnasium. The salary of a professor hardly amounts to £200 a-year. There is no school inspection beyond that of the demarch.

Education is by law compulsory for children from seven to twelve years of age, but this law is not enforced, for it does not require to be; and the results of education in Greece are the more remarkable as being the fruits of what is practically purely voluntary attendance. Every eighteenth person in Greece is at school; in Russia only every seventy-seventh is so. In 1872 the total number of pupils was 81,197,—of whom 65,111 were males and only 16,086 females. Boys and girls are taught at separate schools; of the primary schools, 942 are for boys, with 1069 male teachers and 52,943 pupils, and only 199 for girls, with 221 female teachers and 11,035 pupils. The Hellenic schools and gymnasia are for boys only, and in 1872 had 6655 and 1912 pupils respectively. There are, however, various private schools for girls, with an aggregate attendance of 5000. These figures show that there is a serious defect in female education, for which neither the Government of Greece nor the people have due solicitude. It ought to be mentioned, however, that there is one phase of female education in which Greece is in advance of many other European countries, for the medical school of Athens is open to female students, who numbered 42 in 1879.

Industries. We have no exact statistics as to the numbers engaged in each branch of industry severally, but Bikelas gives in the *Journal* of the Statistical Society of London for 1868 an estimate for the year 1861, according to which nearly half the population (49·37 per cent.) were agriculturists and shepherds, and more than a third of the remainder (or 18·66 per cent. of the whole population) in the liberal professions. 13·87 per cent. were engaged in industrial pursuits, 8·43 per cent. in trade, 5·40 per cent. were domestic servants, and only 4·27 per cent. were persons of independent means. Government officials and their families comprise a twelfth part of the population. There is great want of employers with considerable capital, and the amount of labour done and wages earned by the workmen is much diminished by the extraordinary number of ecclesiastical holidays they are required to observe. There are 195 fast days in Greece, and the number of working days in the year never exceeds 265. There are no paupers in Greece, no poor-law or poor-rate, and no religious associations for charitable purposes. Beggars are very rare, and absolute destitution may be said not to exist.

Agriculture. Agriculture is still in its infancy. A larger proportion of its area is uncultivated than obtains in any country in Europe except Russia; but that is explained by the unusually large part of it which is occupied by mountains. We have no exact statistics since 1860, but then only one-seventh was under cultivation. Its entire area (exclusive of the Ionian Islands, not then part of it), was 45,699,248 stremmas,—a stremma being a little over a quarter of an acre. Of these only 17,824,000 were capable of cultivation, and only 6,076,000 actually under it, and half of this amount is always fallow from their system of working it. By universal testimony the country might grow food for three times its present population, yet it has to import cereals every year to an amount exceeding a third of its own produce, and over £1,000,000 in value. But agriculture contends with many difficulties in Greece, most of them, like the vicious land tax, the want of roads, and the imperfect agricultural methods, being happily remediable.

The soil is, as a rule, light and thin. In many places there is great lack of rain and running water, but the people are expert in irrigation. The chief products are corn, wine, fruit, and oil. Six different kinds of wheat are grown, producing, in a favourable season, as much as 10 or 13 returns, and after a dry spring from 3 to 5. Good crops are got of rye, barley, and maize; oats do not grow so well, and potatoes not at all. Pulse thrives everywhere, and rice is produced in the plains of Marathon and Argos, and in marshy land elsewhere. Cotton and tobacco have been introduced in our own day, and give good returns.

Greece is still in want of one of the first requisites to agricultural prosperity,—a resident proprietary. The modern kingdom began with almost no proprietors. Under the Turks two-thirds of the land belonged to the sultan, and became at the revolution simply national property, which the Government has been selling ever since to private owners on more or less reasonable terms. The peasants are showing a passion for land, and save up to buy their crofts, and in this way a large class of small freeholders is being created, with what effect upon agriculture we have no means as yet of determining. There were 16,122 proprietors in 1861. The relation between landlord and tenant is the metayer system of taking as rent or usufruct a share of the net produce, usually a third, but in the case of Government land 15 per cent. Great part of the agricultural labourers are not Greek subjects, but are Mahometan Albanians from Thessaly and Epirus, who come into Greece annually in harvest-time, in bands of 30 or 40 under a captain, who work at lower rates than Greeks and work longer, for they have no feasts to observe, and who contrive by frugal living to carry back three-fourths of their earnings to their families at home.

The methods of cultivation in use are still primitive. Modern implements are not employed to any great extent, though their manufacture is carried on at Syra and the Piræus, and though even the steam plough has been actually introduced in Elis. The Greek plough is still that of Homer, which the husbandman carries about his croft on his shoulder, and which hardly does more than scrape the surface of the ground. It is wrought by oxen, Greek horses—the old Thessalian breed—being small and unfit for farm work. There is no system of rotation of crops. Fields are cropped till they are exhausted, and then left fallow for a year or two. The farmers have no idea of manure or drainage. There are few enclosures, and even the laying out of the fields is slovenly,—a patch of this crop here, and a patch of that there. The houses of the peasantry are sheds of wood or huts of mud, without either chimney or window, but always with a picture of the Virgin inside.

With all the defects in the Greek system of cultivation, agricultural returns show gradual though slow progress. In 1846 the yield for the year of wheat, barley, and maize was estimated at 6,000,000 kilots, a kilot being nearly 7·3 gallons; in 1876, 12,000,000. In 1860 there were 2,287,645 stremmas—*i.e.*, 565,048 acres—under cereal crops, which yielded 9,512,993 kilots of grain—*i.e.*, 1,165,807 quarters, or 2 quarters an acre.

Vineyards are numerous, but the wine is poor, with little body, and is ruined for European use by the resin put in to preserve it. All provinces produce wine, but the best is that of Santorin, which is shipped largely to Russia. There is still a Malvoisie wine, though it is no longer that which was once so celebrated under the name of Malmsey; and the Kephissia wine of Attica and the red wine of Zante are in good repute. There has been a large increase in the number of vineyards and a marked improvement in the manufacture of wine since the kingdom began, and Greek wines have been of some commercial importance since 1858. In 18[illegible] there were only 25,[illegible] stremmas under vines; there are now 7[illegible].

A grape peculiar to Greece is that of Corinth, which, from the [illegible], is called the currant. It constitutes the largest export of Greece, and goes almost exclusively to England to make the national plum-pudding. Its cultivation has been largely extended of late. In 18[illegible] only 1[illegible] lb were raised, and in 18[illegible], after the destruction of the vines by Ibrahim Pasha, only [illegible] lb, but in 1851 there were 57,[illegible] lb, and in 1876 [illegible] valued at £1,[illegible]. There are now 40,000 [illegible], and this probably cannot be much increased, for the Corinthian vine is fastidious, and grows only on the northern and western shores of the Morea, on some of the Ionian Islands, and at Missolonghi, and nowhere else in Greece or in the world. The vines bear in their sixth year, but do not attain full perfection till their twelfth. The grapes are gathered in August, dried in the sun, and packed.

The olive and the mulberry are very important products of cultivation. The oil of Attica has still its ancient reputation. It is calculated that in Greece in 1876 there were 12,[illegible] olive trees, which yielded 26,[illegible] okes of oil. In 1834 there were only 2,[illegible] trees, yielding 1,[illegible] okes. The mulberry grows best in the south of the Morea, and there the house of almost every peasant is given up in part to rearing the silk-worm, the eggs being nestled in the bosoms of the women. There were in 1833 only 300,000 mulberry trees in Greece; in 1876 there were 2,000,000.

A natural production of Greece of great importance is valonia, the husk of the acorn of the *Quercus Ægilops*, an oak of which considerable forests exist in Arcadia, Attica, the island Zea, and other places. Valonia is valuable on account of the amount of tannin it contains, and is much exported to England and Italy for use in dyeing and tanning. Another species of oak, the *Quercus coccifera*, which grows largely on Mount Taygetus, breeds the insect called [illegible], which, when dried, looks like a berry, and is used in dyeing the red fez of the country. Turpentine is obtained in large quantities from the pines of Cithæron and elsewhere.

Cotton and tobacco are the only products whose cultivation is free from taxation, the exemption being made with a view to the encouragement of their cultivation. Cotton is now grown to a considerable extent, its culture having received a great impetus during the American civil war. It is produced particularly on the marshy lands of Livadia and Phthiotis in northern Greece. In 18[illegible] the produce was [illegible] quintals; in 1864, 193,615 quintals. The annual yield of tobacco is 4,[illegible] okes. Opium, madder, and flax are grown in the northern parts of Greece.

[illegible] The figs of Attica have not degenerated, and they are produced to a considerable extent in other parts also, especially Messenia. In 18[illegible] there were but [illegible] fig trees, in 1861, [illegible]. Apricots, oranges, lemons, pomegranates, and citrons grow well in the islands, and the fruit trade might be largely developed.

Though there is much excellent timber in the Greek forests, it is [illegible] so that it is cheaper to import wood from abroad. In 18[illegible] there were 7,[illegible] stremmas of land under forest, and it is estimated that now only [illegible] are so.

[illegible]

The land tax is still the Turkish system of exacting a percentage—generally a tenth—of the gross produce of the land; and though, in the case of the vineyards, a money commutation, based on the planter's declaration, is coming into use, the tax is, as a rule, paid in kind. This system is rendered more objectionable by the tax being farmed out to private contractors. The cultivator cannot reap his crop, though it be ripe, till the day appointed by the tax collector, and he must cut it then, though it be green. When cut, he must carry the whole crop on pack animals (there being no roads for waggons), sometimes for miles, to the particular public threshing-floor which the collector fixes upon, and he must wait with it there till the collector can find time to see it threshed and take his tithe, which is often weeks, sometimes, it is said, even as long as three months. Proposals for the abolition of this method of taxation have often been introduced into the chamber of deputies, but the matter has always been deferred till they should have a register of lands, which, however, they seem to take no steps to make. Land tax.

When Capodistria assumed the government of Greece fifty years ago, he said there were two things he meant to give the nation,—roads and education. The system of education has been very satisfactorily built up since that time, but its roads are still to make. We have no recent statistics on the subject, but [illegible] says that in 1867 [illegible] roads had been made since the kingdom was established, with a total length of [illegible] kilometres; and [illegible], writing in 18[illegible], complains that, from want of roads at that time, it cost more to carry grain from Marathon to Athens [illegible] than to bring it from the Black Sea, while [illegible] tracts of country, not far from seaport towns, were left entirely uncultivated because of the expense of the transit of their produce. Every man in Greece is by law obliged to give at least three days' labour in the year, or its equivalent in money, for road-making; and a law was passed in 1876 to apply one-fifth of the proceeds from the sale of state lands to making roads. Roads.

Manufacturing industries are steadily advancing. According to a report issued in 1876 by [illegible], director of the statistical bureau at Athens, there are in Greece 95 steam-mills and factories, with a total of 1967 horse power; the most important of these have been established since 1860. They include 35 flour-mills, 12 for cotton-weaving, 2 for cotton-spinning, 4 for grinding, 6 for silk-weaving, 10 oil mills, 3 for constructing machinery, 4 for making wines and spirits, 3 tanneries, 2 metal foundries, 1 powder-mill, and 7 others of various kinds. Shipbuilding is carried on at the seaports. The Greeks excel in tailoring, confectionery, and embroidery. As an index to the industrial progress of the nation it may be noted that in the International Exhibition of 1851 there were only 25 Greek exhibitors; in 1862, 295; and in 1878, [illegible]. Greece has established a series of industrial exhibitions of its own,—the new Olympic games, as they are termed, which a wealthy Greek left £[illegible] a year to found,—which combine literary, scientific, and athletic competitions with those of industry, and which occur, like the old Olympic games, every four years. The cotton industry is making decided progress. The annual export of raw cotton is diminishing, and its importation is increasing; and, to encourage the trade, there is no duty on [illegible], unless exported, while the import duty on raw cotton was reduced in 1875. Leather is made chiefly at Syra.

The marble quarries of Pentelicus, Carystus, and Paros are unimportant works. The [illegible] are not much used as their [illegible] is small. The [illegible] are those of the Laurium Company, which, by help of [illegible] appliances, [illegible] the ancient workers of the mines threw away, and which has been [illegible] heaps of [illegible] in trucks, by a [illegible] of rail belonging to the company, to the town of Ergasteria, [illegible]. The yield of the mines in 18[illegible] was [illegible].

[illegible]

special,—general including all exports and imports whatever, and special taking in only imports meant for home consumption and exports of home produce of the country. The special commerce amounts usually to 80 per cent. of the general. The general commerce of Greece in 1875 amounted to £8,574,168, of which £5,157,629 were imports and £3,417,539 exports. An idea of the remarkable progress of its commerce may be obtained by comparing these figures with the following:—In 1840 the total Greek commerce amounted to £671,[illegible]; in 1851 to £1,[illegible]; in 1860 it was £4,167,[illegible]; and in 1870 £[illegible]. England occupies the first place among countries trading with Greece, its transactions being more than double those of any other country, and amounting in 1873 to 41 per cent., and in 1875 to 38 per cent., of the whole commerce of Greece. Taking the average of the six years ending 1874, Wyndham calculates that 66·7 per cent. of the exports of Greece go to England and that 28·6 per cent. of its imports come from England. France and Austria, its nearest neighbours, stand next. 26 per cent. of its imports are cereals and flour,—the cereals from Russia, Turkey, and Roumania, the flour from France; and 20 per cent. are tissues, mainly from England. Though timber is so abundant, it stands third as one of the largest imports, amounting to £287,779 in 1875. The other chief imports are cattle, salt meat, rice, sugar, leather, iron, and paper. The principal item of export, amounting to half the whole, is currants, this in 1875 was £1,[illegible],467, of which £1,083,482 went to England; then come oil, hides, lead, figs, valonia, wines and spirits, tobacco, cotton yarn, &c.

The Greek coasting trade is not open to foreigners. The steamers of the Hellenic Company possess a monopoly of the coastage of these waters, the object being to encourage the development of native steam navigation.

Railway. There is only one railway in Greece, if we except the private one already mentioned belonging to the Laurium Company. It is from Piræus to Athens, is 7½ miles long, belongs to Government, and carries passengers only. Another railway is projected from the Piræus to Lamia (Zeitoun) in the north (140 miles), with the view of connecting Greece with the general railway system of Europe. There were 1235 miles of telegraph in Greece in 1875, the property of Government, and worked at a considerable loss. The postal

Postal system. system is a Government undertaking, and has been a source of profit only since 1861, when postage stamps were introduced. In 1875 there were 131 post-offices in Greece. There are two banks,—the

Banks. National, with its head office at Athens, and the Ionian, with its head office at Corfu. The National had in 1868 a paid-up capital of £540,000, with a reserve fund of £215,000.

Money. The currency of Greece is that of the Latin monetary league, which it joined in 1868, and which allows it to strike 26,000,000 silver francs and as much gold as it thinks proper. Under Otho, Greece had a coinage of its own, on the basis of a double standard and the decimal system, the unit being the drachma (equal to 8½d.), which was divided into 100 equal parts called leptas. Coins of various values were struck, but only £4000 in gold pieces, and only £26,000 in silver, an amount quite inadequate for the trade of the country, and quickly disappearing altogether, so that there is probably not a single coin of them now left in Greece. It became necessary therefore to declare the gold and silver coins of other countries a legal tender in Greece; and these, with the notes of the National and Ionian Banks, became, and still remain, the practical currency of the country, so that the simplest payment may require a puzzling arithmetical calculation, for people have to pay in sovereigns and thalers prices stated in drachmas and leptas. Though the unit of the Latin currency is the franc, the official accounts of Greece are still reckoned in old drachmas, in distinction from which the franc is termed the new drachma. There are 28 old and 25 new drachmas in the pound sterling.

Weights and measures. The system of weights and measures is the Turkish. Their measures of length are—the pique, which is equal to 27 inches; the royal pic, equal to 1 metre, or 3·2808 feet; the stadion, equal to 0·62 English miles. Their measures of superficial extent are—the stremma, equal to one-fourth of an English acre, and the hectare equal to 10 stremmata. Their standard of weight is the cantar or quintal, equal to 125 lb avoirdupois. It is divided into 44 okes, an oke being equal to 2·84 lb, and subdivided into 400 old and 1280 royal drams. A kilo, used for weighing corn, is half a cantar, or 22 okes. 816 kilos are equal to 100 quarters.

Finances. The financial condition of Greece is unsatisfactory. Its annual expenditure usually exceeds its income, and it is deeply in debt. The new kingdom was born in debt, and contracted to pay the expenses of the revolution that gave it being, and to that original burden it has from time to time added fresh liabilities, till it has now no longer any credit in the money markets of Europe, and is deeper in debt in proportion to its revenue than any European country except Spain. The total debt of Greece was £15,360,133, according to Mr Merlin's report in 1875, and, what with the accumulation of interest and the contraction of a fresh debt for army expenses during the Servian insurrection of 1876, it must now be over £16,000,000. This debt consists of two kinds, foreign and internal. The foreign debt is of two parts. There are first the original two loans, amounting between them to £2,800,000, which were negotiated by the revolutionists in 1824 and 1825 with two English houses at 59 and 55 per cent., and whose coupons are now held mainly by Dutch speculators. On this Greece has never paid a farthing of interest. The Greek treasury, although it accepts the obligation, puts it off from year to year under the heading "Deferred Debt." With accumulating interest at 5 per cent., it had increased to £8,084,500 in 1874. The second part of the foreign debt is a loan of £2,400,000 guaranteed by the three protecting powers on the accession of Otho in 1832, and negotiated with Rothschild at 94. On this Greece paid interest for a few years, but its payment has so fallen into arrear that in 1874 this debt had grown to £3,870,000. There is also a small debt due to the Bavarian Government, amounting now to £250,000, and there are some still smaller debts to other foreign creditors. The internal debt of the country consists partly of indemnity due to sufferers in the War of Independence, partly of loans contracted with capitalists within the kingdom after its credit abroad was gone; it now amounts in all to £5,270,339.

The revenue for 1877, according to the estimate in the budget, was £1,401,687, and the expenditure £1,466,708. The actual receipts usually fall short of the budget estimate, for Greece permits her subjects to fall much into arrear with the payment of their taxes; and in 1867 it was calculated there was an aggregate of arrears of taxes amounting to £2,226,000. This revenue is received partly from direct taxes on land and property; partly from indirect taxes; partly from the public services, the post office, telegraphs, and printing; partly from the rent of the public domains, mines, quarries, hot springs, salt, fisheries, fruits, olive gardens, vineyards, and currant plantations; and partly from the sale of national lands and the ecclesiastical revenues. The largest sources of revenue are the land tax, which brought in 8,500,000 drachmas in 1877; the customs, 13,400,000; and the stamps, 4,200,000. The cost of collecting the land tax is very extravagant. It takes £25 to collect £100, or ten times more than it does in France. The Greeks are not sorely taxed. Rangabe estimates that they pay 23·43 drachmas (about 17s.) each in the year as taxes.

Of the expenditure of Greece, nearly one-fourth part goes to pay interest on its debt, another fourth to maintain its army and navy, and a large sum (£136,386) to pay pensions to persons who suffered in the revolution, or who possessed interests in the Ionian Islands at the time of their cession. The education and worship of the country cost £75,427, and the foreign office and diplomatic service only £40,257. The administration of justice takes £107,716, and the department of the interior, including the post-office and many other outlays, £171,526. The salaries of members of the chambers of deputies come to £16,071.

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PART II.—GREEK HISTORY.

SECTION I.—GREEK HISTORY TO THE DEATH OF ALEXANDER THE GREAT.

The early history of Greece is the first chapter in the political and intellectual life of Europe. In contrast with nations still in the tribal stage the Greeks have already the life of cities; in contrast with the despotic monarchies of the East they recognize the principle that no personal rule should be unlimited. From the first they appear as a people obedient to reason and to a native instinct of measure. In the political sphere this leads them to aim at a due balance of powers and tendencies in the state, at the definition of duties and the protection of rights. In the intellectual sphere it leads them to explore causes, to interpret thought in clear forms, to find graceful expression for the social feelings and sympathies. The historical interest of Greece does not begin therefore only at the point where details and dates become approximately certain, but with the first glimpses of that ordered life out of which the civilization of Europe arose. At a later stage the Greek commonwealths offer the most instructive study which the ancient world affords in the working of oligarchic and democratic institutions. Then, as the Roman power rises, culminates, and declines, Greek history assumes a new character and a new interest. From Alexander the Great dates the beginning of a modern Greek nation, one, not in blood, but in speech and manners. Two main threads link together the earlier and later history of civilized man. One passes through Rome, and is Latin; the other passes through the new Rome in the east, and is Greek.

In a sketch like the present it would be impossible to attempt a detailed narrative of facts, which, besides, fall to be considered under particular headings. The aim here will be rather to trace in outline the general course of the development, and to indicate, so far as a rapid survey permits, the leading causes and tendencies which were at work in its successive stages.

Six periods may be distinguished. I. The prehistoric period, down to the close of the great migrations. II. The early history of the leading states down to about 500 B.C. III. The Ionic revolt and the Persian wars, 502–479. IV. The period of Athenian supremacy, 478–431. V. The Peloponnesian War, 431–404, followed by the period of Spartan and then of Theban ascendency, 404–362. VI. The reigns of Philip and Alexander, 359–323 B.C.

I. *The Prehistoric Period, down to the close of the great Migrations.*

"Ancient Hellas," says Aristotle, "is the country about Dodona and the Achelous, ... for the Selloi lived there, and the people then called the Graikoi, but now the Hellenes" (*Meteor.*, i. 14). The name *Graikoi* probably meant the "old" or "honourable" folk (Curtius, *Etym.*, 130). The Italians may have enlarged the application of this name, which they found on the eastern side of the Ionian Gulf. The moderns have followed the Romans in giving it to the whole people who, from very early times, have always called themselves *Hellenes*.

Primitive Indo-European civilization.

The evidence of language tells something as to the point of civilization which had been reached by the ancestors of the Indo-European nations before the Hellenes parted from the common stock in Central Asia. They had words for "father," "mother," "brother," "sister," "son," "daughter," and also for certain affinities by marriage, as "father-in-law," "brother-in-law," "daughter-in-law." They lived in houses; they wore clothes made of wool or skins; as arms they had the sword and the bow; they had flocks and herds, goats and dogs; they drove, if they did not ride, horses. They were a pastoral rather than an agricultural people. They knew how to work gold, silver, and copper; they could count up to a hundred; they reckoned time by the lunar month; they spoke of the sky as the *Heaven-father*. The first great migration from the common home was that which carried the ancestors of the Teutonic, Slavonic, and Lithuanian tribes into north-western Europe. The next was that which carried the ancestors of Greeks, Italians, and Celts into southern and south-western Europe.

Language indicates that there must have been a period during which the forefathers of Greeks and Italians, after the Celts had parted from them, lived together as one people. Again, the Greek language, and in particular its character and development, tells that the Hellenes, after the Italians had left them, must have long remained an undivided people. But to us this primitive Hellenic unity is prehistoric. We first know the Hellenes as a race divided into two great branches, each with well-marked characteristics of its own,—*Dorians* and *Ionians*; while those who have been less affected by the special causes which produced these divergences from an earlier common type are regarded as forming a third branch, and are called collectively *Æolians*. Further, we hear of a people distinguished indeed from the Hellenes, yet apparently felt (as by Thucydides) to be not wholly alien from them,—a people represented as having been before them in Greece proper, on the coasts, and in the islands of the Ægean,—the *Pelasgians*. In some Homeric passages, and those among the oldest, the name *Pelasgoi* denotes a tribe of Achæan or Æolian Greeks living in Thessaly (*Iliad*, ii. 681; xvi. 233). In other poetical texts of later date, and repeatedly in Herodotus, *Pelasgoi* is a general designation for people of whom the Greeks knew little definitely, except that they had preceded the Hellenic dwellers in the land. In this second and vague use, "Pelasgian" is virtually equivalent to "prehistoric."

Hellenes.

Pelasgians.

Earliest Hellenic migrations.

The highlands of Phrygia have the best claim to be regarded as the point of departure for the distinctively Hellenic migrations. In these fertile regions of north-western Asia Minor, the Hellenes, after the Italians had left them, may have lived, first as a part of the Phrygian nation, and afterwards as a separate people. From these seats a great wave of migration seems to have carried over the Hellespont into Europe a population which diffused itself through Greece and the Peloponnesus, as well as over the coasts and islands of the archipelago. In after ages, when the kinship, though perhaps dimly suspected, was no longer recognized, the Hellenes called these earlier occupants of the land *Pelasgians*. It has been conjectured that in *Pelasgos* we have combined the roots of πέραν and εἶμι (ἰτ). The name would then mean "the further-goer," "the emigrant." It would thus be appropriate as the name given by the Hellenes, who had remained behind in Phrygia, to the kinsmen who had passed over into Europe before them.

First epoch.

Second epoch.

The second epoch of migration from the Phrygian highlands appears to have been one by which single Hellenic tribes, with special gifts and qualities, were carried forth to become the quickeners of historic life among inert masses of population, among those "Pelasgians" who had long been content to follow the calm routine of husbandmen or herdsmen. The ancestors of the Ionians went down to the coasts of Asia Minor, and became the founders of a race whose distinctive powers found scope in maritime enterprise and in commerce. The ancestors of the Dorians passed into the highlands of Northern Greece, and there developed the type of hardy mountaineer which united the robust vigour of hunter and warrior with a firm loyalty to ancestral traditions in religion and in civil government.

Phœnicians.

Of these two branches,—the Ionian and the Dorian,—the Ionian was that which most actively influenced the early development of Greece. But the Ionians themselves derived the first impulses of their progress from a foreign source. Those Canaanites or "lowlanders" of Syria, whom we call by the Greek name of Phœnicians, inhabited the long narrow strip of territory between Lebanon and the sea. Phœnicia, called "Kefa" by the Egyptians, had at a remote period contributed Semitic settlers to the Delta or "Isle of Caphtor;" and it would appear from the evidence of the Egyptian monuments that the Kefa, or Phœnicians, were a great commercial people as early as the 16th century B.C. Cyprus, visible from the heights of Lebanon, was the first stage of the Phœnician advance into the Western waters; and to the last there was in Cyprus a Semitic element side by side with the Indo-European. From Cyprus the Phœnician navigators proceeded to the southern coasts of Asia Minor, where Phœnician colonists gradually blended with the natives, until the entire seaboard had become in a great measure subject to Phœnician influences. Thus the Solymi, settled in Lycia, were akin to the Canaanites; and the Carians, originally kinsmen of the Greeks, were strongly affected by Phœnician contact. It was at Miletus especially that the Ionian Greeks came into commercial intercourse with the Phœnicians. Unlike the dwellers on the southern seaboard of Asia Minor, they showed no tendency to merge their nationality in that of the Syrian strangers. But they learned from them much that concerned the art of navigation, as, for instance, the use of the round-built merchant vessels called γαῦλοι, and probably also a system of weights and measures, as well as the rudiments of some useful arts. The Phœnicians had been first drawn to the coasts of Greece in quest of the purple-fish which was found in abundance off the coasts of the Peloponnesus and of Bœotia; other attractions were furnished by the plentiful timber for shipbuilding which the Greek forests supplied, and by veins of silver, iron, and copper ore.

Two periods of Phœnician influence. Two periods of Phœnician influence on early Greece may be distinguished: first, a period during which they were brought into intercourse with the Greeks merely by traffic in occasional voyages; secondly, a period of Phœnician trading settlements in the islands or on the coasts of the Greek seas, when their influence became more penetrating and thorough. It was probably early in this second period,—perhaps about the end of the 9th century B.C.,—that the Phœnician alphabet became diffused through Greece. This alphabet was itself derived from the alphabet of the Egyptian hieroglyphics, which was brought into Phœnicia by the Phœnician settlers in the Delta. It was imported into Greece, probably, by the Aramæo-Phœnicians of the Gulf of Antioch,—not by the Phœnicians of Tyre and Sidon,—and seems to have superseded, in Asia Minor and the islands, a syllabary of some seventy characters, which continued to be used in Cyprus down to a late time. The direct Phœnician influence on Greece lasted to about 600 B.C. Commerce and navigation were the provinces in which the Phœnician influence, strictly so called, was most felt by the Greeks. In art and science, in everything that concerned the higher culture, the Phœnicians seem to have been little more than carriers from East to West of Egyptian, Assyrian, or Babylonian ideas.

Influence of Asia upon European Hellas. The legends of European Greece speak clearly of foreign elements in civilization and in religious worship which came in from the East. But they do not constrain us to suppose that those who brought in these new elements were always, or as a rule, strangers to the people among whom they brought them. On the contrary the myths constantly say, or imply, that the new comers were akin to the people among whom they came; as the sons of Ægyptus are first cousins to the daughters of Danaus; as Cadmus and Pelops, though nominally of foreign origin, are thoroughly national heroes and founders. Hence it appears reasonable to conclude that the East by which European Hellas was most directly and vitally influenced was not the Semitic but the Hellenic East; that the Ionian Greeks of Asia Minor, after having themselves been in intercourse with Phœnicia and Egypt, were the chief agents in diffusing the new ideas among their kinsmen on the western side of the Ægean. Asiatic Greeks, who had settled among Egyptians in the Delta, or who had lived amid Phœnician colonies in Asia Minor, would easily be confounded, in popular rumour, with Egyptians or Phœnicians. The Asiatic Greeks, as pioneers of civilization in European Greece, appear sometimes under the name of Carians,—when they are little more than teachers of certain improvements in the art of war, and have a distinctly foreign character,—sometimes as Leleges, who are associated especially with Lycia, Miletus, and the Troad, and who, as compared with the "Carians," are the representatives of a more advanced civilization. In the east the seafaring Ionians gave their name to the whole Greek people, as in the Hebrew Scriptures the Greeks are "the sons of Javan,"—the *Uinim* of the Egyptians, the *Iauna* of the Persians. It does not appear that the European Greeks of early days used "Ionian" in this way as a collective name for the Asiatic Greeks. But such names as *Iasion*, *Iason*, *Iasian Argos* point to a sense that the civilization which came from Asia Minor was connected with Ionia. At a later time the Greeks forgot the Ionians and Phœnicians who had brought an Eastern civilization to the western side of the Ægean. Vividly impressed by the great antiquity of this civilization itself, especially in Egypt, they preferred to suppose that they had derived it directly from the source.

Religion. The appearance of new elements in religious worship is one great mark of the period during which Greece in Europe was still being changed by influences, Greek or foreign, from the East. The worship which the fathers of the Hellenes had brought with them from the common home in Asia was the worship of the "Heaven-father," the unseen father who dwells in æther, whose temple is the sky, and whose altar is most fitly raised on the mountain top, as the ancient shrine of the Arcadian Zeus was the grove on the summit of Mount Lycæus. This is the "Pelasgian Zeus, dwelling afar," to whom the Homeric Achilles prays. But as the united Hellenic race parted into tribes, so to the first simple worship of the Heaven-father was added a variety of local cults. And as mariners from other lands began to visit the coasts, they brought in their own gods with them. Thus Melcarth, the city-god of Tyre, is recognized in Melicertes as worshipped at the isthmus of Corinth. In one Greek form of the worship of Heracles, Astarte—the goddess of the Phœnician sailors—becomes Aphrodite, who springs from the sea. The myth of Adonis, the worship of the Achæan Demeter, are other examples. There are, again, other divinities who came to European Greece, not directly from the non-Hellenic East, but as deities already at home among the Ionians. Such was Poseidon, and, above all, Apollo, whose coming is everywhere a promise of light and joy.

The early states. Little precise knowledge of the earliest kingdoms and states can be extracted from the legends as they have come down to us, but some general inferences are warranted. Crete. The tradition that Minos cleared the archipelago of pirates and established a wide maritime dominion, that he was the first to sacrifice to the Charites, and that Dædalus wrought for him, may be taken at least as indicating that Crete played a prominent part in the early history of Greek culture, and that there was a time when Cretan kings were strong enough to protect commerce in the Ægean waters. Phrygia. Again, though Gordius and Midas have passed into the region of fable, there are reasonable grounds for the belief that the ancient kings of Phrygia once exercised dominion over Asia Minor. Lydia. The Lydians, in whose origin Semitic and Aryan elements appear to have been mingled, have a twofold interest in this dawn of Hellenic history. First, they represent the earliest kingdom in Asia Minor of which anything is certainly known. Secondly, they are on land what the Phœnicians are on the sea,—carriers or mediators between the Greeks and the East. Troy. In the north-west corner of Asia Minor, a branch of the Dardani—whose ancestor is described as worshipping the Pelasgian Zeus—founded the kingdom of the Troas, the land of Troy. It has been remarked that the double names of the Trojan heroes,—Alexander, Paris,—Hector, Darius,—point to the twofold relationship of the Trojans, on the one side to Hellas, on the other to Asia. In

The Minyæ.

European Greece we find the race known as the Minyæ, whose early glories are linked with the story of "Jason and the Argonauts" moving southward from the shores of the Gulf of Pagasæ into the valley of Lake Copais, and founding the Bœotian Orchomenus. The early greatness of Thebes is associated with the name of Cadmus, the king-priest who introduces the art of writing, who builds the citadel, who founds a system of artificial irrigation. The Achæan princes, whose chivalrous spirit is expressed in the Homeric Achilles, rule in the fertile valley of the Thessalian Phthiotis. In the Peloponnesus the Pelopidæ at Mycenæ reign over Achæans; and Agamemnon is said to rule, not only "all Argos," but "many islands." The principle on which such legends as that of Agamemnon's sovereignty may best be estimated has been well stated by Mr Freeman:—[1]

"The legend of Charlemagne, amidst infinite perversions, preserves a [illegible] groundwork of real history; I should be apt to find in the legend of Agamemnon a [illegible] groundwork of real history. There [illegible] that we can test the one story and [illegible] the other, by the [illegible] of [illegible]. The [illegible] in one case, which [illegible] high probability in the other. . . . Later [illegible] would never lead us to believe that there had been [illegible], if not [illegible], at least as [illegible] of [illegible] Greece. So [illegible] would never lead us to believe that there had [illegible] whose [illegible] from the Eider to the Ebro. But we know that the Carolingian legend is thus far confirmed by history; there is, therefore, no a priori [illegible] of the Pelopid legend. The [illegible] would not have [illegible] real history or tradition [illegible]. So [illegible] would have [illegible] Mykênê, a place [illegible] in later history, as the capital of this [illegible]. [illegible] the capital of Karl from Aachen to Paris; had it really been Paris, no one would have transferred it to Aachen. . . . Whether Agamemnon be a real [illegible] or not, the combination of internal and external evidence leads us to set down the Pelopid dynasty at Mykênê as an established fact."

We now come to a phase in the development of early Greece which tradition represents as following, but at no great interval, the age in which a Pelopid dynasty ruled at Mycenæ and fought against Troy. This is the period of great displacements of population within the mainland of European Greece. The first of these migrations is that of the people afterwards known as Thessalians. A fierce tribe of [illegible] warriors, they passed from Thesprotia in Epirus over the range of Pindus, and subdued or drove out an Æolic population who dwelt about Arne, in the fertile lowlands of [illegible] Thessaly. Those of the Æolians who had not submitted to the conquerors passed southward into the land thenceforth called Bœotia, where, between Orchomenus and Thebes, they founded a new home. The conquest of Bœotia appears to have been difficult and gradual; and even after the fall of Orchomenus and Thebes, Platæa is said to have maintained its independence. The legend placed these events about 1124 B.C., or [illegible] years after the fall of Troy. About twenty years later the mythical chronology [illegible] the third and [illegible], known as the return of the Heraclidæ. We need not enter here into the details of the myth. It will be enough to indicate the results to which any examination of the [illegible] leads. The Dorians, [illegible] of Macedonia, had [illegible] themselves [illegible] of Parnassus [illegible] to the [illegible] between [illegible] and Œta, which was thenceforth [illegible] Doris. [illegible] from these [illegible] that the Dorians [illegible] under [illegible] the hero Hyllus, son of the Tirynthian Heracles. The Hyllean chiefs of the expedition represented themselves, accordingly, as seeking to reconquer that royal dominion of Heracles in the Peloponnesus of which his descendants had been wrongfully deprived by Eurystheus. Hence the Dorian migration itself came to be called the "Return of the Heraclidæ." The migration had two main results:—(1) the Dorians, under leaders claiming Heraclid descent, overthrew the Achæan dynasties in the Peloponnesus, and either expelled or subjugated the Achæan folk; (2) a portion of the Achæans, retiring northward before the Dorian invaders in the south, drove the Ionians on the coast of the Corinthian Gulf out of the strip of territory which was thenceforth called Achaia; and these Ionians sought refuge with their kinsfolk in Attica. It is in the nature of the heroic myths to represent changes of this kind, which may have been the gradual work of generations, as effected by sudden blows. Some comparative mythologers have maintained with much ingenuity that the "Return of the Heraclidæ" is merely one of those alternations which balance each other in the hundred forms of the solar myth. It appears more consistent with reason to believe that there was really a great southward movement of population, which resulted in the substitution of Dorian for Achæan ascendency in the Peloponnesus. We cannot pretend to fix either the exact time at which it commenced or the period which was required for its completion. One thing may, however, be affirmed with probability. It cannot have been done all at once, as the myth says that it was. The displacement of the Achæans was accomplished only by degrees, and perhaps after the lapse of centuries.

"The return of the Heraclidæ."

The same remark applies to those three streams of migration from European Greece to the coasts of Asia Minor, which are represented as having ensued on the Dorian conquest of the Peloponnesus, and which may naturally be connected with the disturbance of populations which the southward advance of the Dorians caused. The Achæans, driven from their old seats in the south, moved northwards; and, reinforced by Æolic kinsmen from Bœotia and Thessaly, established themselves on the north-west coast of Asia Minor, where Lesbos and Cyme became their strongholds. By degrees their dominion spread inland, until they had become masters of Mysia and the Troad. The Æolic migration which thus created an Asiatic Æolis was unquestionably the slow work of generations. The immediate cause of the Ionic migration, which began later than the Æolic, appears to have been the overcrowding of Attica by the Ionians driven out of Achaia. The Æolic settlements had been the work of a people migrating in large masses. The Ionic colonization seems to have been effected rather by smaller numbers of warlike adventurers, sprung from the noble Ionian families of Attica and the Peloponnesus, who claimed to rule over the Ionic communities already established on the Asiatic coast. The Dorian colonists, following the southward direction of their previous conquests, settled on the south-west coast of Asia Minor. The islands of Cos and Rhodes received Dorian settlers; and, after what was probably a long struggle, the Dorians subdued Crete.

Traditional migrations from Greece proper to Asia Minor.

1. The Æolic migration.

2. The Ionic.

3. The Dorian.

While the populations had thus been settling down into the places which they were to occupy during the historical age of Greece, a movement had been in progress on the European mainland which tended to quicken among the [illegible] a sense of the unity of the race. This was the establishment of local [illegible] among [illegible] for the common worship of the same god. These [illegible] were of a federal character, that is, while the [illegible] of the [illegible] were independent in other matters, they were subject to a common central authority in all that concerned religious worship. Such a federal

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[1] "The Myk[illegible] [illegible]," [illegible]

The [illegible]

[illegible]

association was called an *amphictyony*, that is, a *league of neighbours*. The most important of such leagues was the Delphic amphictyony, of which the object was to conserve the worship of Apollo at Delphi. This league arose in Thessaly, where the conquerors who had come in from Epirus sought to establish themselves more firmly by embracing the cult of Apollo. It was afterwards extended through the southern districts until it included most of the tribes dwelling about Œta and Parnassus. The members of the Delphic amphictyony gave a new meaning and value to the federal compact by applying it to enforce certain obligations of humanity in war. They took an oath that they would not raze each other's towns, nor, during a siege, cut off the supply of water. It was in connexion with the Delphic amphictyony that the name *Hellenes* appears to have been first distinctly recognized as the national name. The earliest collective name of the race, in Greek tradition, had been *Graikoi*. The members of the Delphic amphictyony chose as their federal name that of *Hellenes*,—a name of sacred associations, if we may connect it with that of the *Selloi* or *Helloi*, the priests of the Pelasgian Zeus at Dodona,—in the region which, according to Aristotle, was the most ancient Hellas. The circumstances which gave currency to Hellenes as a common appellative have left a reminiscence in the myth that Hellen was nearly related to Amphictyon.

[illegible]

The Homeric poems may be regarded by the student of history as great pictures of political and social life, illustrating the whole variety of Greek experience down to the close of that age which saw the tides of Æolic, Ionic, and Doric migration flow from the west to the east of the Ægean. It is a distinct question how far recoverable historical fact is embedded in their text, or how far trustworthy inferences may be drawn from them in regard to a supposed series of events. But at least the legends of the Achæan princes and warriors are there, as they came through Æolic minstrels to the poets of Ionia; and, various as may be the ages and sources of the interwoven materials, the total result may be taken as a portraiture, true in its main lines, of the age from which these legends had come down. In the political life described by the Homeric poems the king rules by divine and hereditary right. But he is not, like an Eastern monarch, even practically despotic; he is bound, first, by *themistes*, the traditional customs of his people; next, he must consult the *boule*, the council of nobles and elders; and, lastly, his proposals require to be ratified by the *agora*, or popular assembly. The social life is the counterpart of this. It is a patriarchal life, in which the head of the family stands to his dependants in a relation like that of the king to his subjects. It is, within the family pale, eminently humane; and the absence of a charity which should include all mankind is in some measure compensated by the principle and practice of hospitality. The position of free-born women is high,—higher than in the historical age; and polygamy is unknown among Greeks. Many of the pictures of manners, especially in the *Odyssey*, have the refinement of a noble simplicity in thought and feeling, and of a genuine courtesy which is peculiarly Hellenic. The useful arts are still in an early stage. The use of the principal metals is known, but not, apparently, the art of smelting or soldering them. Money is not mentioned, oxen being the usual measure of value; and there is no certain allusion to the art of writing.

II. *The Early history of the leading States down to about* 500 B.C.

The Peloponnesus.

In the history of the Peloponnesus after the Dorian immigration we begin to be on firmer ground. There may still be large room for doubt as to particular dates or names, but the age left permanent records in the institutions which survived it. The first thing which should be borne in mind with regard to the Dorian immigration is that its direct influence was confined to three districts of the Peloponnesus. Argolis, Laconia, and Messenia were thoroughly Dorianized. Of the other three districts, Arcadia remained almost wholly unaffected, Elis and Achaia were affected only indirectly, through the influx of the populations which the Dorians had displaced. The first rank in the Peloponnesus was long retained by Argos. The ancient primacy of its Achæan princes was inherited by its Dorian rulers; and now, under the dynasty of the Temenidæ, Argos acquired a new prestige as the head of a federative Dorian hexapolis, of which the other members were Phlius, Sicyon, Trœzene, Epidaurus, and Corinth. It was only by slow degrees that the power arose which was destined to eclipse Argos. When the Dorians entered the valley of Eurotas, they found "hollow Lacedæmon" already shared among people of other tribes. Leleges, Minyans, and Achæans had been there before them. Both Æolian and Achæan elements remained in the land. The settlement of the Dorians was made in a strong position under Mount Taygetus, on the right or western bank of the Eurotas; and the fact that, unlike most Greek cities, it was not founded on a rocky base, but on arable soil, was expressed by the name *Sparta* (sown land). It was indeed less a city than a group of rude hamlets,—the camp of a military occupation. And, as a natural stronghold, defended by an alert garrison, it dispensed with walls. Sparta was at first only one member of a Laconian hexapolis. It was at a later stage that Sparta became the head-town of the country, and the seat of a central government. The origin of the dual kingship may probably be traced to this period. Such a dualism has no parallel elsewhere among Dorians; and, as regards one at least of the two royal lines, we know that the Agiade Cleomenes proclaimed himself an Achæan. The two royal lines of the Agiadæ and Eurypontidæ may have taken their beginning from a coalition or compromise between Dorian and Achæan houses. Afterwards, when it was desired to explain the dualism and to refer both lines to a common source, Agis and Eurypon were represented as descended from the twin sons of Aristodemus, Eurystheus and Procles.

Results of the Dorian conquest.

Argos.

Sparta.

The Spartan institutions

The spread of Spartan power in the Peloponnesus was preceded by the building up of that political and social system which made the Spartan citizens a compact aristocracy, exclusively devoted to the exercises of war. The personality of Lycurgus is shadowy. He has even been classed with those beings who, like Prometheus, Hermes, and Phoroneus, bestow on men that gift of fire without which they could not have attained to a high civilization. But the charge of excessive credulity can scarcely be brought against those who hold, with E. Curtius, that "there really lived and worked in the first half of the 9th century B.C. a legislator of the name of Lycurgus, a man who, as a born Heraclide, was called to take part in public affairs." It is another question whether he was the author of all the institutions which were afterwards ascribed to him. The example of another legislator who stands in a far clearer light of history,—the Athenian Solon,—whom the orators sometimes credit with the work of Clisthenes in addition to his own, may serve to show how loose such ascriptions often were. But at least the work of Lycurgus may be assumed to have marked an epoch in the history of the Spartan system. This system rested, first, on a distinction of three orders. Dorians alone were *Spartiatai*, citizens of Sparta, as opposed to mere Lacedæmonii, and to them belonged all political power. Lycurgus, said the tradition, assigned nine thousand lots of land to as many Spartiatæ; the land descended from father to eldest son, and, failing issue, reverted to the state. The older or non-

Lycurgus.

Dorian population, settled chiefly on the mountain slopes around the Spartan lands, were called *Perioikoi*. They were free farmers, who had no share in the government, and were not required to perform military service. Lastly, the *Helots* cultivated the lands of the Spartans, not as slaves belonging to private masters, but as serfs of the commonwealth; hence no Spartan citizen could sell a Helot or remove him from the land. From each farm the Helots had to produce annually a certain quantity of barley, oil, and wine; if there was a surplus, they could keep it for themselves. The condition of the Helots was thus in some respects better than that of ordinary Greek slaves. But it was such as constantly to remind them that they had once been a free peasantry. It was this, as much perhaps as positive ill-usage, which made it so peculiarly galling. The hatred of the Helots was a standing menace to the Spartan commonwealth. As Aristotle says, the Spartan kingship meant practically a life-tenure of the chief military command. The government was essentially an official oligarchy, in which the power of the irresponsible ephors was not importantly modified by the gerousia, while the popular assembly played a part hardly more active than that of the Homeric agora, with its formal privilege of simple affirmation or veto. The military training, from childhood upwards, to which the whole social life of Sparta was made subservient, was at first a necessity; but it soon became thoroughly identified with the ambition and with the pride of an exclusive warrior-caste. Sparta was sharply marked off from the other Greek communities by this systematic treatment of war as the business of life. When the military prestige of Sparta began to decline in the course of the 4th century B.C., it was remarked that this was due to the increased attention which other states had begun to pay to the art of war, whereas in old days the Spartans had been like professional soldiers matched against civilians.

Character of the government.

The social life a school of war.

Growth of Spartan power.

The mountain wall of Taygetus had set a barrier between Laconia and Messenia, which might have seemed to forbid the extension of Spartan power towards the west. If the Dorians in Messenia had fully preserved the warlike character of the race, they would probably have had little to fear. But they seem to have been in some measure enervated by the natural wealth of a country which, at the same time, excited the envy of their neighbours. Myths have grown thickly around the story of the two Messenian wars. This, at least, appears certain: the gradual conquest of Messenia by Sparta occupied not less than a hundred years [illegible]

[illegible] passes to the western coast, there was an ancient sanctuary of the Pelasgian Zeus. An amphictyony, or league of neighbouring towns, held sacrifice and games there once in four years, the management of the festival being shared between Pisa and Elis. A dispute arose between these two states. Sparta confirmed Elis in the religious superintendence of the festival, and at the same time arrogated to herself the political headship of the sacred league. Every effort was now made by the Spartans to extend the popularity and enhance the brilliancy of the Olympic games. Sparta—already supreme in Laconia and Messenia, already the victorious rival of Argos in the east of the land—now appears at the Olympian shrine of Zeus in a character peculiarly well adapted to attract the loyalty of the western Achaeans. The general recognition of Sparta as the first state in the Peloponnesus may be said to date from the time when, under Spartan auspices, the Olympic festival acquired a new celebrity.

Transition from monarchy to oligarchy.

For political reasons Dorian Sparta had always cherished the traditions of the Achaean princes; but the monarchy of the Achaean age, if it still existed anywhere, was a rare survival. The form of government which had generally succeeded to it was oligarchy, that is, the rule of a group of noble families claiming descent from the heroes, possessing certain religious rites in which no aliens participated, and claiming to be, by a divine authority, the interpreters of the unwritten law. These noble families made up the state. The commons, who lived in or around the city as artisans, labourers, or farmers, were free men, but had no political rights. The Dorian ascendency in the Peloponnesus was peculiarly favourable to oligarchies. Sparta was, in fact, such an oligarchy, though not of the closest kind,—the Dorian citizens being the privileged class, while the Perioeci answered to the commons elsewhere. It was a fortunate circumstance for the political development of Greece that oligarchy did not, as a rule, pass directly into democracy. A period of transition was needed, during which the people, hitherto debarred from all share of political direction, should learn the meaning of membership in the state.

The [illegible]

This was afforded, at least in some measure, by that peculiar phase in the life of the Greek commonwealths which intervenes between oligarchy and democracy,—the age of the tyrannies. [illegible] both superior and contrary to the laws. [illegible] Such was Peisistratus at Athens. [illegible] aisumnetes or dictator,—as Pittacus of Mitylene. **Their results.** The benefits conferred on the Greek commonwealths by the tyrannies were chiefly of two kinds. (1) The tyrant often instituted new [illegible] as festivals, in which the whole body of the citizens might take part. A feeling of civic unity was thus created, which could not exist while the nobles formed a separate caste, as exclusive in their worship as in their other privileges. (2) The court of the tyrant became a centre to which poets and artists were attracted. Such a man as Periander of Corinth (625-585) might aim at resembling an Eastern despot, but his encouragement of liberal arts must still have given an impulse to the higher civilization of Corinth. Polycrates of Samos, the friend of Anacreon, welcomed all men of fine gifts to his court; Pisistratus showed a like care for poetry, and for the artistic embellishment of Athens. The root of evil in the tyranny was its unlawful origin, and its consequent reliance upon force, frequently leading the tyrant to aim at keeping the citizens in a state of helplessness and mutual distrust. But the founder of a tyranny was usually a man with some inborn qualities for command and the baser forms of oppression were not required until he had given place to a weaker successor.

Colonization. The age of the oligarchies and tyrannies coincides with the most active period of Greek colonization, which received an impulse both from redundant population and from political troubles at home. The two centuries from 750 to 550 B.C. saw most of the Greek colonies founded. Sicily received settlements from both the two great branches of the Greek race. **Sicily.** Naxos, founded by the Chalcidians of Eubœa (735 B.C.), with Leontini and Catana, founded soon afterwards by Naxos, formed a group of Ionic communities on the eastern side of the island. Syracuse, founded by Corinth (734 B.C.), Gela, colonized by Rhodians and Cretans (690 B.C.), and Agrigentum, of which Gela was the parent-city (582 B.C.), were among the chief of the Dorian commonwealths on the south-eastern and south-western coasts. These Siceliot cities formed a fringe round the Siculi and Sicani of the interior; but, though in the presence of non-Hellenic populations, they never lost among themselves the sharp distinction between Dorian and Ionian (or "Chalcidic"), a distinction which was long the key-note to the inner history of the Siceliots. **Italy.** The earliest of the Greek settlements in Italy was the Ionic Cumæ, on the coast near Cape Misenum, a little to the north-west of Naples. It was founded by Chalcidians of Eubœa, as early, according to the tradition, as 1050 B.C. The Dorian Tarentum,—a colony of Sparta,—and the Achæan (Æolic) settlements of Sybaris and Croton, dated from the latter part of the [illegible] century B.C. Posidonia (Pæstum) was founded by Sybaris. Locri, an Æolic settlement near Cape Zephyrium (whence its epithet "Epizephyrian"), and the Ionic Rhegium, founded from Chalcis, complete the series of the [illegible] cities which [illegible] Italy [illegible] Magna Hellas [illegible]. The [illegible] was the war between the two [illegible] cities, ending in the destruction of [illegible] B.C. By [illegible] Asia Minor [illegible] the Greeks of Italy [illegible] against the [illegible] The name Magna Hellas remained, but its old significance was [illegible] the [illegible].

[illegible] The [illegible] Sicily and Italy [illegible] than at those lonely outposts of [illegible] single city stood in barbarian [illegible]

east coast of Spain. If Carthage had not fulfilled the purpose for which it was founded, by serving as the jealous guardian of Phœnician commerce in the western Mediterranean, Greek settlements would probably have multiplied on those shores as rapidly as elsewhere. Cyrene, on the African coast, was a Dorian colony (630 B.C.) from Thera, itself colonized by Sparta, and became the founder of Barca. Corcyra was colonized by Corinth about 700 B.C., and joined with the mother city in founding settlements (among others, Epidamnus) on the coast of Epirus. The northern shores of the Ægean and the Propontis were dotted with colonies, from the group of towns planted by Chalcis in the peninsula thence called Chalcidice, to Byzantium,—which, like Selymbria, was founded by Megara (657 B.C.). Among the colonies on the western coast of Asia Minor, Miletus was especially active in creating other settlements, particularly for purposes of commerce. Naucratis, in the delta of the Nile, was a trading colony from Miletus, and flourished from 550 B.C. On the southern shores of the Propontis and the Euxine, Cyzicus and Sinope (itself the parent city of Trapezus) were daughters of Miletus. Here too were the remotest of Greek settlements,—Panticapæum (Kertch in the Crimea), afterwards the capital of the Greek kings of the Bosporus; Olbia (or Borysthenes) on the adjacent mainland; and Istria, at the mouth of the Danube. The above enumeration, though not exhaustive, will serve to mark the wide extent of the area included by Greek colonization. **Nature of the Greek colony.** As the city was the highest unit in the political conception of the Greeks, so each colony contained within itself the essentials of a complete political life. Its relation to the parent-city was one of filial piety, not of constitutional dependence. In so far as the cult of the gods and heroes whom it worshipped was localized in the mother-country, it was needful that a link should exist between the religious rites of the colony and those of its parent; and this religious continuity was symbolized by the sacred fire which the founder (οἰκιστής) carried with him from the public hearth to the new settlement. For the rest, Massalia and Olbia were cities of Hellas in as full sense as Athens or Sparta. It was due to the self-sufficing character (αὐτάρκεια) of the Hellenic city as such that Hellas was not a geographical expression.

Early history of Attica. When Attica first comes into the view of history, it already forms a single state of which Athens is the capital; the kingly period is over, and, though a close oligarchy still rules, there are signs of coming change. But the hints of poetical legend, and sometimes the surer evidence of the ground itself, enable us to go further back, and to form at least a general conception of earlier chapters in the story of the land. Of the three plains on the [illegible] shore of the [illegible] gulf,—those of Megara, [illegible], and Athens,—the Attic plain is that which offered the greatest advantage to settlers. It is the most spacious; it is the best watered; it holds the most central position in the district which stretches south-east from the chains of Cithæron and Parnes to the Ægean; it has the best seaboard for navigation and commerce; and it contains the best [illegible]. Traces of early immigrants of various stocks survived in the names of places, in worships, and in legends. [illegible] Phaleron, are Minyan names; the myths and cults [illegible] also of Carian, [illegible] Cretan, Tyrrhenian [illegible]. But the chief influence which came to Attica from beyond [illegible] the Phœnician settlements [illegible] points to the Phœnician effort to establish friendly intercourse [illegible] **The four [illegible]** [illegible] distinguishes four periods in the early history of Attica, with [illegible] In the first [illegible] "Pelasgians [illegible]," in the [illegible] second "Kekropidæ," in the third "Athenians," in the fourth "Ionians." The extensive series of rock-dwellings found on the south and south-west of the Acropolis are, by the ingenious and probable conjecture of E. Curtius, connected with the first of these periods. This primitive Pelasgic settlement was the Rock-town (Κραναά); its inhabitants were Kranaoi, the dwellers in the rocks. The second period was one in which the Acropolis became the seat of a small number of nobles, and of a princely family claiming descent from the earth-born Cecrops. The citadel becomes the centre of religious and political life; beneath it dwell Pelasgic bondmen, who work for the Cecropidæ as the Cyclopes worked for the Perseidæ at Argos. The city of the Cecropidæ—no longer of the Kranaoi—becomes the head of the twelve cities among which the Attic land was divided. As the leading families are drawn towards the Cecropid city, rivalries ensue, which are mythically represented by the strife of rival gods on the Acropolis. Zeus, the Pelasgic god, has priority of possession. But his honours are disputed by Poseidon, the deity of the Thracians settled on the gulf of Salamis, and of their priestly clan, the Eumolpidæ. The third claimant is Athena, the divinity of a race possessing a higher culture, the giver of the olive to the land. The final victory falls to Athena. But Zeus keeps the place of honour as protector of the whole community,—Polieus; and Athena shares her sanctuary with Poseidon. The mythical Erechtheus,—representing at once the ancient Poseidon and the nursling of Athena,—is the symbol of the victory and the conciliation. This is the third period of Herodotus; "Erechtheus having succeeded to power," the Cecropidæ became Athenians. The fourth and last period is that in which Ionian settlers press forward from their earlier seat on the bay of Marathon, and establish themselves—not without opposition—on the banks of the Ilissus. The worship of the Ionian Apollo takes its place beside that of Zeus and Athena. The Ionic settlement on the Ilissus was included in an enlarged Athens, and the close of the epoch was marked by that union (συνοικισμός) of Attica into a single state which Attic tradition ascribed to the hero king Theseus.

Character of the Attic population.

The barren soil of Attica had protected it from such wholesale changes of population as had passed over Thessaly, Bœotia, and the Peloponnesus. In contrast with the occupiers of those lands the Attic population claimed to be indigenous; and the claim was true in this sense that the basis of the population was an element which had been there from prehistoric times. On the other hand the maritime situation of Attica had been sufficient to attract foreign immigrants. Thus in Attica no one type of life and character prevailed to the same extent as the Dorian in the Peloponnesus or the Æolian in Bœotia. The Ionian element was tempered by others older than itself. This fact is the key to that [illegible] and harmonious development which so remarkably distinguished the Attic people alike in politics and in genius. The institutions which are found existing in Attica in the 7th century B.C. must be regarded as dating from the age which preceded, and that of Theseus,—the age, namely, in which the [illegible] of Attica were fused together into a single state. The inhabitants of Attica form three classes,—the Eupatridæ or nobles, the Geomori, or husbandmen, and the Demiurgi, or handicraftsmen. The government was wholly in the hands of the Eupatridæ, who alone were citizens in the proper sense. The Eupatrid order was divided into four tribes, named after the sons of Ion,—Geleon, Hoples, Ægikoreus, Argadeus. Each tribe contained three phratries or clans, and each clan thirty gens or houses. The members of each clan were united by the worship of [illegible] ancestor, and all the clans were bound together by the common worship of Zeus Herkeios and Apollo Patroos.

Classes.

Kingship—archonship.

The transition from monarchy to oligarchy was more gradual at Athens than it seems to have been elsewhere. First, the priestly office of the king was taken away; and, as the old name *basileus* implied religious as well as civil authority, he was henceforth called simply the ruler, *archon*. But the office of archon was still held for life, and was hereditary. The second step was to appoint the archon for ten years only. The third and last step was to divide the old regal power among nine archons appointed annually (683 B.C.) The first archon, called Eponymos, because his name marked the date of official documents, had a general supervision of affairs, and in particular represented the state as the guardian of orphans and minors; the second archon was high priest (basileus); the third was commander-in-chief (polemarch); the remaining six were the custodians of the laws ("thesmothetæ"). After this reform, two events are the chief landmarks of Attic history before Solon. The first is the legislation of Draco, the second is the revolution of Cylon. Hitherto the Eupatridæ had been the depositaries and sole interpreters of an unwritten law. Draco, himself a Eupatrid, was now commissioned, not to frame a new code, but to write down the laws as they existed in oral tradition. To a later age the laws of Draco became a proverb of severity; but their severity was that of the rude age from which they had come down, not of the man who was employed to tabulate them. By this code (620 B.C.), and by the establishment of a court of fifty-one judges (ἐφέται) in capital cases, the people were so far secured against abuse of the judicial office. But the existence of serious popular discontent a few years later is shown by the attempt of Cylon (612 B.C.). Stimulated by the example of his father-in-law, Theagenes, the tyrant of Megara, he resolved to seize the supreme power at Athens. Promises of relief and of a new agrarian law gained him adherents among the distressed classes; but when he had succeeded in seizing the Acropolis, he found himself disappointed of popular support and surrounded by the troops of the archons. He escaped. His partisans surrendered, on the promise of the archon Megacles that their lives should be spared; but, when they had left the altars, they were cut down. The "Cylonian crime" was denounced by the people as having brought a pollution upon the city, and the punishment of the whole clan of the Alcmæonidæ—to which Megacles belonged—was demanded as an expiation. The Eupatridæ refused to yield, until Solon, one of their order, persuaded the Alcmæonidæ to stand a trial before three hundred of their peers. They were found guilty of sacrilege, and were banished.

Draco.

Cylon.

Legislation of Solon.

Solon was now to come forward as the umpire of still graver issues. The [illegible] of his [illegible] and his nature on the people is expressed in the legend that his recitation of his elegy, "Salamis," fired them to strike the blow by which "the fair island" was won back from the Megarians. The part which he had taken in the Alcmæonid affair was well fitted to make him trusted both by the nobles and by the people. His legislation had a twofold scope. In the first place he aimed at giving immediate relief to a class whose plight was desperate. As there was little money in the land, those in whose hands it was had been able to force up the rate of interest as they pleased. The small [illegible] were being crushed out of existence by a load of debt, mortgaging their farms to their creditors, who, in default of payment, could even sell the debtor as a slave. Solon depreciated the value of the silver drachma by 27 per cent., so that a debt of 100 old drachmas could be paid with 73; debts to the state were cancelled altogether. In a fine poetic fragment Solon calls as witness of his work "the mother of Olympian deities, the black earth, whence I took up of yore the pillars that had been set in many a place,"—these ὅροι being the stones

Relief of debtors.

New classes. Ecclesia. Council. Areopagus. Solon's account of his own work.

that marked a mortgaged homestead. Secondly, Solon aimed at establishing a permanent equilibrium between classes. He classed the citizens by their rated property as (1) Pentacosiomedimni, (2) Hippeis, (3) Zeugitai, (4) Thetes. The first class alone could hold the archonship; the fourth had no political privilege except that of voting in the assembly. But Solon made the assembly (ἐκκλησία) what it had never before been, a real power. He gave it (1) the right of passing laws, (2) the right of calling magistrates to account, (3) the right of electing archons. At the same time he created a council of four hundred, to be elected annually by the people, through which all measures should be introduced to the assembly. He strengthened the old Eupatrid Areopagus, by adding to its jurisdiction in homicide a general power of moral censorship, and provided that the archons of each year should, if found worthy, pass at the end of it into this senate. Athenians of a later age often described Solon as the founder of the democracy. This was not his own conception of his work. We have his own description of it:—"I gave the people as much strength as is enough, without taking away from their due share (τιμῆς), or adding thereto. But as for those who had power and the splendour of riches, to them also I gave counsel, even that they should not uphold violence. And I stood with my strong shield spread over both, and suffered neither to prevail by wrong." Solon was not a champion of popular rights, but a philosophic mediator between classes.

Tyranny of Pisistratus.

The removal of the urgent pressure of usury, the substitution of wealth for birth as the canon of privilege, and the bestowal of strictly limited political power on the people were Solon's achievements. It is no proof of their inadequacy that they were soon followed by the appearance of a successful demagogue. The Attic population was locally divided into three classes,—the Diacrii or the "highlanders" of the north-east district (the poorest); the Parali, the boatmen and fishermen of the coast; and the "Pedieis," the richer farmers of the Attic plain. Each of these classes formed a political faction, with an ambitious noble at its head. The Diacrii were led by Pisistratus, the Parali by Megacles, the Pedieis by Lycurgus. On the pretence that he had been murderously assaulted by the enemies of the people, Pisistratus obtained a guard of 50 men. It was presently increased to 400. He then seized the Acropolis (560 B.C.). After having been twice driven out by the combined factions of the Plain and the Shore, he finally established himself as tyrant in 545 B.C., and reigned till his death in 527 B.C. He did not abolish Solon's constitution, though he reserved some of the higher offices for members of his own house. His government appears to have been mild and wise. He set the example of submission to the laws. By many new enactments he promoted good order and morality. The convenience of the citizens and the beauty of Athens were consulted by the construction of new buildings, roads, and aqueducts. There were but two things to remind Athenians that this paternal rule had been founded in force,—the presence of hired troops, and the levy of tithes on private lands. Pisistratus was succeeded by his eldest son Hippias. In 514 B.C. Hipparchus, the brother of Hippias, was murdered by Harmodius and Aristogiton, in revenge for an affront offered to the sister of Harmodius. The rule of Hippias, which had hitherto resembled that of his father, now became cruel. The Alcmæonidæ—who had been in banishment since the final return of Pisistratus in 545—had won the favour of the Delphic priesthood by an act of liberality. The temple at Delphi having been burned down, they had undertaken to rebuild it, and, instead of common limestone, which would have satisfied the contract, used Parian marble for the east side of the temple. They now exerted their influence. Whenever Sparta or a Spartan consulted the oracle, the response always included a command to set Athens free. At last Cleomenes, king of Sparta, took the field. The children of Hippias fell into his hands, and, to save them, Hippias voluntarily withdrew from Athens (510 B.C.). The rule of the Pisistratid house was now at an end. In the phrase of the song which gave ill-merited glory to Harmodius and Aristogiton, Athens was once more under equal laws.

End of Pisistratid rule.

Reforms of Clisthenes. The ten tribes. The Council. Generals. Jury-courts. Ostracism.

But there was a vehement strife of factions. The Eupatrid party, under Isagoras, wished to restore the aristocracy of pre-Solonian days. The party of popular rights was supported by the Alcmæonidæ, and led by Clisthenes, whose father, Megacles, had married the daughter of Clisthenes, tyrant of Sicyon. Clisthenes, in the words of Herodotus, took the people into partnership, and by his reforms became the real founder of the democracy. Abolishing the four Ionic tribes, which had included the Eupatridæ, he instituted ten new tribes, which included all the free inhabitants of Attica. Each tribe was composed of several *demes* (townships) not adjacent to each other,—thus securing that the old clans should be thoroughly broken up among the new tribes. The number of the Council (Boule) was raised from 400 to 500,—50 members being elected from each of the ten new tribes. Further, it was arranged that each tribal contingent of 50 should take it in turn to act as a committee (πρυτάνεις) of the council,—a board of presidents (πρόεδροι), and the chairman of the day, being again chosen in rotation from the committee. A new office was also instituted. The command of the army was given to a board of ten Generals (strategi), one being elected by each of the tribes. In later times the strategi became ministers of foreign affairs. Jury courts of citizens were organized out of the assembly, to share the administration of justice, which had hitherto belonged to the archons and the Areopagus. As a safeguard for the state against party struggles, it was provided that, if the Council and the Ecclesia should declare the commonwealth to be in danger, each citizen might be summoned to indicate by ballot the name of any man whom he thought dangerous, and that, if the same name was written on 6000 tickets (ὄστρακα), the man so indicated should go into exile for ten years, without, however, losing his civic rights or his property. This was the institution of ostracism. Finally, choice by lot was substituted for voting in the election to the archonship, thus diminishing the danger of factious partisanship.

Strife of factions.

Isagoras, the leader of the party opposed to these reforms, had a zealous ally in Cleomenes, king of Sparta. Clisthenes, they alleged, was aiming at a tyranny such as that of his grandfather and namesake at Sicyon. Sparta, the leading Dorian state, was in a manner the recognized champion of aristocracy against revolution. The Spartan herald summoned the Athenians to banish the accursed Alcmæonidæ, and Clisthenes voluntarily left Attica. Cleomenes arrived at Athens with his army. Isagoras was made archon; seven hundred "democratic" families were banished; the newly constituted Council of five hundred was dissolved. But now the people rose in arms. Cleomenes and Isagoras were besieged on the Acropolis. On the third day of the siege they surrendered. Cleomenes and his troops were allowed to withdraw. Isagoras escaped, but his Athenian adherents were put to death. Clisthenes now returned to Athens. He seems, however, to have excited popular indignation by promoting a treaty with Persia, by which the supremacy of the Persian king was acknowledged. He thus lent colour to the accusation of his enemies that he was aiming at a tyranny; and he was banished. Cleomenes presently invaded Attica a second time, with the Peloponnesian allies. But the other Spartan king, Demaratus, was opposed to his designs. The Corinthians refused to follow him, and his army broke up when it had advanced no further than Eleusis. Meanwhile the Thebans and the Chalcidians of Eubœa had been induced to take up arms against Athens. Freed from the danger of the Peloponnesian invasion, the Athenians marched against the Thebans. They found them on the shore of the Euripus, and routed them. Crossing the strait into Eubœa, they defeated the Chalcidians on the same day. The lands of the Chalcidian knights (Hippobotæ) were divided in equal lots among four thousand Athenians, who occupied them, not as colonists forming a new city, but as non-resident citizens of Athens. This was the first *klerouchia*. The Spartans, incited by Cleomenes, now made a final effort to repress the democratic strength of Athens. Hippias was invited from his retreat on the Hellespont to Lacedæmon, and a Peloponnesian congress was convened at Sparta to discuss a project for restoring him to Athens as tyrant. The representative of Corinth urged that it would be shameful if Sparta, the enemy of tyrannies, should help to set up a new one. The congress was of his mind. The scheme failed, and Hippias went back to Sigeum.

The first *klerouchia.*

In these five years (510–505) which followed the fall of the Pisistratidæ the future of Athens was decided. Athens had become a free commonwealth, in which class grievances no longer hindered the citizens from acting together with vigorous spirit. The results were soon to appear in work done by the Athenians, not for Athens only, but for all Greece.

Athens a free commonwealth

The time was now drawing near when Greece was to sustain its first historical conflict with the barbarian world. There was not, in the modern sense, an Hellenic nation. But there were common elements of religion, manners, and culture, which together constituted an Hellenic civilization, and were the basis of a common Hellenic character. The Graikoi of Epirus, united in the worship of the Pelasgian Zeus, had become the Hellenes of Thessaly, united in the worship of Apollo. The shrine at Delphi, at first the centre of the most important amphictyony, had now become the religious centre of all Hellas. It was acknowledged as such by foreigners, by the kings of Phrygia and Lydia in the east, by the Etruscan Tarquinii in the west, as afterwards by the Roman republic. In political matters also Delphi was a common centre for the Greek states, mediating or advising in feuds between factions or cities, and giving the final sanction to constitutional changes. A sense of Hellenic unity was further promoted by the great festivals. [illegible]

Elements of Hellenic unity.

Delphi.

The national games.

Art and [illegible]

little more than an ideal. The only great enterprise in which Greeks had made common cause against barbarians belonged to legend. The first historical event in which the unity of Greece found active expression was the struggle with Persia.

III. *The Ionic Revolt and the Persian Wars*, 502–479 B.C.

The twelve Ionian cities on the western coast of Asia Minor formed a community which kept itself thoroughly distinct from the Æolian colonists to the north and the Dorians to the south. The Pan-Ionic festivals preserved the memory of the common descent. The Ionian life and culture had a character of its own. But the Ionian cities had no political cohesion, nor had they any recognized leader. One after another they became tributary to the kings of Lydia. The process of subjugation commenced at the time when the Lydian dynasty of the Mermnadæ (about 716 B.C.) began to make themselves independent of Assyria. It was completed by Crœsus, to whom, about 550 B.C., all the Ionian cities had become subject. Crœsus was friendly to the Greeks: he respected their religion, and enriched its shrines; he welcomed distinguished Greeks to Sardis. All that was exacted from the Ionians by Crœsus was that they should acknowledge him as their suzerain, and pay a fixed tribute. The Persians, under Cyrus, defeated Crœsus and conquered Lydia about 547 B.C. The whole coast-line of Asia Minor was afterwards reduced by Harpagus, the general of Cyrus. The Persians, zealous monotheists, destroyed the Greek temples. But it was not till the reign of Darius, who succeeded Cambyses in 521 B.C., that the Ionians felt the whole weight of the Persian yoke. Darius, the able organizer of the Persian empire, preferred that each Ionian city should be ruled by one man whom he could trust. He therefore gave systematic support to tyrannies.

The Ionian cities

under Lydia;

under Persia.

It is characteristic of the political condition of Ionia that the revolt was not a popular movement, but was the work of two men, each of whom had private ends to serve. Histiæus, tyrant of Miletus, had rendered a vital service to Darius during his Scythian expedition ([illegible] B.C.) by dissuading the other Greek leaders from breaking down the bridge over the Danube, which secured the retreat of the Persian army. Having been rewarded with a principality in Thrace, he presently became suspected of ambitious designs. Darius sent for him to Susa, and detained him there on the pretext that he could not live without his friend. Meanwhile Aristagoras, the son-in-law of Histiæus, ruled at Miletus. In 502 Aristagoras undertook to restore the exiled oligarchs of Naxos, and for this purpose obtained 200 Persian ships from Artaphernes, the satrap of western Asia Minor. The enterprise miscarried. Aristagoras, dreading the anger of Artaphernes, now began to [illegible]

The Ionic revolt.

partly through the shameful desertion of the Samians and Lesbians during the battle (496 B.C.). The Persians soon afterwards took Miletus by storm (495 B.C.). The Greek cities of the Asiatic seaboard and of the Thracian Chersonese successively fell before them.

First Persian expedition against Greece. But the vengeance of Darius was not yet complete. He could not forget that Greeks from beyond the sea had helped to burn Sardis, and he resolved that the punishment of Athens and Eretria should be as signal as that of his own vassals in Ionia. A Persian army, under Mardonius, crossed the Hellespont and advanced through Thrace. But the Persian fleet which accompanied it was shattered by a storm in rounding Mount Athos. The progress of Mardonius was also checked by the Thracians, and he retreated to Asia.

Second Persian expedition. The ambition of Mardonius had been to bring all European Hellas under the rule of the Achæmenidæ. The second Persian expedition, guided by more cautious counsel, had a narrower scope. It was directed strictly against those states which the great king had vowed to punish. The intrigues of the Pisistratidæ were busy in promoting it, and Hippias was to lend his personal guidance to its leaders. But before the new force set out Persian agents were sent through Greece to demand the symbols of submission from the cities. Most of the islands feared to refuse. Ægina, now a prosperous maritime power, complied from another motive than fear. Even Persia was welcome to her as an ally against Athens. The Athenians called upon Sparta, whom they thus recognized as the head of Greece, to punish this treason to the Hellenic cause; and Cleomenes, after overcoming the opposition of his royal colleague, Demaratus, took an arbitrary revenge on the Æginetans by depositing ten men of their chief families in the hands of the Athenians.

In 490 B.C. the second Persian expedition crossed the Ægean under the command of Datis and Artaphernes. Naxos was sacked, Eretria was betrayed. It seemed hardly doubtful that Athens too must fall. The Persians landed in the bay of Marathon, enclosed by the spurs of Brilessus (Pentelicus) and the hills of the Diacria. They thus avoided the dangers of a voyage round a rocky coast; and no part of Attica, Hippias told them, was so favourable to cavalry. The Athenians had sent for help to Sparta; but a religious scruple forbade the Spartans to march before the time of the full moon. Nine thousand Athenian citizens, with the slaves who carried their shields, went forth to meet the Persians at Marathon. On the way they were joined by a thousand Platæans,—the whole force of that city,—who came to stand by their old protectors. Miltiades, formerly the ruler of the Chersonese, was one of the ten Athenian generals. Five of these voted for awaiting Spartan help. The other five, led by Miltiades, were for giving battle at once; and the vote of the polemarch, Callimachus, turned the scale in their favour. The Greeks charged down from the hillside upon the Persians. The Greek centre was driven in, but the Greek wings prevailed and then closed upon the Persian centre. The Persians fled to their ships. Six thousand Persians fell. The Greek loss was about 192. Believing that traitors at Athens had signalled to the Persians to surprise the city while undefended, the army hastened back. The Persian fleet soon approached, but seeing troops on the shore, sailed away for Asia.

Battle of Marathon.

Miltiades. After the victory of Marathon Miltiades was all-powerful at Athens. He asked the people to give him a fleet, in order that he might strike another blow at Persia while the glories of Marathon were fresh. His demand was granted. But he employed the fleet in an attempt to wreak a private grudge on the island of Paros. At the end of twenty-six days he returned to Athens baffled, and suffering from a wound in the thigh. He was impeached for having deceived the people, and was sentenced to a fine of about £12,000. Being unable to pay it, he was disfranchised as a public debtor. His wound mortified, and he died, leaving debt and dishonour to his son Cimon.

Policy of Themistocles. Aristides was now the most influential man at Athens, as Themistocles was the ablest. Themistocles foresaw that the Persians would return, and that Athens could resist them only on the sea. He aimed therefore at creating an Athenian navy. Already (491 B.C.) he had persuaded the Athenians to set about fortifying the peninsula of the Piræus, which, with its three harbours commanded by the height of Munychia, offered greater advantages than the open roadstead of Phalerum. He now urged that the revenues from the silver mines of Laurium should be applied to building a fleet. The frequent hostilities between Athens and Ægina enforced the advice. Before 480 B.C. Athens had acquired 200 triremes. Aristides was at the head of a party who viewed this movement with alarm. Had not the naval empire of Miletus, Chios, and Samos been transient? The land-holding citizens who had fought at Marathon would give place to a mob of sailors and traders. An unstable democracy would carry the state out of the ancient ways. The strife of parties came to an issue. An ostracism was held, and Aristides was banished,—probably in 484 or 483 B.C. Themistocles remained the leader of Athens in the new path which he himself had opened. Athens was now the first maritime power of Greece.

Xerxes. The repulse at Marathon had probably not prevented the Persian commanders from representing their expedition as in a great measure successful. Darius resolved on the complete subjugation of Greece. But, when vast preparations had been in progress for three years, he died, leaving the throne to Xerxes, the eldest of his four sons by Atossa, the daughter of Cyrus (485 B.C.). Xerxes was not, like his father, a born ruler or a trained warrior. But he was profoundly convinced that all human beings were the natural slaves of the Persian king; and he was influenced by a strong war-party in the palace, with Atossa and Mardonius at its head. The house of Pisistratus, the ambitious Aleuadæ of Thessaly, and Demaratus, the exiled king of Sparta, united in urging an invasion of Greece. It was in vain that Artabanus, the uncle of the king, argued on behalf of the moderate party at the court.

Third Persian expedition. Orders were given to raise such an armament as the world had never seen, a host which should display the whole resources of the empire from the Indus to the Ægean, from the Danube to the Nile. Forty-six nations were represented by the forces which wintered at Sardis in 481 B.C. A fleet of 1200 triremes, and about 3000 transports and smaller craft, assembled near Cyme and Phocæa on the Ionian coast. In the spring of 480 B.C. Xerxes led about a million of men to the Hellespont, whither the fleet went before to meet them.

Condition of Greece. Greece was probably never stronger than it was at this time. The population of the Peloponnesus may have been about two millions. Athens, according to Herodotus, had 30,000 citizens. The Bœotian towns and the islands were prosperous. The proportion of slaves to freemen varied from perhaps four to one at Athens to as much as ten to one at Corinth or Ægina. Life was still simple and vigorous. Society was not divided into rich classes enervated by luxury and poor classes enfeebled by want. The public palæstras were schools of physical training for war. But that which Greece lacked was political unity.

Political divisions. Aristocracy and democracy were already rival forces. Everywhere the aristocrats felt that a victory over Persia must have a national character, and must [illegible] the people. They inclined therefore to the [illegible] and the stand in defence of Greece was eventually made by a few states only. Sparta, as the leading city of Greece, took the first step towards the formation of a national party, by convening a congress at the isthmus of Corinth in the autumn of 481. Here Themistocles showed his statesmanship by prevailing on the Athenians to abstain from disputing the hegemony of Sparta. Most of the Peloponnesian cities were represented at the congress. But Argos and Achaia, jealous of Sparta, held aloof. In Bœotia, Thebes,—the enemy of Athens,—favoured Persia. In Thessaly the dynasty of the Aleuadæ were the active allies of the invader. Gelon of Syracuse refused to aid unless he were to lead. The Corcyreans promised sixty ships, but did not send them. Crete also failed to help. The states which fought against Persia were then these only,—Sparta with her Peloponnesian allies, Athens, Ægina, Megara, Platæa, Thespiæ. This national league expressed indeed the principle of Greek unity, but Greece was far from being united. The "medizing" party was strong, and it counted some adherents in many even of the patriotic cities. Wherever democracy had enemies Persia had friends.

Plans of defence.

The first idea of the national defence was to arrest the torrent of invasion at some northerly point which could be held against great numerical odds. Tempe proving untenable, it was resolved to make a stand at Thermopylæ. When Leonidas had fallen with his 300 Spartans and the 700 Thespians who shared their heroic death, the next object of the Peloponnesian allies was to guard the isthmus of Corinth. The peculiar misfortune of Athens in the war was her position between two gates, the first of which had been forced by the enemy. The Greek leaders seem to have assumed at first that it was vain to oppose the Persian land forces in an open field. Xerxes occupied Athens, and the flames which destroyed its houses and temples at last avenged the burning of Sardis. The Greek ships, which had gained some advantage over the Persian fleet at Artemisium in the northern waters of the Eubœan strait, had moved to Salamis as soon as it was known that the Persians had passed Thermopylæ. The homeless population of Athens had been conveyed to Salamis, Ægina, and Trœzen before the arrival of Xerxes. And now the forecast of Themistocles was verified. Athens, and Greece itself, were saved chiefly by the Athenian ships,—200 in number out of a total of 366. The Peloponnesian leaders wished to withdraw the fleet to the isthmus. Themistocles saw that if it left Salamis it would disperse. He sent word to Xerxes that the Greeks meditated escape. The Persian fleet surrounded them in the night. Next day the battle of Salamis was fought. Of 1000 Persian ships, 200 were destroyed; the rest fled. It was on the same day that Gelon of Syracuse defeated the Carthaginians at Himera in Sicily (480 B.C.). Xerxes lost heart and retreated to Asia, leaving Mardonius with 300,000 men to finish the war. In the summer of 479 Athens was again occupied and destroyed by the Persians. Now at length Sparta came to the rescue. Pausanias, the guardian of the young son of Leonidas, led 110,000 of the allies into Bœotia, and utterly defeated the army of Mardonius near Platæa (479 B.C.). On the same day the troops of the Greek fleet defeated those of the Persian fleet in a battle on the shore at Mycale near Miletus. This victory set Ionia free from Persia.

Athens

Battle of Salamis.

Lessons of the Persian wars.

The Persian wars had revealed both the weakness and the strength of Greece. The hereditary aristocracy of Thessaly had shown that they were eager to establish the supremacy of their house with the help of Asiatic despotism. Such states as Argos and Thebes had not been ashamed to indulge jealousy and party spirit by betrayal of the common cause. Even Sparta and the Peloponnesian allies had been disposed to confine their endeavours to the defence of their own peninsula, leaving Athens and the northern cities to their fate. On the other hand the struggle had brought into strong relief the contrast between absolute monarchy and constitutional freedom. This appeared in two things: the Greek strategy was superior; and the Greek troops fought better. Athens, in particular, had shown how both the intelligence and the spirit of citizens are raised by equal laws. The mistakes of the invaders,—which, to a Greek mind, might well have seemed the work of Ate,—were such as are natural when a vast force is directed by the intemperance of a single will. Artemisia and Demaratus advised Xerxes to occupy Cythera. The Thebans advised Mardonius to sow dissension among the Greeks by means of bribes. Both counsels were judicious, and both were neglected. Time is, in war, the surest ally of superior numbers and resources; but the impatience of the Persian commanders staked everything on a few pitched battles. Again, the Persians, unlike the Lydians of old, destroyed the Greek temples. They thus conferred an immense moral advantage on their antagonist. He could no longer doubt that he was helped by his gods.

IV. *The Period of Athenian Supremacy*, 478–404 B.C.

In the space from the Persian to the Peloponnesian War the central interest belongs to Athens. The growth of Athenian empire, the successive phases through which it passed, and its influence on the rest of Greece, the inner development of Athenian life, political, intellectual, social,—these are the salient features in a period of about fifty years. The first care of Themistocles after the repulse of the Persian invasion was to restore the fortifications of Athens. The jealous interference of Sparta, instigated by Ægina and Corinth, was defeated by his ingenuity. A wall of larger circuit than the old one was built round Athens, and a strong wall was also carried round the Piræus. The Persians had been driven out of Ionia, but they still held many places on the Thracian and Asiatic coasts. The Spartan Pausanias, commanding the Greek fleet, took Byzantium from the Persians in 478. He now formed the design of making himself a despot, and his adoption of the manners of a Persian grandee became so offensive to the Greek captains that they requested the Athenian commanders to assume the leadership of the fleet. Pausanias was recalled to Sparta, and his successor found that the hegemony had already changed hands. The league, of which Athens now became the head (477 B.C.), was intended to continue the national defence against Persia. Its special purpose was to guard the Ægean. Aristides was chosen to assess the rate of contribution for the members. The representatives of the several cities met at the temple of Apollo in Delos, where the common fund was also deposited. Hence the league was called the Confederacy of Delos. It was only gradually that this free confederacy, with Athens for a president, passed into an Athenian empire over tributary cities. At first each city contributed ships to the common fleet. But the practice arose of allowing some cities to contribute money instead of ships. A city which did this had no control over Athens, and no protection against attack. One after another of the discontented allies revolted from Athens, and was forcibly reduced to the condition of a subject. Naxos was the earliest example (466 B.C.); Thasos was the next (465 B.C.), and as early as 449 B.C. only three remained autonomous and free,—Samos, Lesbos, and Chios. The removal of the common fund from Delos to Athens (about 459 B.C.) was merely the outward sign of a change in which most members of the original league had already been compelled to acquiesce. In the earlier years of the Confederacy the work for which it had been formed was not neglected. Of the successes gained against Persia the

Pausanias.

Confederacy of Delos.

Gradual change in its character.

most notable was the victory of Cimon over the Persians, both by land and by sea, at the mouth of Eurymedon (466 B.C.). But, as Athens assumed more and more distinctly an imperial character, the common fund came to be regarded as a tribute which could be applied to exclusively Athenian objects. This was the grievance which made the very name of the "tribute" (φόρος) so hateful.

Culmination of Athenian power.

The years 457–455 B.C. may be taken as marking the greatest extension of the Athenian empire. It was in 457 that their victory at Œnophyta in Bœotia, following on their defeat at Tanagra, enabled the Athenians to break up for a time the oligarchical league over which Thebes presided. Democracies were established in the Bœotian towns, and Athens was virtually supreme, not only in Bœotia, but also in Phocis and Locris. In 455, after a struggle of some years, Athens conquered Ægina. But now the tide began to turn. In 453 the defeat of the Athenians at Coronea destroyed the power of Athens in Bœotia, Phocis, and Locris. Oligarchies were restored. First Eubœa and then Megara revolted from Athens. The Spartans, released from a truce of five years (452–447), invaded Attica. They advanced, however, no further than the Thriasian plain; and it was believed that their leader, the king Pleistoanax, had taken Athenian bribes. Freed from this danger, Pericles was enabled to reduce Eubœa.

Thirty Years' Truce.

But the dream of an Athenian land-empire was over. In 445 a truce for thirty years was concluded between Athens and Sparta. Athens gave up all dependencies on the mainland of Greece. Henceforth the Athenian empire was to be maritime only.

Between the conclusion of the Thirty Years' Truce and the events which led to the Peloponnesian War the most important incidents were—first, the revolt of Samos and its reduction by Athens (440 B.C.); next, the foundation by Athens of two settlements, Thurii, on the site of Sybaris in southern Italy, and Amphipolis, on the Strymon, in Thrace.

Constitutional changes at Athens.

Meanwhile the inner political life of Athens had passed through great changes. Soon after the Persian wars, the fourth or poorest class of the Solonian timocracy had been made eligible to the archonship. This was done on the proposal of Aristides himself. The maritime population of the Piræus was now large, and it had become impossible to exclude the main body of the citizens from the chief offices of the state. The development of Athenian democracy had been secured by that loyal unity of civic action and feeling which the Persian wars had produced. Themistócles, whose policy had been the source of those new impulses, did not remain to direct them; he was accused of complicity in the Persian intrigues of Pausanias, and ostracized (about 471 B.C.). Aristides died in 468. Cimon, the son of Miltiades, was now at the head of a conservative party. The other party, which was rather progressive than properly democratic, was led by Pericles, an Alcmæonid, and Ephialtes. A blow was dealt to the influence of Cimon and his party when the Spartans insultingly dismissed an Athenian force which had marched, under Cimon, to help them in reducing the insurgent Helots on Mount Ithome (464 B.C.). Soon afterwards some important reforms were proposed and carried by Ephialtes. The powers of the Areopagus were diminished. Probably it lost its general censorial power and its veto upon legislation, retaining its jurisdiction in homicide. The archons and generals were deprived of their discretionary judicial powers. Henceforth the people was to be the final judge both in criminal and in civil causes. The juries chosen from the Heliæa were now organized as a permanent system of courts, every juror receiving a fee from the state for each day of his attendance. Cimon was ostracized; and the exasperation of the conservative party was shown by the assassination of Ephialtes (457 B.C.). Cimon was succeeded in the leadership by his kinsman Thucydides, son of Melesias; and when, in 443 B.C., Thucydides also was ostracized, there was no longer any disciplined resistance to the policy of Pericles. Athens was now strengthened and embellished by a series of public works.

Public works.

Already in 457–456 two long walls had been built, one from Athens to Phalerum, the other from Athens to the Piræus; and about 445 a third or intermediate wall, parallel to the latter, was built on the proposal of Pericles. The Odeion, a theatre for musical performances, arose on the east side of the theatre of Dionysus, under the Acropolis. On the Acropolis itself the Erectheion, the shrine of Athene Polias, which had been burned by the Persians, was rebuilt on a greater scale; and the Parthenon, the magnificent temple of the Virgin Athene, containing the chryselephantine statue of the goddess by Phidias, was constructed under his superintendence from the plans of Ictinus and Callicrates (438 B.C.). The Propylæa or portals, forming a colonnaded entrance to the Acropolis on the western side, were completed a few years later.

Pericles.

The period known as "the age of Pericles" may be roughly defined as the years from 460 to 430 B.C. The idea which pervades the whole work of Pericles is that the Athenian people, having been called upon by circumstances to rule over a wide alliance, must be trained to rule worthily. Pericles was opposed to extending the empire of Athens; but he was resolved to hold it, because he saw the danger of giving it up. And, in order that it should be held securely, he saw that the people must be educated, first, politically, by constitutional freedom, and next, intellectually and socially, by general cultivation. The *theoricon*, or money given to the citizen to pay for his seat at the theatre, was doubtless a party expedient, like the pay provided for the juror and for the citizen-soldier; it belonged to a plan for breaking the exclusive power of wealth. But it also fitted into the system by which Pericles sought to bring the citizens collectively under the influence of art in all its noblest forms. Painting, music, sculpture, architecture, had each its place in this scheme; but for the statesman's object no single instrument was perhaps so potent as the drama. It was a time of contending forces, in which one chief peril was lest the generation to which a larger future was opening should lose its hold on what was best in the past. The religious tradition and the new ethical subtlety were nowhere reconciled in so lofty an ideal as by Sophocles; nor could any presentment of art rival the theatre in its power of quickening a sympathetic enthusiasm.

The "age of Pericles" would have produced better results for the political future of Athens if Pericles himself had been less great. As Thucydides says, the nominal democracy was virtually the rule of one man. The informal sovereignty of Pericles hindered the rise of those who might otherwise have been trained to succeed him. During his lifetime the need of a restraining force was not felt in the reformed institutions, for that force was supplied by a single mind. But when he was gone it was seen that the new equilibrium of the state depended on a Pericles being at its head. Probably Pericles himself believed that there were men who could continue what he had begun; and if he was wrong, that cannot detract from the glory of what he did for his own time.

V. *The Peloponnesian War*, 431–404 B.C. *The Period of Spartan and then of Theban Ascendency*, 404–362 B.C.

Causes of Peloponnesian War.

In examining the causes which led to the breach of the Thirty Years' Truce, and to the Peloponnesian War which followed it, Thucydides distinguishes two alleged or immediate causes from a third cause which was not alleged, but which lay deeper than either of the others. The two alleged causes were—(1) the active help given by Athens to the Corcyræans in their quarrel with Corinth concerning Epidamnus, a colony of Corcyra; (2) the Athenian blockade of Potidæa, a Corinthian colony which had revolted from Athens. The more essential cause was the growth of Athenian power, and the alarm which this caused to the Lacedæmonians. In truth the affair of Epidamnus and the affair of Potidæa were merely the sparks which happened to kindle the flame. That long conflict which we call the Peloponnesian War had been prepared from the time when the Athenian democracy, founded by Clisthenes, had become a power in Greece through the successful struggle against Persia. From that time there were two antagonistic principles, represented by two rival cities,—oligarchy by Sparta, democracy by Athens. The other cities grouped themselves naturally around these. All Greece was divided between these two ideas. The Peloponnesian War is the collision between them. It would be inconsistent with the limits and the scope of this sketch to enumerate the details of the war in each of its twenty-seven years. Yet we must aim at indicating the periods into which it falls, the leading characteristics and tendencies which it presents.

First period of the war, 431–421 B.C.

1. The first period of the Peloponnesian War comprises the years from its commencement in 431 B.C. to the peace of Nicias in 421,—hence sometimes called the Ten Years' War. As one of its main features was the frequent invasion of Attica by the Peloponnesians, the latter called it the Attic War. The result of it was that Sparta had gained nothing, and that Athens had lost nothing except Amphipolis. By the peace of Nicias Athens kept all places which had surrendered voluntarily. Those allies of Sparta from which these places had been taken were naturally discontented. Corinth and Thebes especially were aggrieved. In spite of all the mistakes of Athens,—in spite of the desolating plague,—in spite of such reverses as the defeats at Delium and Amphipolis, and the loss of the Chalcidic towns,—Athens remained on the whole triumphant; and against what Brasidas had done for Sparta might be set the victories of Phormio and the capture of Sphacteria. On the other hand the peace of Nicias had brought disaffection into the Spartan confederacy.

Second period, 421–413 B.C.

2. The second period of the war extends from the peace of Nicias in 421 to the catastrophe of the Sicilian expedition in 413. The four years immediately following the peace of Nicias are the only years during which the great fundamental antithesis on which the whole war rested was temporarily obscured. Many of the allies of Sparta were discontented, and the intrigues of Alcibiades were active among them. But it was in vain that oligarchical allies were gained for the moment to the democratic cause. The normal relations were soon restored. Then came the Athenian expedition to Sicily, ending in a crushing disaster. Thucydides thinks that the mistake lay, not so much in an original miscalculation of strength, as in the failure at Athens to support the expedition after it had gone. It is indeed possible that with other guidance Athens might have conquered Syracuse. But at least it was essential that Athens should put forth its whole strength, if only for the reason that no people resembled the Athenians so closely as the Syracusans. Yet never had the Athenians fought under greater disadvantages. The Athenian force went to attack; at Syracuse they had to act on the defensive. The bold and versatile Alcibiades was made a public enemy. Nicias, timid and in weak health, is opposed to Gylippus, who unites a Dorian energy of hatred to Athens with something like Ionian command of resource. And, when everything had been lost except a chance of saving the army, the perversity of Nicias defeated the prudence of Demosthenes. The Sicilian disaster was the turning-point of the war. Pericles had warned the Athenians against needless ventures and a policy of aggrandizement. They had incurred a needless risk of tremendous magnitude, and had lost. If they had won, Alcibiades would probably have raised a tyranny on the ruins of their democracy.

Third period. 413–404 B.C.

3. The third and last period of the war is from the Sicilian defeat in 413 to the taking of Athens by Lysander in 404, a few months after the battle of Ægospotami. This is the period called the Decelean War, because Decelea in Attica was occupied by the Spartans in 413, and continued to be a permanent base of their operations against Athens. As the sea board of Asia Minor was the scene of much of the fighting, it is sometimes also called the Ionian War. In this last chapter the war takes a new character. After the Sicilian overthrow Athens was really doomed. The Decelean War is a prolonged agony of Athenian despair. Athens had now no hope but in her ships; and the leaders had to find their own supplies. The Spartan treasury was also empty. This want of money on both sides gave the mastery of the situation to Persia. And it was due to the factious treason of Alcibiades that the aid of Persia was given to Sparta. Athens was ultimately conquered, not by the Spartan confederacy, but by the disloyalty of Athenians bent on ruining political opponents. The "Revolution of the Four Hundred," with its brief success, greatly contributed to the exhaustion of the city. Even at Ægospotami, even when Lysander was before Athens, it was the baneful influence of Athenian faction that turned the scale. When Athens had been taken and the walls destroyed, Sparta was once more the first power in Greece. When Thrasybulus and the patriotic exiles had overthrown the rule of the Thirty Tyrants, they restored the Athenian democracy, but they could not restore the old Athenian power.

Altered character of Sparta.

Sparta itself was changed. The old Spartan institutions had taught a simple reliance on disciplined strength. In the Peloponnesian War Sparta had won the victory with Persian gold. Already the love of money had found its way into the state which had once been so carefully protected from it. Differences of degree had arisen between the citizens, whose equality had been the very basis of the old Spartan life. Citizens who had been impoverished by the rise of prices, and who could no longer pay their share of the public tables, were now distinguished as "inferiors" (ὑπομείονες) from those who retained their full civic rights (ὅμοιοι). Spartan commanders abroad were not always inaccessible to bribes. The habit of military discipline indeed remained. Spartans were still distinguished, as a rule, by gallantry in the field, by care for the dead, and by attention to the ritual of the gods. Nor had the valley of the Eurotas remained closed to the higher culture of Greece. The old type of Spartan leader—the rough soldier incapable of eloquence or of finesse—had ceased to be the only type. An Athenian might have envied the powers of persuasion and the diplomatic tact of such Spartans as Brasidas, Lysander, or Gylippus. But the qualities of the old Sparta were seldom fused into a perfect harmony with the new accomplishments. Such men as Lichas and Callicratidas were rare. The balance of political power, as it existed in the old constitution, had also been unsettled. The kings were still, as of old, the commanders-in-chief on land. But the new office of the admiral (ναύαρχος) was invested with the chief command at sea. The supreme control of the state had passed more and more into the hands of the ephors, and the ephors, chosen annually, were not always incorruptible.

Sparta had waged the Peloponnesian War in the name

Spartan rule in Greece.

of freedom. The Greek cities were to be liberated from the all-absorbing tyranny of Athens. Now, however, Sparta altogether failed to redeem these pledges. On the contrary she aimed at setting up a tyranny of her own. Oligarchical governments were established, controlled in each city by a Spartan garrison under a Spartan harmost or military governor. The earliest and one of the worst cases was the tyranny of the thirty tyrants at Athens, set up by Lysander, and supported by Spartan arms until, after eight months, the Athenian exiles under Thrasybulus marched from Phyle upon Athens. The Athenian democracy was formally restored in September 403 B.C.; and the liberators used their victory with a wise moderation. Four years later Socrates was put to death, because a party blindly zealous for the old beliefs of Athens could not see that such thought as his led to the only firm basis for a new social order.

Greece and Persia.

The retreat of the 10,000 Greeks under Xenophon, in 401 B.C., marks a turning-point in the relations of Greece to Persia. It was to the Greeks a striking revelation of Persian weakness, an encouragement to schemes of invasion which would before have seemed wild. Sparta now began a war against the Persians in Asia Minor—partly to escape from the reproach of having abandoned Asiatic Hellas to the barbarian. Agesilaus, on whom the lesson of the famous retreat had not been lost, was encouraged by success to plan a bolder campaign. But in 394 B.C. the Athenian Conon, commanding the fleet raised by the satrap Pharnabazus, utterly defeated the Spartan fleet at Cnidus. Soon afterwards, under his protection, the Long Walls of Athens were restored. The Spartan power in Asia Minor was at an end. The oligarchies were overthrown, and the Spartan governors expelled.

Battle of Cnidus.

Corinthian War.

The reverses of Sparta did not end here. At the instigation of Persia an alliance was formed between Athens, Thebes, Argos, and Corinth. In the territory of the latter state the allies waged war on Sparta, to whose aid Agesilaus was recalled from Asia. When the Corinthian War had lasted six years, the peace of Antalcidas was negotiated between Sparta and Persia (387 B.C.). By it the Greek cities in Asia, with Cyprus, were given up to Persia. Lemnos, Imbros, and Scyros were assigned to Athens. All other Greek cities were declared independent. The meaning of this was that they were to be independent of each other—isolated for purposes of defence—and all alike dependent on the Great King. The Corinthian War had begun from Persian intrigue; it ended with a peace dictated by Persia. But the Spartan policy had gained its own ends. The so-called "autonomy" of the Greek cities disarmed the rivals of Sparta. Now, as at the end of the Peloponnesian War, a prospect of dominion was opened to her. The Persian king, whom this disgraceful peace practically recognized as suzerain of Greece, was to be merely the guarantor of terms under which Spartan ambition might be securely pursued.

Peace of Antalcidas.

Revolution at Thebes.

New Athenian Confederacy.

A few years later these designs met with their first serious check. In 382 B.C. the Spartans treacherously seized the Cadmea or citadel of Thebes. They held Thebes for three years. But in 379 a party of Theban exiles, under Pelopidas, surprised the Spartan garrison and recovered the city. A still greater discouragement to Sparta was the establishment of a new Athenian Confederacy—precautions being taken against the members passing, as under the Delian Confederacy, into the condition of mere tributaries. Thebes joined the new confederacy, and presently succeeded in restoring the old Bœotian league, of which Thebes was the head. But the rise of Thebes had excited Athenian jealousy. Peace was made in 371 between Athens and Sparta. Thebes, thus isolated, was at once attacked by the Lacedæmonians. They invaded Bœotia, but were defeated by the Thebans under Epaminondas at Leuctra, 371 B.C. This destroyed Spartan power outside of the Peloponnesus. Epaminondas next invaded the Peloponnesus itself. He resolved to set up rivals to Sparta on her own borders. He therefore united the cities of Arcadia into a league, with a new city, Megalopolis, for its capital; and he gave independence to Messenia, which for three centuries had been subject to Sparta—laying the foundations of a new capital, Messene, around the great natural citadel of Ithome. The Arcadian league did not long hold together. Mantinea led a group of Arcadian towns favourable to Sparta. In 362 B.C. a battle was fought near Mantinea between the Spartans and the Thebans. The Thebans were victorious, but Epaminondas fell. With his death the temporary supremacy of Thebes came to an end. Sparta had, however, been reduced from the rank of a leading state. Xenophon closes his *Hellenica* with these words:—"There was more confusion (ἀκρισία) and tumult in Greece after the battle than before."

Theban victory at Leuctra.

Epaminondas.

General character of the period, 404–339 B.C.

Political confusion is indeed the general characteristic of the period between the end of the Peloponnesian War and the Macedonian conquest of Greece. In the preceding century Athens and Sparta had been the vigorous representatives of two distinct principles. The oligarchic cities rallied round Sparta, the democratic round Athens. But at the end of the Peloponnesian War Athens was exhausted. Sparta, now predominant, but suffering from inner decay, exercised her power in such a manner as to estrange her natural allies. Thus both the normal groups of states were broken up. New and arbitrary combinations succeeded, seldom lasting long, since they were prompted merely by the interest or impulse of the hour. In this period of unstable politics the moment most promising, perhaps, for the future of Greece was when Athens had formed a new naval confederacy, and was also allied with the Bœotian league. But the alliance was broken by Athenian jealousy of Thebes,—not to be renewed until Greek independence was on the eve of receiving its death-blow. The work of Epaminondas in one sense died with him; the brief hegemony of Thebes passed away. But in another sense the results which he achieved were enduring. He had been for Thebes such a man as Pericles was for Athens—a ruling personal influence in a democratic commonwealth; and he had raised Theban policy to the old Athenian level. The aims of Thebans were no longer confined to the circle of Theban interests; Thebes now aspired to be what Athens had been—the champion of national freedom and greatness. The power founded by Epaminondas was transient; but this large Hellenic patriotism made itself felt in some degree as a permanent inspiration, preparing the Thebans to stand by the Athenians in the last struggle for Greek freedom.

Work of Epaminondas.

VI. *The reigns of Philip and Alexander*, 359–323 B.C.

Decay of Greek civic life.

Three years after the death of Epaminondas Philip came to the throne of Macedon. His power rapidly grew. A warlike people, ruled by an able and ambitious king, was now the northern neighbour of Greece. The most obvious vice of Greek politics at this period was disunion; but the disunion itself was only the symptom of a deeper decay. No one city of Greece any longer retained the vigour required in a leader. Had either Athens or Sparta now possessed such vital force as they showed in the Persian wars, no local or temporary feuds would have prevented the organization of national defence. Nothing marks the decay of the Greek commonwealths more significantly than the fact that they did not even recognize the urgency of the danger. Demosthenes had the old Greek spirit; but he stood almost alone. The principles on which he constantly insisted, and which give unity to his entire career, are mainly

Demosthenes.

two:—first, the duty of the Athenian citizen to sacrifice personal ease and gain to the service of Athens; secondly, the duty of Athens, as the natural head of free Greece, to consult the interests of all the Greek cities. The energy of Demosthenes was not first roused by the progress of Philip. Before there was danger from the quarter of Macedon, **Demosthenes had seen clearly that the decay of public** spirit threatened the destruction of Hellenic life. As he said to the Athenians afterwards, if Philip had not existed they would have made another Philip for themselves. And **the condition of Athens was at least not worse than that of any other city which could have aspired to lead.**

Philip. A strategist so keen-sighted as Philip must early have perceived that he had little to fear from combined resistance, so long as he was careful not to attack too many separate **interests at the same time. Greeks, he saw, were past** fighting for each other as Greeks. This was the key-note of his policy to the last. While making aggressions on one **Greek city or group of cities, he always contrived to have others on his side.**

First period of his relations to Greece. 359–346 B.C. Philip's career in relation to Greece has two periods. The end of the first period is marked by his admission to the Amphictyonic Council: the end of the second, by the **battle of Chæronea. During the first period Philip is still** a foreign power threatening Greece from outside. He takes Amphipolis from the Athenians; he destroys Potidæa; he acquires towns on the Thracian and Messalian coasts; he defeats the Phocians under Onomarchus, and even advances to Thermopylæ, to find the pass guarded by the Athenians; finally, he destroys Olynthus and the thirty-two towns of **its confederacy. In the second period he is no longer a** foreign power. Having intervened in the Sacred War and crushed the Phocians, he has taken the place of Phocis in the Amphictyonic Council, and has thereby been admitted within the circle of the Greek states. The First Philippic and the three Olynthiac speeches of Demosthenes belong to the first of these periods. The speeches On the Peace, On the Embassy, On the Chersonese, and the two later Philippics, belong to the second. In the Third Philippic, the climax of his efforts before Chæronea, Demosthenes reviews the **progress of Philip from the Hellenic, not merely from the** Athenian, point of view. Philip has destroyed Olynthus, he has ruined Phocis, he has sown dissensions in Thessaly; Thebes is afraid of him; he has gained Eubœa and the Peloponnesus; he is supreme from the Adriatic to the Hellespont; and the last hope of Greece is in Athens. Demosthenes succeeded in winning back Byzantium to the Athenian alliance, and in persuading Thebans to fight by the side of Athenians, but he could not avert the catastrophe of Chæronea.

Second period, 346–338 B.C.

Philip president of a Hellenic league. After the victory which made him master of Greece, Philip deprived Sparta of her conquests in the Peloponnesus. The Messenians, Arcadians, Argives, recovered their old possessions. A congress was then summoned at the isthmus of Corinth. Macedonia and the Greek states were united in a federal league. A federal council was constituted to guard the federal laws, and the Delphic Amphictyony was recognized as a tribunal to which the council should refer any breach of these laws. Philip, representing Macedonia, the most important member of the league, was acknowledged as its head or president. His position in regard to the Greek cities was thus in form much the same as that of Athens or Sparta in former days. It was nominally an hegemony, with somewhat more stringent powers, corresponding to the more systematic constitution of the league. In practice it was military lordship over Greece. Yet Demosthenes had not failed. The [illegible] of the Greek states toward Philip was [illegible] [illegible] that they had given him trouble. Thessaly had actively helped him and had been completely subjugated. The Peloponnesian rivals of Sparta had not been active either in helping or resisting him, and they were now more dependent on Philip than they had formerly been on Sparta. Athens alone had effectively resisted him, and Athens was treated by him with the prudent respect due to a serious antagonist.

Sicily. Timoleon. If Greek liberty had received a fatal blow in Greece **proper, there was another part of Hellas in which, almost** simultaneously, it had been vindicated with splendid success. While Demosthenes was making his heroic resistance to the designs of Macedon, the enemies of Hellenic freedom in Sicily had been encountered with equal vigour and happier fortune by Timoleon. A few years after the defeat of the Athenian armament in 413, Sicily had suffered two invasions of the Carthaginians. Selinus and Himera, Agrigentum, Gela, and Camarina, had successively fallen. The first Dionysius, in consolidating his own tyranny at Syracuse, had been content to leave half the island in the hands of the foreign foe. The feeble misrule of his son, **Dionysius II., produced a series of revolutions. A party** at Syracuse invoked the aid of Corinth. Timoleon was **sent with only 1200 men (343 B.C.). His first work was to deliver Syracuse from the contending forces of Dionysius and a rival named Hicetas, and to restore the Syracusan democracy. His next work was to drive the Carthaginians out of Sicily. He defeated them with crushing effect at** the river Crimesus (340 B.C.). The Sicilian Greeks were now free. Sicily entered on a new period of prosperity, which lasted until Agathocles became tyrant of Syracuse **(317 B.C.). Thus the brightest days, perhaps, of Hellenic** Sicily coincided with those in which the cities of the Hellenic mainland were learning to bear the Macedonian yoke.

405–367 B.C.

The time seemed now to have come for an enterprise which, since the retreat of the Ten Thousand, had been the **dream of many Greek captains, but which none had yet** been in a position to attempt. Philip, in the forty-seventh **year of his age, had declared war against Persia, and was** preparing to invade Asia at the head of an army gathered from all Greece, when he was assassinated by a young **Macedonian noble in revenge for a private affront (336 B.C.). Alexander, Philip's son and successor, was only twenty.** Marching into Greece, he promptly repressed an insurrectionary movement, and was recognized by a new assembly at Corinth as commander-in-chief of the Greek armies. He next marched against the tribes on the northern borders of Macedonia. While he was absent on this expedition the Thebans rose against the Macedonian garrison. Alexander returned, took Thebes, and razed it to the ground (335 B.C.). At Corinth he received the homage of the Greek states and then returned to Macedonia.

Death of Philip. Accession of Alexander.

Alexander was now free to execute the design of Philip. As captain-general of Hellas, he went forth to invade the Persian empire, and to avenge the wrongs suffered by Greece at the hands of the first Darius and of Xerxes. The army with which he crossed the Hellespont in 334 B.C. numbered perhaps about 30,000 infantry and 5000 cavalry. It was composed of Macedonians, Greeks, and auxiliaries from the barbarous tribes on the Macedonian borders. The devotion of native Macedonians to their hereditary king was combined with the enthusiasm of soldiers for a great general. Even if the military genius of Alexander had not been of the first order, his personal authority over his Macedonian troops, and through them over the rest, would still have been greater than was ever possessed by a Greek citizen commanding fellow-citizens.

Alexander invades Asia.

Three stages of his career. Alexander's career of conquest has three stages, marked by his three great battles. The victory at the Granicus (334 B.C.) gave him Asia Minor. The victory at Issus (333 B.C.) opened his path into Syria and Egypt. The victory at Arbela (331 B.C.) made him temporary master of the whole East. In accomplishing the first two of these stages Alexander was not compelled to assume any new character. The king of Macedon, the elective captain-general of Greece, needed no other titles by which to hold the lands to which he came as a deliverer from Persia. The later history of these lands is the proof. Asia Minor was by degrees thoroughly Hellenized, and remained Greek till the Turks came in the 11th century. Syria and Egypt were not indeed Hellenized as whole countries, but their capital cities, Antioch and Alexandria, were Hellenic; and the control established by Alexander was retained by Macedonia or by Rome for centuries. At the third stage, however, Alexander's conquests entered upon an entirely new phase, and compelled him to take up an altogether new position. Neither in his Hellenic nor in his Macedonian capacity could he put forward any effective claim to hold the Persian empire proper,—the empire stripped of its Egyptian, Phœnician, and Hellenic dependencies. He could hold Persia only as a Persian king, as the successor of those Achæmenid kings whose dynasty he had overthrown. The constitutional king of Macedonia, with limited prerogatives, the elective captain of Greece, must now assume a third and distinct character. He must be also a Persian king, a constitutional despot. The merely European influences represented by Alexander might leaven the East, but they could not lastingly possess or transform it. Hellenic cultivation, like Roman power, was not permanently introduced over any wide area east of the Euphrates. This fact is enough to illustrate the enormous difficulty of the task which Alexander had undertaken. It seems not impossible that policy may have been mingled with vanity in his exaction of divine honours. Greeks or Macedonians could never pay him the slavish homage which Persian subjects rendered to their king. But the contrast between European and Asiatic royalty would at least be less glaring if the master of Persia were also acknowledged as the son of Zeus Ammon.

Greek settlements in Asia.

The colonies planted by Alexander in his progress through Asia make the beginning of a new period in Hellenic history. Hitherto we have had to do with a people whose Hellenic unity rests, not merely on community of language and civilization, but also upon community of blood. Now, by the side of this natural Hellenic nation, there arises an artificial Hellenic nation, with a common language and civilization, but not exclusively of Hellenic blood. The Macedonians may be regarded as the founders of this artificial nationality. They were doubtless of a stock kindred to the Hellenic; in what degree, it is less easy to say—but (with the exception of their kings) they were generally regarded by the Greeks as standing half-way between Greeks and barbarians. Philip did much to Hellenize Macedonia; and the Macedonian colonies of Alexander became in their turn centres from which the influence of Hellenic civilization was diffused through Asia. Henceforth there are two Hellenic types: the Greek of Greece proper, who preserves in some degree the marked individuality of the old Greek character; and the Asiatic Greek, more readily affected by foreign surroundings, more pliant and less independent. The history of the modern Greek nationality dates from the days of Alexander.

Results of Alexander's conquests.

The results of Alexander's conquests were beneficent chiefly in two ways: first, by liberating the hoarded treasures of the Eastern kings, and so stimulating industry and commerce; secondly, by opening Asia to a new civilization, which helped to promote intellectual and moral progress, even in those places where its influence was limited or transient. In the process of doing this much that was valuable may have been destroyed. But it can hardly be questioned that on the whole the gain far outweighed the loss. If Alexander had not died at the age of thirty-two, leaving his work unfinished, it would perhaps have been easier to judge how far he deserves the credit of having contemplated these benefits to mankind. There is nothing to show that he intended to govern otherwise than as an absolute ruler, with a better machinery for controlling his subordinates than had been possessed by the Persian kings. Such a view is not inconsistent with the fact that his colonies enjoyed municipal freedom. Nor can it be proved that he meant his colonies to be anything more than military strongholds or commercial centres. But it may at least be said that, if his object had been to diffuse Hellenic cultivation over Asia, he could have adopted no more effectual means. It is conceivable that, in his vision of that complex empire which imposed such almost irreconcilable tasks upon its ruler, the idea of engrafting Eastern absolutism on Greek politics may have co-existed with the idea of Hellenizing Asiatic society

In that period of Hellenic history which closes with Alexander we are tracing the gradual development of a race with special gifts of mind and body, which strongly distinguish it from all other races. The Hellenes set the Hellenic stamp on everything which they create,—first, on their language itself, then on their politics, their literature, and their manners. Every element of their life receives its mature shape from themselves, even when the germ has been borrowed; the Hellenes are an original people in the sense that they either invent or transform. At a very early time they have the political life of cities, and they never rise from the conception of the city to the higher unity of the nation. Their love of clear outline and their sense of measure shrink from every vague abstraction; the principle of order itself is by them identified with "the limit"; the indefinite is a synonym for disorder and evil. The city, an easily comprehended whole, satisfies this instinct; but there is room within its framework for the gradations of monarchy, oligarchy, democracy; for the various modes of acting and thinking which characterize Achæans, Dorians, Ionians. As the leading commonwealths grow to maturity, two principles of government stand out in contrast,—oligarchy and democracy. Each is represented by a great city round which the lesser states are grouped. The inevitable collision comes, and the representative of democracy is at last vanquished But in the hour of victory oligarchy is discredited by the selfish ambition of its champion. A time of political confusion follows, in which no one city can keep a leading place. Separate interests prevail over principles; public spirit declines. The disunion of the cities—incurable, because arising from a deep inner decay—enables the crafty king of a half-barbarian country to make himself the military dictator of Greece. But just when the better days of Hellenic civilization seem to be over, a new career is opened to it. Men who are not of Hellenic blood help to diffuse the Hellenic language, thought, and manners over a wider field; and the life of the modern Greek nation begins. (R. C. J.)

SECTION II.— POST-CLASSICAL GREEK HISTORY.

The later history of the Greeks, from the end of Alexander the Great's reign to the taking of Constantinople by the Turks, may be divided most naturally into five periods, viz.—I. The period of Greek subjection: from the death of Alexander to the accession of Constantine the Great as sole emperor, 323 B.C. to 323 A.D. II. The period of Greek revival: from Constantine the Great to Leo III. (the Isaurian), 323–716 A.D. III. The period of Byzantine prosperity: from Leo III. to Isaac I. (Comnenus), 716–1057 A.D. IV. The period of Byzantine decline: from Isaac I. to the taking of Constantinople by the Latins, 1057–1204 A.D. V. The period of Greek survival: from the taking of Constantinople by the Latins to its conquest by the Turks, 1204–1453 A.D.

In the limited space of an article like the following, it is impossible to enter into detail with reference to the events of any of these periods. It may be well therefore if we turn our attention especially to the causes which were from time to time at work, to the characteristics and tendencies of various ages, and to the changes that came over society.

Importance of the post-classical history.

The history which we thus enter upon is of importance and interest in a different way from that of the classical age of Greece. That age was a unique development in respect of national life and character, of social and political institutions, and of every form of cultivation, and was marked by concentrated energy and intense vigour. The later period is important because of its wide-reaching influence on the world at large, and because it is one, and that the more continuous, of the two great chains of events, in eastern and western Europe respectively, which connect the earlier and later history of civilized man. To the younger student, who is already acquainted with the previous history of Greece and Rome, and has learnt something of the condition of the modern world through the history of England, no other period is probably so instructive and suggestive. He is led into byways of history and remote countries, which have in themselves an element of romance. He comes into contact with races from every branch of the human family in the freshness of their early vigour; and amongst many other lessons he learns one, which cannot be learnt too early, and which historians and students of history are disposed to overlook, that the unfortunate are not therefore to be despised. To more advanced students its value consists in its explaining the existing state of things in a considerable part of Europe and Asia, which cannot be explained otherwise; and still more in the illustrations it affords, both by way of similarity and contrast, to circumstances in the history of western Europe; such, for instance, as the abolition of serfdom, the relations of immigrant races to the original inhabitants, and systems of law and finance. Besides this, so much civilization filtrated from the East to the West in the course of the Middle Ages that a knowledge of Byzantine history is necessary to a proper understanding of that of western Europe. It will suggest also, if properly studied, that while battles, sieges, and other salient events may be the turning points of history, the inhabitants of any particular country are more affected by influences which lie below the surface—by alterations of trade routes and changes in the tenure of land, by the effects of judicious or injudicious taxation, by the administration of justice, and by the relations of different classes to one another.

Misconceptions [illegible] later Greeks.

It is desirable at starting to notice two misconceptions which have prevailed, and in a less degree still prevail, with regard to different portions of this period. The first of these concerns the character of the Greeks during the time of their subjection to the Romans, and in particular under the early emperors, in which age they are often supposed to have been a degraded and unprincipled race. Such expressions as the "Graeculus esuriens" and "Graecia mendax" of Juvenal, and similar ones which are found in Tacitus and other writers of that time, have become proverbial, and have been taken to describe, as those writers undoubtedly intended them to describe, the people at large. There was some justification for the satire of Lucian, that the Romans speak truth only once in their lives, and that when they make their wills. The fact is that these denunciations represent faithfully enough the lower class of Greek adventurers who came to Rome from Alexandria and the Asiatic cities to seek their fortunes, and the Roman writers, with their usual contemptuous ignorance of everything provincial, confused these with the Greek nation. The later Greeks no doubt had degenerated from their great forefathers; but it is only fair to remember that this was to a great extent the result of their circumstances. The rapid growth of Greek culture and Greek political ideas was naturally followed by rapid decay. In sculpture the early archaic style developed in a few decades of years into the manly and perfect style of Phidias, and the change was equally rapid to the luxurious style of Praxiteles, in which the elements of decadence were already traceable. The same thing is apparent in the history of the drama. And in like manner in politics, the constitutions of the various states, which were so well suited to the development of Greek individuality, contained in themselves no element of permanence, owing to the opposing elements which were brought face to face within so narrow an area; and in their relations to one another, all combination on a large scale was prevented by what has been aptly called the "centrifugal" character of Greek politics, so that they were destined inevitably to fall under the dominion of any great empire that should arise in their neighbourhood. Again, it must never be forgotten that the splendid products of Greek genius and Greek character sprang from the black soil of slavery, and could not have existed without it; so that here too we find an element of rottenness, which was sure in the end to produce decay. Consequently, from the time the Greeks lost their liberty, they ought in all fairness to be judged by a different standard from their predecessors, and we ought to be satisfied if we find in them such good qualities as characterize a more ordinary people—industry, respectability, intelligence, good citizenship, capacity for local self-government, and readiness to make the most of their opportunities. In all these respects the Greeks were among the best of the provincials of the Roman empire.

Power of the Byzantine empire.

The other misconception relates to the Byzantine empire, which has been commonly regarded as a period of steady decline and feebleness and decrepitude. The author who is mainly responsible for the prevalence of this view is Gibbon; and it is strange that a writer who was gifted with such profound historical insight should not have perceived that the state which accomplished such great things could not have been powerless. The passage in which he expresses himself on this subject is well known. "I should have abandoned without regret," he says, "the Greek slaves and their servile historians, had I not reflected that the fate of the Byzantine monarchy is passively connected with the most splendid and important revolutions which have changed the state of the world." Yet it was this same empire which kept back for centuries, and ultimately survived, first the Saracens and afterwards the Seljuks, both of which peoples would otherwise have overrun Europe; and which, even in its decline, kept at bay, for more than a hundred years, the Ottomans when at the height of their power, thereby providing the Western nations with a breathing space, without which the career of Turkish conquest would certainly not have been arrested at Vienna, but might have extended to the Rhine or the Seine. During the 8th, 9th, and 10th centuries its military power was the strongest in Europe, and the skill and prowess of its generals was unrivalled, while at the same time its long succession of able emperors and administrators is such as no other monarchical government can show. Its influence is further shown by its missionary efforts, resulting in the conversion to Christianity of the southern Slavonic nations and the Russians, and the consequent spread of civilization throughout the countries they inhabited; by its widely extended commerce both by land and sea; and by its art, especially its architecture, which contributed to the formation of other styles from Egypt to the north of France, and from Russia to Spain. Finally, its social and political [illegible] appears in the state of education, in the regularity of its administration, especially in the matter of justice, and, above all, in the legal standard of the coinage being maintained invariable from first to last, which is a rare proof of a highly organized system. When its situation in the midst of barbarous nations is considered, and the intermediate position it occupied between Asia and western Europe, it may safely be pronounced one of the most powerful civilizing agencies that the world has seen.

I. *Period of Greek Subjection, from the Death of Alexander to the Accession of Constantine the Great as sole Emperor, 323 B.C. to 323 A.D.*

Effect of Alexander's conquests.

The conquests of Alexander the Great differed from those of almost every other great conqueror in this that they were followed up by a scheme of civil government, the object of which was to secure the well-being and promote the civilization of all his subjects. That he was not the ambitious madman which he is often represented as being is amply proved by the forethought with which his campaigns were planned, and by his attention to the commissariat and to other details connected with the transport and maintenance of his vast armies. But his true greatness is most clearly shown by his endeavouring to introduce unity into his vast empire, not by subjecting one race to another, or crushing out the hope of further resistance by an iron rule, but by establishing in it centres of permanent institutions and common culture. These were the Greek colonies with municipal government which he founded at intervals throughout Asia. By these the subject countries, without being forced into a common mould, or organized in defiance of their feelings and prejudices and without reference to their national institutions, were gradually leavened by the system that existed among them, and obtained a certain infusion of the Hellenic character and Hellenic modes of thought. Though Alexander himself did not survive to complete his project, yet enough had been accomplished at the time of his death to leave its influence firmly imprinted, even when his empire fell to pieces and was partitioned among his generals. The consequences of this to Asia were of incalculable importance, and continued unimpaired until the tide of Mahometan conquest swept over the country; and even then it was from Greek literature and art that the Arabs obtained the culture for which they have been celebrated. But its effect was hardly less marked on the Greeks themselves. The Hellenic world was henceforth divided into two sections—the Greeks of Greece proper, and the Macedonian Greeks of Asia and Egypt. Between these there existed a common bond in similarity of education, religion, and social feelings, in the possession of a common language and literature, and in their exclusiveness, whether as a free population ruling a large slave element, or as a privileged class in the midst of less favoured races; but the differences were equally striking. The former retained more of the independent spirit of the ancient Greeks, of their moral character and patriotism; the latter were more cosmopolitan, more subservient, more ready to take the impress of those among whom they were thrown; in them the Ulysses type of Greek character, if we may so speak—its astuteness and versatility—became predominant. This distinction is all important for the subsequent history, since, in the earlier period, it is rather the Greeks of Hellas who attract our attention, whereas after the foundation of Constantinople the Macedonian Greeks occupy the most prominent position. At the same time a change passed over the Greek language; while the ancient dialects were retained, more or less, in the provinces of Greece proper, the Attic dialect became the court language of the Macedonian monarchs, and was used almost exclusively by prose writers. Gradually Macedonian and other provincialisms crept into it, and it was modified by simpler expressions, and words in more general use, being substituted for those preferred by the classic writers of Athens; and thus was formed what was called the common or generally used dialect. The non-Greek inhabitants of the countries in which the Greeks were settled were described as "Hellenizing," and consequently their language, such as we find it in the Septuagint and the New Testament, was called Hellenistic Greek. The literary spirit also migrated to Alexandria, which became for a time the home of the principal Greek culture, and nurtured the genius of Theocritus, the first of pastoral poets, the taste and erudition of Aratus and Apollonius Rhodius, and the research of Aristarchus and other eminent Homeric critics.

Events during 323–146 B.C.

The period of somewhat less than two centuries (323–146 B.C.) which intervened between the death of Alexander and the conquest of Greece by the Romans was a sort of twilight between liberty and subjection. The Lamian War, as the contest between a number of the Grecian states, with Athens at their head, and Antipater, one of Alexander's immediate successors in Macedonia, was called from the siege of Lamia, which was its most prominent event, soon convinced the Greeks that it was idle for them to struggle single-handed with their great neighbour. After that the country formed a bone of contention between the neighbouring potentates in Macedonia, Asia Minor, Syria, and Egypt; and most of the states, with the exception of Sparta, were in the power sometimes of one sometimes of another of them, though the contests of their masters secured them from time to time a partial independence. At length the constant danger to which their liberties were exposed suggested the necessity of some kind of combination on the part of the separate states, and the famous Achæan league arose (280 B.C.), which revived the dying energies of the Greeks, and has thrown a lustre over their period of decline. For the origin of this federation we must go back to the early history of the district of Achaia in northern Peloponnesus, the inhabitants of which, from being isolated from other races by their position between the Arcadian mountains and the Corinthian Gulf, and occupying a succession of valleys and small plains, found a federal union to be the most natural political system by which they could be held together. Throughout the greater part of their history this people exercised little influence on the fortunes of Greece, but in her time of greatest need they came forward as her champions. The league was now revived, with a more definite organization and a wider political object, and under the leadership of Aratus, the greatest of its early "strategi," it wrested Sicyon from the power of its tyrant, and Corinth from the hands of the Macedonians, until at last it embraced Athens, and almost the whole of the Peloponnesus. Unfortunately Sparta held aloof. That city, which had succeeded in maintaining its independence, had fallen into the hands of a narrow oligarchy of wealthy proprietors, who rose in violent opposition to their reforming kings—men whose names would be a glory to any period—Agis and Cleomenes, and succeeded in putting the first to death, while the latter was enabled to overpower them through the influence won by his military successes. But circumstances involved Aratus in a war with Sparta, and here the old Greek spirit of discord betrays itself. When hard pressed by Cleomenes, the Achæan leader applied to the Macedonians, and the result was that Antigonus Doson invaded the country, and at Sellasia inflicted a final and crushing blow on the Spartan power (221 B.C.). The same spirit appears in the Social War, which occurred shortly after this between the Achæans and the Ætolian league, a similar confederation in northern Greece, and was fomented by Philip V. of Macedon. Subsequently, when the Romans made war on Philip for assisting the Carthaginians in the Second Punic War, the consul

Flamininus persuaded both these powers to join in attacking him. At Cynoscephalæ in Thessaly, not far from the scene of a greater battle, Pharsalia, the power of the Macedonian monarchy was broken (197 B.C.), and Philip renounced his supremacy over the Greeks, to whom Flamininus proclaimed their freedom at the ensuing Isthmian games. The final overthrow came in the time of Perseus, the son of Philip, who was defeated at Pydna (168 B.C.), and his dominions, with the adjacent parts of Greece, were reduced to the form of a Roman province. The later years of the Achæan league had been illumined by the leadership of Philopœmen, "the last of the Greeks," as Plutarch has called him, in whose time the whole of the Peloponnesus, including even Sparta, was for a time included in the alliance. But the days of Greece were numbered, and the only question was how soon the remainder should be absorbed by the advancing tide of Roman conquest. At last a pretext for interference presented itself, and the reduction of the country to bondage was signalized by the pillage and destruction of Corinth under Mummius (146 B.C.). The entire area southward of Macedonia and Epirus was constituted the province of Achaia, the title of which thus perpetuated the name of the Achæan league. The struggles in which that and the Ætolian confederation had taken part are an evidence of the revival of a spirit of patriotism in the breasts of the Greeks, and we may well lament over the ruin of their independence; but the truth must be told that this was not the feeling of the majority of the population at the time. The selfishness and cupidity of the Greek aristocracy, such as those whom we have already noticed at Sparta, had imposed so heavy burdens on the people that the great body of them cheerfully acquiesced in the Roman rule. Polybius has preserved to us the saying which expressed the sentiment of the time: "If we had not been quickly ruined, we should not have been saved."

Roman conquests in the West and East.

From the time of the Roman conquest the existence of Greece was merged in that of a greater political unity, so that for the next four centuries, until the commencement of the barbarian inroads, it can hardly be said to have a history of its own. But we must not on this account suppose that the Greeks occupied exactly the same position as the rest of the Roman provincials. In this respect there is a marked difference between the results of the Roman conquests in the West and the East. The inhabitants of the western portion of the empire were at the time of their subjection in a low state of civilization, and destitute of any element of strength in their social and national life. It was natural, therefore, that nations so undeveloped should easily receive the impress of Roman institutions, and should adopt the manners and ideas of their conquerors. The Romans in fact treated them for the most part as inferior beings and did not at first even regard them as absolute proprietors of the lands they cultivated. But in the East the case was different. There the Romans met with a civilization more advanced than their own, which they had already learned to respect, and an elaborate system of civil government and social usages which could not be set aside without undermining the whole fabric of society. Hence the Greeks, while subjected to the Roman administration, were allowed to retain a great part of their institutions, together with their property and private rights, and, from their superiority to the other conquered peoples, remained the dominant power in the East. Even in Asia the despotism of Rome was much modified by the municipal system of the Greek cities and by the influence of Greek culture. Thus it came to pass that, while the Western nations were assimilated to Rome, in the East the Romans rather became Greek, though the Greek nation never became Roman. The effects of this are visible at every turn in the subsequent history, and to this cause may be referred many anomalies which are traceable at the present day in the condition of eastern Europe.

Roman rule in Greece.

It was a part of the Roman policy, in dealing with conquered countries, to treat them at first with mildness, until they became inured to the yoke, and when this was the case, and precautionary measures had been adopted to prevent the possibility of successful revolt, to deal with them more harshly and increase their burdens. This was what happened in the case of Greece. For some time the people at large had no reason to regret the change. The fact of their subjection was not impressed too forcibly upon them, and several cities, such as Athens and Sparta, were allowed to rank as allied states. Their taxes were not increased, and they did not at once perceive the difference caused by the money that was levied being taken out of the country instead of being spent in it. This was, however, the most systematically ruinous part of the Roman system. The Government never paid attention to the provinces for their own sake, but regarded them as an instrument for maintaining the greatness and power of Rome. The immense sums that were drained from them never returned, but were expended in the maintenance of the Roman army, and in the public games and architectural embellishment of the metropolis. Objects of local usefulness, such as roads, ports, and aqueducts, received no attention from the central authorities, and no money was supplied towards their maintenance. Within a century also, when these evils were beginning to make themselves felt, the Roman rule became very oppressive. Though the custom duties were not unreasonable in their nominal amount, they became exorbitant through the system of farming and subletting, and as a special tribunal existed for the enforcement of the collectors' claims, the farmers exercised a most tyrannical power over the mercantile population of the shores of the Mediterranean. In the wake of these harpies followed the usurers, to meet whose claims proprietors had constantly to sell their possessions. The direct weight of the public burdens was further increased by the exemptions enjoyed by Roman citizens in the provinces, and by privileges and monopolies which were granted to merchants and manufacturers; and large sums had to be paid to the Roman governors, both for the maintenance of their establishments, and to obtain exemption from the quartering of troops. But these more or less authorized exactions bore no proportion to the illegal extortions of the proconsuls, who simply pillaged the provincials. No more perfect scheme could have been devised for promoting oppression than that under which these officers were appointed. While on the one hand they superintended the financial administration, on the other they exercised the judicial power; and the only tribunal to which they were responsible was that very senate by which they were appointed, and of which they themselves were members. A governor like Verres had it in his power to ruin a province for several generations, and such instances were not rare. The treatment of Greece in this respect was no exception to the general rule.

The period, however, during which the greatest injury was inflicted on Greece was that of the Mithradatic War (86 B.C.). At the commencement of that struggle many of the leading men and states declared in favour of Mithradates, thinking that under his auspices they might regain their freedom. But the appearance of Sulla with an army soon undeceived them, and they laid down their arms, with the exception of Athens, which was only reduced after an obstinate defence. When the city was at last taken by storm, the majority of the citizens were put to the sword, their possessions seized by the soldiers, the Piræus utterly destroyed, and Attica ravaged. In the same campaign Delphi and the other principal shrines were plundered, and an immense amount of property was ruined throughout the country. Great injury was also inflicted by the Cilician pirates. The existence of these was a result of the jealousy with which the Roman Government regarded the maintenance of armed forces by the provincials, either by land or sea, lest they should be made an instrument of revolt; and since they had no interest in maintaining order, except where their own authority was threatened, the subject nations were so far from profiting by their protection that they were exposed to attack without possessing the power of defending themselves. The confined seas and numerous bays and islands of Greece have always been favourable to piracy, and at this time the evil reached such a height that the welfare of the state was threatened, and Pompey was entrusted with the office of eradicating it; but before this was accomplished many of the wealthiest cities in Greece and Asia Minor had been attacked and pillaged. With the accession of Augustus a brighter era seemed to have dawned; and under the early emperors, who desired to strengthen themselves against the senate, the interests of the provincials were more considered. Greater regularity also was introduced into the taxation, by the land and capitation taxes being regulated by a periodical census. But the old evils to a great extent remained, and these were further aggravated at a later time by the depreciation of the coinage, which proceeded with fearful rapidity, and caused widespread distress among the commercial and labouring classes.

Condition and character of Greeks. The result of these changes is traceable in the condition and character of the Greek people. The conquests of Alexander the Great suddenly threw into circulation the accumulated treasures of the Persian empire, and a great part of these passed into the hands of the Greeks, both in Asia and Europe. The facilities thus created for obtaining wealth increased the material prosperity of the Greek race at large, so that in all probability it never was more numerous than during the period immediately preceding its subjugation by the Romans. Though all calculations respecting the numbers of the population in ancient states are necessarily hazardous, yet it seems probable that the Greeks at that time may have amounted to more than seven millions. But with Greece proper the case was different. There the increase of wealth raised the standard of living considerably above what it had been in earlier and more frugal times, so that the less moneyed class were tempted to emigrate in large numbers to seek their fortunes in the great Asiatic cities, and in the service of the Eastern monarchs, where so great openings presented themselves. The decrease of this class produced a larger accumulation of property in the hands of large owners, and greatly augmented the number of slaves. Under the Romans the wealth of the country, great as it was, was soon dissipated by fiscal exactions, by plunder in war and the private pillage of officials, and by the confiscation of the possessions of individuals, with a view to which a system of accusations was regularly promoted. The natural result of this, combined with the self-indulgent habits which had grown up among the upper classes, was a steady diminution of the population. The first of the Romans who perceived the evils arising from this state of things, and endeavoured to remedy them, was the emperor Hadrian, who had the merit of personally visiting the provinces, and whose tastes naturally led him to sympathize with the Greeks. Though much of the money which he expended in the country in the construction of temples and other splendid edifices tended to the gratification of his private fancies, yet a real improvement in the condition of the people was effected by his restoration of the roads which had fallen out of repair, and the erection of baths and aqueducts. He also lightened the taxation, and raised the Greeks to the rights of Roman citizenship, thereby anticipating the edict of Caracalla, by which that privilege was extended to all the free inhabitants of the empire (212 A.D.). The depopulation of Greece, however, continued; but while in this way the power of the nation was being weakened, and its material resources diminished by the loss of much of the capital that had been invested in the improvement of the country, the actual condition of the inhabitants was for the time improved, because the decrease in their numbers had been more rapid than the destruction of property. Possessing the necessaries of life in abundance, and having but little money to spend on anything beyond, they sank into that condition of indifference and ease in which at last the barbarian nations found them.

It has already been remarked that the character of the Greeks at this period ought not to be judged from the prejudiced statements of Roman writers, nor by reference to the standard of their great forefathers. The introduction of the wealth of Persia had undoubtedly a demoralizing effect on the nation, both in Asia and Europe; but when we consider that throughout a great part of the area that they occupied they were long the dominant class, and had hardly any check to restrain them in the indulgence of their passions, it is rather a matter for wonder that they resisted temptation so far as they did. At least they never sank to such a depth of degradation as the Romans of the imperial times, and in Europe the struggles of the Achæan league show that a value was still set on manly virtues. After this the Greeks became the educators of the Romans, whose upper classes resorted for instruction to the university of Athens; and if the rhetoric and philosophy which was taught there partook sometimes of the nature of literary trifling, and the instructors themselves were characterized by vanity and pedantry, they maintained at all events the standard of cultivation in the world at that time. The love of art still prevailed amongst them, and the quiet, studious life of the Greek cities formed in the eyes of many a favourable contrast to the violent struggles and inordinate passions of Rome. But the disbelief in the national religion which had grown up among the educated classes, notwithstanding the maintenance of the temples and their worship, tended to cause a separation between the upper and lower grades of society; and this, together with the isolation produced by the great size of the estates, which withdrew individuals from the scrutiny of their fellow citizens, weakened the force of public opinion, and thus lowered the moral standard. It can hardly be doubted that the consciousness of this, and the feeling of the need of a higher morality, was one main cause of the eagerness with which philosophy continued to be pursued by the Greeks, since in it they hoped to find the groundwork of truth and justice. Thus during a period of six centuries the European Greeks had gradually degenerated, though for the most part from causes external to themselves; they seemed to have become an insignificant and almost commonplace people. Yet the outline of the character was the same, though the colours had faded; and considering the length of the time, and the agencies at work, we may be surprised at finding that the change had not been greater. It remained to be shown that the finer qualities and more vigorous elements were only dormant; and this was brought to light in the latter half of the third century by two influences, which we must now proceed to explain.

Gothic invasions. The first of these was the invasions of the Goths. These were the earliest of the barbarians to break through the Roman frontier, and the defeat and death of the emperor Decius in Mœsia (251 A.D.), and the subsequent incursions of the Goths into Thrace and Macedonia, warned the Greeks of the peril that impended over them. Immediately the walls of Athens were repaired, the fortifications across the isthmus of Corinth restored, and vigorous preparations made for defence. The invaders soon made their appearance both by land and sea, and one division, landing at the Piraeus, succeeded in carrying Athens by storm; but an Athenian of rank called Dexippus, afterwards the historian of these events, succeeded in assembling a sufficient force to compel them to retire. This reverse was the prelude to their total overthrow, for succours were meanwhile arriving from Italy, by which their separate bands were attacked in detail and destroyed. Some years later, after other inroads, during which many cities of Greece successfully defended themselves, the power of the Goths was broken by the emperor Claudius II. at the great battle of Naissus (269 A.D.). But it was clearly proved at this time that the spirit of the Greeks, which had had no opportunity of displaying itself since the siege of Athens by Sulla, was not extinct, and that, if they had been unwarlike in the interval, it was mainly because their masters had denied them the use of arms. It is not to be overlooked that, when the same barbarians subsequently attacked the Western empire, it went down before them, the reason being that the nations of the West had no such distinctive nationality as the Greeks, and no such municipal institutions to rally round. Anyhow the Greek character was benefited by the public spirit thus evoked, and by the activity infused into society by the feeling that every man might be called on to defend his person and property.

Christianity.

The other and far more important influence which regenerated the Greeks at this time was Christianity. This religion, which had long been working in secret, though in ways which it is almost impossible to trace, now began to produce a marked impression on Greek society. Its power was the greater because it had worked from below upward, and had permeated to a great extent the lower and middle classes. It improved the moral condition of the Greeks by elevating their views of life, by quickening the conscience, and by infusing earnestness into the character; and it renovated their social condition by pointing out to them their duties to one another, by encouraging corporate feeling, and in particular by purifying the domestic relations through its influence on the female sex. At the same time the habit of meeting for the administration of their communities accustomed the Christians to discussion and action in common, and the fact that they formed a powerful corporation independent of the state, which was the reason why they were persecuted by the Roman authorities, was in itself a means of political education. Such an influence, which not merely pervaded every relation of life, but penetrated also to the motives and springs of action, is sufficient of itself to account for the regeneration of the Greeks, which the historian traces in its effects at the end of the 3d century.

The scene now changes, and from the land of Hellas our attention is transferred to the city of Constantinople.

II. *Period of Greek Revival, from Constantine the Great to Leo III. (the Isaurian), 323–716 A.D.*

The principal events of the first half of this period, the two centuries which intervened between Constantine and Justinian, are—the foundation of Constantinople (330 A.D.), the emperor Julian's attempted restoration of Paganism (361), the defeat of Valens by the Goths near Adrianople, and his death (378), the establishment of Christianity by Theodosius the Great as the religion of the empire (380), the partition of the Roman empire between Arcadius and Honorius (395), the publication of the Theodosian code (438), and the extinction of the empire of the West (476). The reign of Justinian (527–565) comprises the great conquests of Belisarius and Narses, whereby the kingdom of the Vandals in Africa was overthrown, and Sicily, Italy, and southern Spain were restored to the Roman empire, the Greek possessions in Italy being henceforth governed by an exarch, who resided at Ravenna; the building of the church of St Sophia at Constantinople; and the reformation of the Roman law. Finally, in the century and a half between Justinian's death and the accession of Leo III., occurred the birth of Mahomet (571); the victorious expeditions of Heraclius against the Persians (622–8); and the seven years' siege of Constantinople by the Saracens in the reign of Constantine Pogonatus (668–675).

Reforms of Constantine.

The reforms effected by Constantine formed one of the greatest revolutions the world has ever seen, and his sagacity is shown by the completeness with which they were carried out, and by the permanence of their effects, for from them proceeded both the strength and the injuriousness of the Byzantine system, which lasted even to the latest days of the empire. To describe them in brief,—he centralized the executive power in the emperor, and constituted a bureaucracy for the administration of public business; he consolidated the dispensation of justice throughout his dominions; he rendered the military power, which had hitherto been the terror and bane of the state, subservient to the civil power; he adopted a new religion, and established a new capital. Henceforth the world was ruled by the emperor and his household, and this administration was wholly irresponsible; and as the interests of the Government were unconnected with those of any nationality and any class of its subjects, there was sure to be a continual struggle between the rulers and those whom they governed. In order that the emperor might be regarded as a being of a different order from the people, he and his court were surrounded by lavish splendour; and in order to check the ever imminent danger of rebellion through pretenders to the throne, the offices of the court were made magnificent prizes, so that ambitious persons might feel that advancement could be obtained by a safer method than civil war. But to meet these expenses, and at the same time to maintain a powerful army, an elaborate system of taxation was necessary; taxation, in fact, came to be regarded as the first aim of government, and the inhabitants of the empire were impoverished for objects in which they had no direct concern. The principal instrument which Constantine used for enforcing this was the Roman municipal system, and this he introduced into Greece, notwithstanding the existence of a national and traditional organization. According to this, each town, with the agricultural district in its neighbourhood, was administered by an oligarchical senate called the *curia*, elected from among the landed proprietors; by them the municipal officers were appointed, and the land tax collected, for the amount of which they were made responsible, while those who did not possess land, such as merchants and artisans, paid the capitation tax, and formed an inferior class.

Caste system.

As wealth declined, the oppressiveness of this system was more and more felt, especially as the private property of members of the *curia* was confiscated when the required amount was not forthcoming; and hence, in order to prevent a further diminution of the revenue, an elaborate caste system was subsequently introduced, which fixed the condition of every class and required a son to follow the calling of his father, lest the number of persons liable to a certain kind of taxation should decrease. With the same view, the free rural population came to be tied to the soil, to prevent the ground from falling out of cultivation. Since, however, it was foreseen that such a system would produce discontent, the people everywhere were carefully disarmed, and the profession of arms was made a thing apart, the military class being separated from all others. For the same reason barbarians were much used as troops, because they could have no sympathy with the citizens. The harshness of the system caused general poverty, and deep-seated hatred of the central government, often resulting in a disposition to call in the barbarians; while its jealousy was the cause of the weakness of the empire, because the provincials, who were really stronger than their invaders, were never allowed to defend themselves. In the West it contributed greatly to the overthrow of the empire, and in the East it repressed the spirit of Hellenic life by interfering with the ancient city communities; and though the force of the Greek character, and the social condition of the countries they inhabited, saved them from destruction, yet, as we look down the long vista of succeeding ages, we may see its baneful effects producing ever-increasing misery.

Its merits. Yet we must not overlook the strong points of Constantine's system. The first of these was the regular administration of justice which he introduced. This the inhabitants of the empire felt they could not obtain elsewhere, and the possession of it reconciled them to many otherwise intolerable grievances. So conscious were succeeding emperors of this that we find strictness observed in this matter until quite a late age of the Byzantine empire. Another was the amount of ability and experience which it secured for the public service. We have called the administrators of public affairs a bureaucracy, and the household of the emperor, but they were not the less a body of most highly trained officials, thoroughly organized in their various services. Each department of the state formed a profession of itself, as completely subdivided, and requiring as special an education as the legal profession at the present day. The perfection of this machinery accounts for the empire not having fallen to pieces in times of internal dissension, sometimes accompanied by foreign invasion; and the facilities it afforded for developing talent are seen in the long succession of able administrators which the system produced, and which came to an end at the commencement of the 11th century, when it began to be disused. And besides this, though the rigorously oppressive taxation was impolitic as well as injurious, yet it may be doubted whether any other system than the high-handed centralization which has been described could have prevented dissolution. Its force is certainly proved by its vitality, and the first great dismemberment in particular was brought about, not by internal causes, but by the power of the Saracens.

Constantinople. The choice of the site of New Rome—which is perhaps the finest position in the world, as it commands the meeting-point of two great seas and two great continents, and rises in seven hills on its triangular promontory between the Propontis and its land-locked harbour the Golden Horn—is an additional proof of the penetration of Constantine; and the event justified his selection, for on numerous occasions nothing else than the impregnability of the seat of government could have saved the empire from destruction. Though the establishment of a new capital was in itself a consummate stroke of genius, yet to some extent it was forced upon the emperor by his conversion to Christianity, for this placed him in direct antagonism to Old Rome, which was still the headquarters of paganism. And whatever might be the feelings of the people, on the part of the administrators themselves the prepossessions to be overcome in deciding on such a change were less than might be supposed, for the government, absorbed as it was in the unceasing care of maintaining and defending the empire, had long ceased to be Roman in its sympathies, and had become cosmopolitan. The new city at the time of its foundation was Roman: its senators were transported thither from Rome; the language of the court was Latin; and the condition of the lower classes was assimilated to that of the old capital by their being exempted from taxation and supported by distributions of grain. But from the first it was destined to become Greek; for the Greeks, who now began to call themselves Romans, an appellation which they have ever since retained, held fast to their language, manners, and prejudices, while they availed themselves to the full of their rights as Roman citizens. Hence, in Justinian's time, we find all the highest offices in the hands of Greeks—not Hellenic Greeks, but a Græco-Roman caste, the descendants of the Macedonian conquerors of Asia; and Greek was the prevailing language. The turning point in this respect was the separation of the East and West in the time of Arcadius and Honorius. Still the Roman system remained permanent, especially in the community of interest created between the emperors and the populace by the largesses and the expenditure on public amusements, the money for which was drained from the provinces; and this fact explains the antagonism that remained between the provincials and the inhabitants of the capital, and the toleration which the latter showed of the tyranny of their rulers. How deeply these abuses were rooted in the city of Constantinople is shown by the circumstance that Heraclius, in despair of otherwise carrying out his schemes of retrenchment and reform, conceived the design of removing the seat of government to Carthage—a plan which he would have carried out had he not been prevented by the unanimous opposition of the Greeks.

The Greek Church. Whether the conversion of Constantine to Christianity was due to sincere belief or to policy, or, as is perhaps most likely, to a combination of the two motives, there can be no doubt that religion had before that time obtained a great influence over the Greeks, and that the cause of the Christian Church and that of the Greek nation were already closely interwoven. Nothing could show more clearly the mastery obtained by the new faith than the subsequent failure of the emperor Julian to revive paganism. We have already seen how life and energy were restored to Greek society by this influence before the end of the 3d century; it was also the unanimity with which it was adopted by that people which inspired them to combine in self-defence, and saved them from the fate of the disunited Western empire. From that early period dates the feeling of brotherhood which pervaded the Greek Church, and the strong attachment which has always existed between the Greek clergy and their flocks, further cemented as it was at a later period by the influence which the clergy exercised in maintaining the people's rights and defending them against aggression. Paganism, however, continued to be recognized until the time of Theodosius the Great, when Christianity was substituted for it by legislative enactments. But the orthodoxy of the Eastern Church, which came to be, and still is, its most distinctive feature, and the identification of the Orthodox Church with the Greek nation, dates from a different time, viz., from the reigns of the Arian successors of Constantine, to whose personal opinions the people were strongly opposed. The political effect of this union ultimately became very great, and resulted in the loss of important provinces to the empire. When the Orthodox had the upper hand, they soon began to clamour for the persecution of heretics, and the emperors being on the same side acceded to their demand. The natural effect of this was disaffection in those regions, such as Syria and Egypt, where the majority of the population were either Nestorians or Eutychians; and the evil was aggravated by the suspicion to which the provincial clergy were exposed, because they were not Greeks, of being heterodox. The alienation from the central government thus produced greatly facilitated the conquest of those countries by the Saracens. It should also be noted that from the time of Constantine the emperors claimed, and were acknowledged, to be supreme over the church in all civil and external matters—a power which, as we shall see, proved to be of great importance at the time of the iconoclastic controversy; and the extensive judicial and administrative authority which Theodosius conferred on the bishops was the origin of that political subserviency, and at the same time of those simoniacal practices, which have been the opprobrium of their order in the Eastern Church.

Reign of Justinian I. The reign of Justinian, which, from the important events which it contained, has naturally much attracted the notice of historians, was a period of false brilliancy. The character of that emperor in many respects resembles that of Louis XIV. Both were men of moderate ability, gifted with great industry and application to business, and with a remarkable power of employing the talents of others; both were fond of splendour and foreign conquest; and both impoverished and ruined their subjects. At the time of his accession Justinian found in the exchequer a large sum of money amassed by Anastasius I., and had he employed this in lightening taxation and improving the position of his subjects, instead of wasting it in wars of his own seeking and lavish expenditure on public buildings, he would have greatly strengthened his kingdom. No doubt the conquests of his generals were splendid, and testify to the greatness of the armies of the empire at this time. No doubt also the compilation of the *Pandects*, *Code*, and *Institutes* was a magnificent work, which has left indelible traces on the legal systems of Europe. And it is an honour to any age to have developed the Byzantine style of architecture, a style thoroughly Greek in its unity and proportion; for, whereas the Romans had borrowed the ancient Greek style, and, adding to it the arch, had used it for wholly incongruous purposes, the Greeks in turn appropriated the arch and dome, and created a new and harmonious style. But the effects of his reign on his dominions were ruinous. He riveted tighter the fetters which Constantine had invented, but he lacked the penetration of Constantine in perceiving the needs of his time. He dissolved the provincial militia, which to some extent still existed in Greece. The population were ground down by taxation, the revenues of the free cities in Greece were seized, and at last the fortifications fell into disrepair, and a great part of the army was disbanded, so that when Zabergan, king of the Kutigur Huns, invaded the country from the north in the year 559, he was able to approach within 17 miles of Constantinople. How great the demoralization was is shown by the state of the empire under Justinian's immediate successors. Within less than twenty years after his death the conviction of a great change impending was so widely spread that a story was rife that it was revealed to the emperor Tiberius II. in a dream that on account of his virtues the days of anarchy should not commence during his reign. The condition of things has been described as "universal political palsy."

[illegible] The 400 years which elapsed between Constantine and Leo III. were the great period of the barbarian invasions. The Goths, who, as we have seen, had overrun Greece in the latter half of the 3d century after their great defeat at Naissus (Nisch), were more or less kept in check, and became in some degree a civilized and Christian people in the country of Dacia, to the north of the Danube, which they had permanently occupied after the Roman colonies in that country were withdrawn by Aurelian. But in the reign of Valens, when the Huns were overrunning Europe, they were pressed onwards by those invaders, and occupied Moesia between the Danube and the Balkan, which province was peacefully ceded to them. It was only in consequence of treacherous treatment by the Romans that they afterwards entered the empire as enemies, and fought the campaign which ended in the defeat and death of that emperor (378). They were soon pacified by Theodosius, and persuaded to enlist in great numbers in the imperial armies; but during the reign of his successor Arcadius, the famous Alaric roused the spirit of his countrymen, and ravaged the whole of Greece [illegible] Peloponnesus [illegible] he turned his steps to the conquest of Italy. For a time both Goths and Romans were [illegible] Attila, who with his hordes of Huns swept over the lands south of the Danube (442-7), and was only induced to retire by an agreement on the part of Theodosius II. to pay him an annual tribute. But again, in the reign of Zeno (475), the empire was in imminent danger from the Goths under Theodoric, who, like Alaric, had lived at Constantinople, and like him also withdrew into Italy. Towards the beginning of the 6th century the Goths make way for more barbarous invaders, Bulgarians of Turanian origin, and various Slavonic tribes, for whose pastoral habits the now depopulated country was better suited than for a more civilized population. But they in turn were soon swallowed up by the Avars, whose vast monarchy occupied a great part of eastern Europe, and whose armies, in the time of Heraclius, threatened Constantinople itself. It was in order to impose a permanent check on that people that this emperor induced the Servians and Croatians to occupy the districts eastward of the Adriatic, Dalmatia and Illyricum, which were deserted, owing to their constant inroads. These Slavonic settlers paid allegiance to the empire, and as they formed agricultural communities, introduced an element of permanence into the country. The Avar power disappeared as suddenly as it had risen, and at the end of the 7th century its place is taken by the Bulgarian kingdom, which lasted for nearly 350 years, and was the great antagonist of the Byzantine empire in its most flourishing period. At the close of this long enumeration of invasions, we cannot help being astonished at the successful resistance that was offered to them. No doubt the conformation of the European provinces of the Eastern empire, with their successive mountain barriers, was a source of strength from the ease with which they could be defended; but this could hardly have saved the Greeks, had it not been for the number of their walled cities, their superiority in the art of war, the courage of the people when called out by circumstances, and the strong position of the capital.

Persian wars. On the side of Asia, during the same period, a long struggle was maintained with Persia. The dynasty of the Sassanides, which arose on the ruins of the old Parthian kingdom, had raised that country to great power and prosperity. The second in order of its princes, Sapor I., had taken the emperor Valerian prisoner (257), and a century later Julian lost his life when fighting in Persia. The ill success of Justinian in his Persian wars ought fairly to be ascribed as much to the ability of his great opponent, Chosroes Nushirvan, as to his own shortcomings; but the fact remains that even Belisarius won small glory from these contests, and after a struggle of twenty years' duration a treaty was concluded, which required the Byzantine monarch to pay an annual subsidy of thirty thousand pieces of gold. War, however, continued during the reigns of his successors Justin II. and Tiberius II., until an honourable peace was concluded by Maurice, the son-in-law of the last named emperor, at whose court Chosroes II., the rightful sovereign, had been received when he was an exile. This prince, when he was reinstated on his paternal throne, showed his gratitude to the Romans. But when Maurice was dethroned by the rebel Phocas, the Persian monarch declared war, professedly with the design of avenging his benefactor. The greater part of the Asiatic provinces were laid waste, and a Persian army was for a time encamped on the shores of the Bosphorus, so that it seemed as if the Roman empire was about to be conquered by Persia. From this it was saved by Heraclius, who was not only one of the ablest of the emperors, but one of the greatest of military leaders. He [illegible], and in seven campaigns, by a series of brilliant victories, dealt a death-blow to the Persian power. The struggle was [illegible], and Heraclius, [illegible] tous to the Romans also. The period when it occurred was that of the rise of the Saracens, and the exhaustion caused by it contributed in no slight degree to the extension of their power.

We turn now to the condition of the Greeks during this period. In the interval between the first Gothic invasions and the accession of Constantine the material prosperity of Greece had increased, owing partly to the devastation of the provinces to the north of that country, the wealthy inhabitants of which were forced to take refuge in Greece, and partly to the insecurity of the Red Sea, Egypt, and Syria, which caused the commerce of Central Asia to take the route of the Black Sea, whence the trade of the Mediterranean passed once more into the hands of the Greeks. It can hardly be said that the reforms of Constantine benefited the population, because of the severe exactions they introduced; for, as has been already mentioned, the rich were forced to supply from their own incomes any deficiency that might occur in their district, and by this means, before Justinian's time, the class of great landed proprietors had been extinguished. But the fixed position which the clergy and the lawyers obtained under Constantine's system was a general advantage, because this constitutional check modified the oppressiveness of the Government in its dealings with the people. In the case of the latter of these two orders the effect would have been greater, had not Latin been the language of legal business until after the time of Justinian. The period of 120 years between the death of Arcadius and that emperor's accession was a time of improvement. During the long reign of Theodosius II. the power was in the hands of his sister, the philanthropic Pulcheria, and of his ministers, and these seem to have ruled judiciously; and the five succeeding emperors, Marcian, Leo I., Zeno the Isaurian, Anastasius, and Justin, were all men born in the middle or lower class of society, and of provincial origin, and had come to the throne at a mature age. The sympathy which they thus had with the body of their subjects accounts for their economy, and for their endeavours to restore the resources of the empire and alleviate its burdens, and generally to introduce regular forms of procedure into public business. Far different was the case with Justinian, whose severe demands for money distressed all classes of his subjects.

Athens.

But it was on Athens that his hand was most heavily laid. That city was still a literary capital where Hellenic learning was cultivated; and if the *Hero and Leander* of Musæus and that graceful pastoral romance, the *Daphnis and Chloe* of Longus, are to be assigned to so late a date as the fifth century, the spirit of the ancient literature had not long been extinct among the Greeks. The ancient buildings still existed in all their splendour; the citizens lived a life of quiet, self-complacent ease; and the paganism, of which it was now the centre, had been purified from its vices by the maxims of philosophy and the influence of Christianity. It remained for Justinian, in his merciless centralization, to close its schools and confiscate their revenues. At the same time the Olympian games were brought to an end. From this time onward the inhabitants of Hellas are but little heard of, and at the beginning of the 8th century we find them spoken of by Byzantine writers under the contemptuous title of Helladici, while the Greek nation is represented by the population of Constantinople and Asia Minor. Yet this period was not wholly disadvantageous to Greece. As the danger from the invading barbarians increased, its citizens regained the power of using arms, and revived a municipal administration to direct their efforts. It was also in Justinian's reign that silkworms were introduced from China, and the manufacture of silk became a profitable source of revenue to Thebes and other towns.

One result of the financial legislation of this time was a change which, though the lawgivers certainly did not foresee it, was most beneficial in its effects. This was the gradual extinction of slavery in the Eastern empire. The power that effected this was not Christianity, for that religion had recognized slavery as an institution, nor yet civilization, for that among the Greeks was intimately connected with the employment of slaves. It was rather produced by an alteration that was taking place in the condition of certain classes, which annihilated the distinction between the freeman and the slave. When the oppressiveness of taxation had destroyed the wealthy proprietors, and, in order to prevent the land from falling out of cultivation and thus diminishing the revenue, the cultivators of the land were tied to the soil, the poorer class of freemen began to sink down into the condition of serfs. On the other hand the slaves who were employed in agriculture became for the same reason an object of solicitude to the legislature, and their proprietors were forbidden to alienate them. They thus acquired a recognized position, not far removed from serfdom; and when all the lower class were reduced to the same state of poverty, the difference in the political status of the two orders came to be obliterated. Many centuries elapsed before this change fully worked itself out. The slave trade was still an important branch of commerce in the Roman empire, and freemen were sold as slaves if they failed to pay their taxes; but henceforth the system was doomed to ultimate extinction. When we consider the extent to which slavery prevailed in the ancient world, and the misery which it caused, we cannot regret the circumstances which caused it to disappear, even though they were accompanied by much suffering.

Extinction of slavery.

The system, not the people, at fault.

It is important also to remark, now that we are approaching the period of change from ancient to modern society, that the decline of civilization in the later Roman empire was not owing to degeneration in the people themselves, or to an inevitable downward tendency in highly civilized communities. It is a mistake to attribute to decay in human character changes that are clearly traceable to the need of such external resources as are indispensable for its development. The prohibition to carry arms necessarily renders a people unwarlike. Where municipal institutions are discouraged, public opinion soon becomes powerless. When the resources which might be employed in constructing roads are withdrawn, communication ceases, and with it the interchange of ideas and other influences by which the intellect is quickened. The degradation was produced by the injustice of the Government, which pillaged its subjects, and systematically destroyed all independence among them. Whenever the iron hand was removed, they showed signs of renewed life and vigour, but the strength of the central power was too great to encourage any hope of resisting it successfully. They had no choice but to sit down under it, and suffer it to drain their life-blood by slow degrees.

Threatened extinction of the empire.

At the commencement of the 8th century the extinction of the empire of the East appeared to be imminent. The same causes which had overthrown the Western empire were threatening it with destruction. The Saracens had overrun all its Asiatic possessions, and had attacked the capital itself, while in Europe it was threatened by the Bulgarians. The provinces were falling off: Syria, Egypt, Africa, and the conquered provinces of Spain were wholly lost, and in Italy the dominions of the exarchate were greatly circumscribed by the Lombards. At home rebellion prevailed in the army, and anarchy in the government, six emperors having been dethroned within the space of twenty-one years. It seemed as if the Greek race itself would be destroyed; in the countries conquered by the Saracens the Greeks were almost exterminated, and Greek civilization proscribed, while Hellas was threatened with occupation by the barbarians. But at this moment the helm of the state was seized by a man who, by his force of character and his great abilities, inaugurated a new state of things, and gave the empire a new lease of life. This man was Leo the Isaurian.

III. *Period of Byzantine Prosperity: from Leo III. to Isaac I. (Comnenus)*, 716–1057 A.D.

The Byzantine empire.

Considerable difference of opinion has existed as to the precise time at which the Roman empire of the east may be said to have ended, and the Byzantine empire to have commenced. Gibbon remarks that "Tiberius by the Arabs, and Maurice by the Italians, are distinguished as the first of the Greek Cæsars, as the founders of a new dynasty and empire." The question turns on modifications of the old Roman system of administration, and the introduction of a new order of things, which lasted until the overthrow of the state. These commenced, no doubt, shortly after the death of Heraclius, and were closely connected with the victorious advance of the Saracens, which necessitated a reform, and at the same time concentrated the empire, and confined it more and more within the districts inhabited by Greeks. But the altered state of things did not become apparent, nor were the changes systematized, until the time of Leo III., and therefore he may most rightly be regarded as having inaugurated the Byzantine empire. The first century and a half of the present period embraces the iconoclastic controversy, while the two remaining centuries coincide with the rule of the Basilian dynasty. It was a time of great men and great achievements, both in government and war, and the events it contains amply suffice to defend the Byzantine empire from the imputation of feebleness and decrepitude; and those who delight to find in history strongly marked characters and stirring incidents will be amply rewarded here. Few personages stand out in stronger relief than the ruthless, yet ascetic, warrior Basil, the slayer of the Bulgarians; and few occurrences are more romantic than the death of Leo the Armenian, who defends himself with the crucifix in his chapel, where he was chanting the prayers in the early morning, while his successor lies in fetters in the neighbouring dungeon.

Reforms of Leo III.

We must first notice the reforms, which caused the reign of Leo III. to be an era in the history of the empire. These extended to almost every branch of the administration. In respect of the army, he reorganized the military establishment by placing the various bodies of soldiers in the different "themes," or departments, each with a general of its own, thereby providing for local defence, and avoiding the danger of rendering the military commanders too influential—a system which defended the empire for five centuries. The geographical arrangement in themes was introduced by Heraclius, but reconstructed by Leo, and bore somewhat the same relation to the previous division into provinces that the departments in France bear to the earlier distribution of that country. In respect of finance, he brought the taxation immediately under the emperor's cognizance, so that thenceforth the emperors were their own finance ministers. All local agencies for collecting the taxes were abolished, and their functions transferred to the imperial officers, who took census regularly. By this means he raised more money than his predecessors, but the increased prosperity of the people showed that the burden did not fall so heavily. In respect of justice, in order to obviate the difficulties which had arisen in the administration of Justinian's elaborate laws, especially since the facilities for communication throughout the empire had decreased, he published in Greek an abridged manual called the *Eclogue*, and codified the military, agricultural, and maritime laws. In respect of religion, he aimed at counteracting the element of superstition which had crept into the church, and through it was corrupting the public mind. But this last point calls for separate consideration, since the worship or prohibition of images became the burning question of the age.

Iconoclasm.

The history of Iconoclasm is the history of Constantinople during the 8th century and the first half of the 9th, and involved a great part of the empire in its distractions. There can be little doubt that, in his opposition to image worship, Leo represented the opinion of a large part of the enlightened laymen of his time, while the great body of the clergy, but especially the monks, together with the mass of the population, were passionately attached to the statues and pictures, as objects of reverence, not to say of adoration. But the fact that the stronghold of iconoclasm was Asia Minor, and especially that part of it which bordered on the countries occupied by the Saracens, suggests that it was in part owing to the spread of Mohammedanism, the rigidly monotheistic character of which creed was a standing protest against these material conceptions of religion. Nor should we overlook the deeply rooted feeling in the mind of Orientals of the opposition between spirit and matter, which would naturally cause them to be alive to such questions of controversy. The emperors of this time were those of the Isaurian, Armenian, and Amorian dynasties, all which names remind us that they came from the Asiatic provinces; whereas the great restorer of images, the empress Irene, during whose regency the second council of Nicæa in their favour was held (787 A.D.), was an Athenian. But the question was complicated by a further issue; the question of images was closely connected in the minds of the emperors, and especially of Leo III. and his hard-handed son Constantine Copronymus, with that of their supremacy in matters of religion. They viewed with jealousy the independent power of the church, and were glad of the opportunity this controversy afforded of strengthening their control over this department, and claiming to the full those ecclesiastical rights which, from the time of Constantine the Great onward, had attached to the imperial authority. As this move was only part of a system of centralization, the monks and others who supported image worship were from one point of view the assertors of liberty against autocratic rule, and they were recognized as such by a certain number of moderate men, who watched with anxiety the growth of despotism. As toleration was unknown to the age, persecution was carried on by both sides with equal ferocity, and the contest swayed to and fro, until it was brought to an end by the final restoration of images under Michael III., the last of the Amorian line (842). Its effects on society had been remarkable. At first its influence was bracing, as was shown by the renewed vigour which pervaded the empire; for both sides were thoroughly in earnest, and among the iconoclasts in particular an element of Puritan energy was evolved. But in its later stages, when the people at large were weary of the strife, and the struggle was felt to be in reality one between church and state, the prevalent hypocrisy generated disrespect for religion, and this was followed by general immorality. It further caused the loss to the empire of its dominions in central Italy. So great was the alienation produced by this movement in the minds of the popes Gregory II. and III. that thenceforward the holy see was for the most part either active in its opposition to the Byzantine power or lukewarm in support of it. At last, in 751, Ravenna was captured by the Lombards, and the Greek exarch retired to Naples.

Schism [illegible]

The subsequent ecclesiastical affairs of this period must be briefly dismissed, though they exercised an important influence on the fortunes of the Greeks. The final separation of the Eastern and Western Churches took place in 1053, though events had long been leading up to it. Already in the middle of the 9th century, when the pope interfered between the rival patriarchs Ignatius and Photius, a rupture was very nearly occurring; and at last, though the formal causes of division were theological, yet the assumptions of the see of Rome and political antagonisms were in reality more influential motives. The bitterness thus created culminated in the capture of Constantinople by the Latins at the time of the fourth crusade; and the subsequent refusal of aid by the Western nations to the Greeks greatly facilitated the success of the Ottomans. From this, the greatest breach in the Christian world, we turn with thankfulness to the missionary efforts of this age. In the middle of the 9th century two brothers, Cyril and Methodius, preached the gospel to the southern Slavonians, and converted them to Christianity. By Cyril the alphabet called Cyrillic was invented, which was generally adopted by the Slavonic peoples. About the same time the Bulgarians renounced their paganism, through the influence of a sister of their king, Bogoris, who had been educated as a prisoner at Constantinople, and afterwards restored to her native country. The rest of the nation had been prepared for this change by the numerous Christian slaves who had previously been carried off by them in war. A century later Christianity was introduced by Greek influence among the Russians, whose capital was now at Kieff, and who were among the most dreaded foes of the Eastern empire. If the missionary spirit is the best evidence of the vitality of a church, it is clear that that of Constantinople, however much corrupted by formalism, was still animated by the spirit of true religion.

Saracen wars. The Persian monarchy, which for 400 years had been the rival of the Roman power in Asia, had now succumbed to the victorious arms of the Saracens; and that people again, during the next four centuries, were engaged in almost continual war with the Byzantine empire. In the reign of Constantine Pogonatus, the caliph Moawyah besieged Constantinople for seven years by land and sea, the invaders retiring to Cyzicus for the winter (672–9); but, owing in great measure to the newly invented Greek fire, he was obliged at last to desist from the attempt, and almost the whole of his force was destroyed. Notwithstanding this reverse, the attempt was renewed within a year after Leo III.'s accession by Moslemah, brother of the caliph Saleiman, with an enormous host; but the skill of the Byzantines in military defence, which was equal to that of the Romans in their best days, baffled his attempts, and a winter of extraordinary severity ensuing ruined the attacking army. The importance of this result was incalculable to Europe—far greater than that of the victory of Charles Martel at Tours. The Saracen empire was now at its height, and reached from the Indus to the Atlantic; and it was the full brunt of this power, now in full tide of conquest, which was resisted at Constantinople. Had that city fallen, there was no power that could have prevented it from overrunning Europe. After this, Asia Minor continued for ages to be the battle-ground of the two opposing empires, until it was so devastated and depopulated by successive campaigns as to be fit only for the occupation of the nomad tribes who were to succeed. In the midst of these struggles the invasions of Haroun al Rashid, the splendour of whose court obtained for him a reputation in the West which he did not enjoy among his contemporaries in the East, appear hardly more than plundering incursions. The Byzantine nobles, who were trained in this school of war, were distinguished for their military spirit and personal prowess; and the troops of which the armies were composed were so powerful and well-disciplined that the Saracens would never meet them in the field except with far superior numbers. By sea, however, the empire was less successful than by land. During the first half of the 9th century both Crete and Sicily were conquered by these enemies, and in the year 904 occurred the memorable sack of Thessalonica. A Saracen fleet appeared before that city, and, after storming the sea-wall, pillaged the whole place and butchered the citizens without respect of sex or age. The most famous successes were those of Nicephorus Phocas and his successor John Zimisces. The former of these great commanders, who before he became emperor had reconquered the island of Crete, at the end of a brilliant campaign in Syria obtained possession of Antioch (968) after it had been in the hands of the Mahometans for 328 years. Five years later Zimisces carried his victorious arms even to the banks of the Tigris. But while the disorganized state of the caliphate of Bagdad, in the early part of the 11th century, removed all fears from that quarter, a new enemy began to appear on the eastern frontier of the empire—the Seljuk Turks. Unfortunately, at this critical conjuncture, a fatal mistake was made. The safety of that frontier had long been guaranteed by the Armenian kingdom of the Bagratians, whose country was admirably adapted for defence, and whose population were a hardy race of Christian mountaineers. In the year 1045 the emperor Constantine IX. destroyed this kingdom, and thereby laid his dominions open to the invaders.

Bulgar- wars. In Europe, at the same time, the empire was exposed to the attacks of a foe hardly less formidable, and in closer proximity—the Bulgarians. After the extinction of the Avars, this people, who had long been in subjection to them, had founded an important monarchy in the ancient Mœsia at the end of the 7th century; and henceforward the Byzantines had to defend their European possessions, not as before against a succession of migratory tribes, but against the concentrated force of a single nation. In the time of Constantine Copronymus we find that it required all the energy and military talents of that emperor to keep them at bay, and on one occasion they carried their ravages up to the neighbourhood of the capital. In the beginning of the 9th century their king, Crumn, defeated and slew the emperor Nicephorus I., who had invaded his territory, in a night attack on his camp, and converted his skull into a drinking-cup for his table. We have already noticed how, later in that century, the nation embraced Christianity, and at the same time a tract of country on the southern side of the Balkan range was ceded to them, and received from them the name of Zagora. By this time also they had imperceptibly changed their nationality and their language, for by intermingling with the more numerous Slavonian tribes of the countries in which they settled, they lost the traces of their Hunnish origin, and became to all intents and purposes a Slavonic race. By the neighbourhood of Constantinople, and the trade between that city and the German and Scandinavian peoples which passed through their country, they became a commercial nation, and advanced in the arts of life. But the rapacity of the Greeks in imposing heavy customs on their traders involved them again in war with the empire, and when peace was re-established, the treaty between Romanus I. and their king, Simeon, was made under the very walls of Constantinople (923). In the reign of Nicephorus Phocas the Russians, who had not long before appeared on the scene of action, were invited by the Greeks to invade Bulgaria, and they so effectually crushed the Bulgarians (968) that his successor, John Zimisces, was obliged to come to their aid, in order to save his own territory from falling a prey to the new comers. It was shortly after this that the great and final struggle commenced. Under their chief, Samuel, a man of great vigour and ability, they extended their conquests over Macedonia and Thessaly, and made plundering incursions into Greece and the Peloponnesus. But finding that the plains of Bulgaria were unfavourable to him as a seat of war, on account of the superior discipline of the imperial forces, Samuel transferred his seat of government to Achrida, on the confines of Macedonia and Albania, and thence he extended his kingdom from the Adriatic to the Ægean, so that the country he ruled was as extensive as the European portion of the Byzantine empire. But these events coincided with the culminating period of Byzantine greatness, and Samuel found a worthy rival in Basil II., who from his subsequent victories obtained the title of "slayer of the Bulgarians." By him the Bulgarian power was brought to an end; and the whole people submitted to the dominion of the Greeks (1018).

The Russians.

The third people with whom the empire had to contend at this time was the Russians. In the reign of Michael III., the last of the Amorian dynasty (865), the inhabitants of Constantinople were astonished by the appearance in the neighbourhood of the city of a fleet of 200 small vessels, which passed down the Bosphorus from the Black Sea. The enemy contained in these was the Russians, who not long before had established themselves at Kieff on the Dnieper, and whose restless spirit and love of plunder prompted them to attack the strongest city in the world. Their ignorance of the art of war rendered them no formidable foe to the Byzantine forces, but their daring and cruelty produced a profound impression on the civilized and peaceful citizens. Similar attacks were made in 907 by Oleg and in 941 by Igor, but the influence of trade and the introduction of Christianity into Russia gradually promoted more peaceful relations, and the Byzantines employed the powerful tribe of the Patzinaks, who occupied the northern shores of the Black Sea, to counterbalance their opponents. But the campaign of John Zimisces on the Danube in 971, which followed on the negotiations of his predecessor for the subjugation of the Bulgarians, showed how important a military power the Russians had become, for he found in their chief, Swatoslav, an enterprising and powerful adversary, whom it required all his skill to overcome. Once more, in the time of Constantine IX. (1043), the Scandinavian Varangians, by whom the Russians were mostly represented in their marauding expeditions, appeared before Constantinople, but with no better success than before; and from this period the alliance of that people with the Byzantines was long uninterrupted, and the two nations were bound together more and more by religious sympathy. In the days of the Comneni the Varangians regularly formed the bodyguard of the emperor.

Constitutional changes.

Constitutional changes were usually of slow growth in the Byzantine empire, yet at the end of this period we find considerable alterations to have been effected. Under the early iconoclastic emperors there was a tendency towards the greater concentration of power in the hands of the sovereign, but Basil I converted the government into a pure despotism. This he effected by abolishing the legislative functions of the senate, which body, though now a shadow of its former self, had existed in one form or another all along, and exercised a certain influence in controlling the absolute power of the emperor. When this restraint was removed, and the senate reduced to an administrative council, no check remained except the fear of revolution. Basil also tacitly introduced what, strange to say, had never existed in the Roman empire, and even now was only partially recognized—the principle of legitimacy in succession. With a view to this he established the custom that his descendants should be born in the "porphyry chamber," so that the name Porphyrogenitus might become a title of legitimacy. In this way a partial antidote was created to that inveterate disease of the Byzantine empire which a French writer has called *la maladie du trône*—the ambition to be emperor at all hazards, notwithstanding the risk involved both in the attempt and the possession of the office. The growth of this idea is proved by the loyalty shown a century and a half later to the empress Zoe, an aged, profligate, and incapable woman, on account of the legitimacy of her descent. But the greatest change of all, and one that contributed greatly to the subsequent decline of the empire, was effected at the end of this period. This was the abolition of the system of training officials to conduct the various departments of the state, and the entrusting those offices to eunuchs of the imperial household. The object of this was to lessen the power of the territorial aristocracy, and to diminish the chance of rebellion, by placing the government in the hands of men who could not found a dynasty; but from this time onward the efficiency of the administration began to wane. It was the disregard of the aristocracy involved in this change that caused the conspiracy of the nobles in Asia Minor which set Isaac Comnenus on the throne. It should also be noticed that few of the emperors throughout this period were Greeks, most of them being either Armenian or Slavonian by extraction. This circumstance accounts for a certain freedom from prejudice and independence of view which may be traced in their actions, but at the same time it caused them to be wanting in sympathy with their subjects.

Condition of the people.

During a considerable part of this period, notwithstanding the desolating wars which we have described, the prosperity of the inhabitants of the empire was very great. Finlay, who is excellently qualified to judge in a matter of this kind, gives it as his opinion that under the iconoclast emperors their moral condition was superior, not only to that of all contemporary kingdoms, but to that of any equal number of the human race in any preceding period. The society of this time has been too much judged of by the murders and mutilations which were rife in consequence of the struggles for the throne; but it should be remembered that these were confined almost entirely to the court and its surroundings, and did not affect the mass of the people. And their material prosperity was equally great. The emperor Theophilus, notwithstanding his lavish expenditure, is recorded to have left at his death a sum equal to five million sovereigns—an amount of money which could hardly have been extorted from a people otherwise than wealthy. This was the result of the commerce of their immense mercantile marine, which had in its hands the whole of the carrying trade between Asia and western Europe. To this it should be added that, under Basil the Macedonian and his successors, care was taken to moderate the burden of taxation, a policy that accounts in great measure for the duration of his dynasty, which occupied the throne of Constantinople longer than any other. Unfortunately the riches thus obtained tended after a time to accumulate in the hands of the few, and from the reign of Basil II. the middle class, that element which society can least of all afford to dispense with, began rapidly to diminish. As a consequence of this, in the 11th century manufactures declined in the cities, while in the country the immense estates of the aristocracy were cultivated by Mahometan slaves or Slavonian serfs; and thus the higher class itself began to feel the lethargy of wealth, and though still unconscious of coming change, was on the eve of impending decline.

Modern Greek nationality.

In the year 747, during the reign of Constantine Copronymus, the empire was visited by a fearful pestilence, which, both in the mortality and the demoralization of society it produced, must have rivalled, to judge by the accounts left us by the Byzantine historians, those of Florence and London, of which Boccaccio and Defoe have drawn such vivid pictures. As this calamity was the primary cause of the immigration of foreign settlers into Greece, it is intimately connected with the question of modern Greek nationality, and consequently the present appears a fitting place briefly to discuss this subject, on which great differences of opinion, turning mainly on the mediæval history of the country, have prevailed. The controversy originated in the famous thesis of Professor Fallmerayer of Munich, that, owing to the great influx first of Slavonian and afterwards of Albanian colonists, not a single drop of Hellenic blood flows in the veins of the Greeks at the present day. The discussion of this point has enlisted much ability and learning on both sides, but the question appears now to have been pretty well set at rest by the abandonment of Fallmerayer's hypothesis. How early Slavonian settlements began to take place in Greece it is difficult to determine; but though the occupation of the Peloponnese by Avars and Slavonians at the end of the 6th century, on which much stress has been laid, is doubtfully historical, yet colonies of those races probably established themselves in the northern part of Greece. But that the great change in this respect was produced by the pestilence is shown by the oblivion of Hellenic names of places which dates from that time. For, though a fair number of ancient names of seaport towns, such as Patræ, Corinth, and Epidaurus, and some names even in a district so extensively occupied by Slavonians as Arcadia, have been preserved to the present day, yet the great majority of the modern names are now, and have been since the 8th century, either Slavonic or of later Greek origin. Not only was the country greatly depopulated by the plague, but a considerable portion of the native middle class was induced by the emperor to migrate to the capital, in order to fill up the void in the inhabitants which had been caused by its ravages. The districts which were thus left vacant were soon after occupied by Slavonian tribes, so that until the middle of the 9th century they formed a large part of the population. But in the latter part of that century the Greeks began to recover a numerical superiority, and from this period dates the process of the absorption and Hellenizing of the Slavonians, so as to form the mixed race of which the greater part of the population of Greece is now composed. In effecting this change the Greek Church played an important part. The affinity between the ancient and modern Greeks has been traced by several lines of reasoning. It has been pointed out how great is the resemblance of character between them, and that too in points presenting the sharpest contrast to the character of the Slavonic races. The survival of old beliefs and classical superstitions at the present day has been carefully observed. The language is a lineal descendant of the ancient speech, and contains next to no Slavonic element; and lest it should be thought that this language had been imported into the provinces from one or more great centres, and had not survived in the districts themselves, it is proved that numerous classical words and forms, which have been lost to the language at large, still survive in the local dialects. Thus, though the physical connexion between the modern Greeks and the ancient Hellenes, in certain districts at all events, may be slight, as seems to be implied by the difference of physiognomy, yet in all that really constitutes a people, their character, feelings, and ideas, the former are the lineal descendants of the latter.

IV. *Period of Byzantine Decline: from Isaac I. to the taking of Constantinople by the Latins*, 1057–1204 A.D.

The Comneni.

At the commencement of the preceding period there was a prevailing fear among the inhabitants of the empire that its extinction was imminent, and we have seen how this was followed by an age of unexampled prosperity. The feeling of the time on which we now enter was completely the opposite of this, and yet it was a period of decline. The long duration of the empire, notwithstanding numerous vicissitudes, its superiority to contemporary nations in power and wealth, and its apparent security from foreign enemies, inspired the people with a belief in its permanency, and blinded them to the seeds of disease that were already working. Yet before the end of the 11th century the Seljouk Turks had occupied all the inland part of Asia Minor, and had established their capital at Nicæa, in the immediate neighbourhood of Constantinople. It would, however, be a mistake to suppose that, in its external relations at all events, the whole of the Comnenian period was a time of decay. On the contrary, during a considerable period it witnessed a remarkable revival; and the three great emperors of that dynasty, Alexius, John, and Manuel Comnenus, whose long reigns extend over an entire century (1081–1180), were men who would be conspicuous figures in any age. All of them were distinguished by personal courage and skill in war, by literary culture, and by sagacity in politics; but in other respects they represented very different types. The first, Alexius, was indefatigable in business, patient in maturing his schemes, and active in carrying them out, but vainglorious, unprincipled, and fond of artifice. From this Ulyssean phase of Greek character we turn to a true Achilles, his son John, the most amiable character that ever occupied the Byzantine throne—a man irreproachable in morals, open-hearted, generous in action, prudent in council, and pious without superstition. The last of the three, Manuel, presents us with a nature spoiled by the early possession of absolute power, but gifted with most of the features admired by his contemporaries—handsome in person, tall of stature, and so powerful that, at a tournament at Antioch in which the chivalry of the West took part, he unhorsed every antagonist—but passionate in temper and ill-regulated in mind. In an age which produced men like these it may well be inquired, What were the sources of decline?

Causes of decline.

In the first place, the emperors were almost the only capable men. This was the natural effect of the centralization of the system. The neglect of the education of persons intended to be employed in the administration, and the employment of creatures of the court for offices of trust, were now bearing their fruit. Everything depended on the existing sovereign; and it only required the vices of a thoroughly profligate man like Andronicus Comnenus, the last of his dynasty, to ruin the state. As might be expected also under these circumstances, disorder soon crept into every branch of the public service. The census, which for eleven centuries had been carefully compiled, was now neglected; justice, which more than anything else had united the provinces to the empire, was more imperfectly administered; and the army became inferior to those of Western nations. This last change was produced partly by the degeneracy of the nobles in military spirit, owing to the growth of luxury, partly by the officers being appointed by favouritism, and the habit of disbanding troops at the end of a campaign, in order to save money to defray the expenses of the court. At the same time the great diminution of the middle class, owing to the extension of the large properties, lessened the number of those who were willing to defend their liberties against invaders. The privileges also, in respect of trade, which were conceded by Alexius I. to the Venetians and by Manuel to the Genoese and Pisans, to the detriment of the native merchants, commenced the decline of Greek commerce; and this was accelerated by the piracy that arose, when the money that had been contributed by the commercial communities for the maintenance of local squadrons of galleys was ordered to be remitted to Constantinople. To all this must be added the influence of the higher Greek clergy, whose subserviency to the state had increased since the separation from the Western Church, and the conservatism of whose ideas discouraged all attempts at progress on the part of the people.

The crusades. The age of the Comneni is the time of the crusades. These famous expeditions will produce a very different impression on the mind according as they are regarded from the point of view of the East or the West. From the latter point of view they may be regarded as bringing to a focus the religious and martial enthusiasm of the time, as forming a safety valve for restlessness, as enlarging the ideas and elevating the spirit of the people. But to the great mass of the Easterns they appeared as hardly better than marauding expeditions, and as producing unmitigated evil. Though the first crusade (1095) was partly undertaken in consequence of the solicitations of Alexius for aid against the Seljuks, yet as soon as the first undisciplined bands entered the country they pillaged the natives; and when the more organized companies followed, though many of their leaders, like Godfrey and Tancred, were men of the highest character, yet it required all the address of the Byzantine monarch to transmit these armies into Asia without some irreparable injury being done to his capital. No doubt the faults were not all on one side, for the suspicion and falsity of Alexius gave just ground of complaint to the crusaders. But he had a very difficult part to play. Had he placed himself, as was proposed, at the head of the crusade, he had no reason to expect obedience on the part of the feudal nobles, while at the same time he left his kingdom exposed to the danger of rivals at home and fresh bands from abroad. Accordingly he chose the ignoble part, and followed in their footsteps with the view of regaining what he could to his dominions. The second and third of these expeditions passed through the empire with comparatively little injury, though in the latter of the two the island of Cyprus was lost to Richard of England; but the ill-will that was manifested by the Greeks on those occasions ripened in the minds of the Westerns those seeds of hatred which at last bore fruit in the great buccaneering expedition which is commonly called the fourth crusade (1204). This event, of which a narrative has been left us from both sides, by the Greek historian Nicetas and the Frank chronicler Villehardouin, is certainly one of the most disgraceful transactions in history. A certain lustre has been shed over it by the age and blindness of the doge Dandolo, who was one of the principal leaders; but that a Christian force assembled for the purpose of fighting the infidels should turn its arms against the most important Christian city of the time is an act of unparalleled baseness; nor can anything be conceived more deliberately mean than the treaty by which the spoil of the empire was partitioned beforehand between the nations who took part in the attack. From this blow Constantinople never recovered, though it is fair to add that hardly less injury had been caused by the storm and plunder of the city during the rebellion which set Alexius Comnenus on the throne.

The Seljuks. In Asia this period opens with a great disaster, the defeat of Romanus IV. by Alp Arslan, in the battle of Manzikert in Armenia (1071). Gibbon has eloquently described the scene, in which the Seljuk sultan, after placing his foot on the neck of the captive emperor, spares his life and hospitably entertains him. The Seljuk race of Turks were already masters of a great part of western Asia, and in the reign of Malekshah, Alp Arslan's successor, their dominions extended from the banks of the Jaxartes to the Mediterranean. The empire had now entered on the third great struggle of four centuries' duration, which it maintained in the East—first with the Persians, next with the Saracens, and finally with the Turks, whether Seljuk or Ottoman. But the present contest was commenced under altered circumstances. It was soon felt how fatal was the policy which had denuded the Armenian frontier of its native defenders, and how few obstacles were presented in Asia Minor to an invading force when a large portion of the free population had disappeared. And the character of the invaders also had changed; for, whereas the Persians and Saracens had felt an interest in civilization, the Turkish hordes were composed of nomad barbarians, whose object in war was plunder, and who occupied the countries they conquered as pastoral tribes. Hence their system of warfare consisted in exterminating the agricultural population by successive inroads, until one district after another lay open for their permanent settlement. Within three years after the battle of Manzikert, the Seljuk power extended over the greater part of Asia Minor; and when, in the year 1080, Nicæa fell into their hands, that place became the capital of a separate kingdom, which was called the sultanate of Roum, that is, of Rome. From thence they were driven back by the crusaders at the time of the first crusade, and transferred their seat of government to Iconium, in a more remote position in the south-east of the country. After this they carried on a succession of wars with the Byzantine Government, the most remarkable event in which was the great battle at Myriocephalus, on the borders of Phrygia, in which the emperor Manuel was signally defeated. During the distractions that prevailed at Constantinople shortly before the fourth crusade, it might have been in the power of the Seljuks to seize that city, and so to anticipate the Latins; but at this time the kingdom was divided between the ten sons of the sultan, Kilidji-Arslan II., and thenceforward the power of the Seljuks was less formidable.

Wars in Europe. Meanwhile the European dominions of the emperors had been assailed by a variety of foes, among whom the Normans were the most conspicuous. In the year 1071 Robert Guiscard succeeded in expelling the Byzantines from their remaining possessions in southern Italy, and fired by the ambition of rivalling his great compatriot, who four years and a half before this had made himself master of England, he conceived the design of conquering the Byzantine empire. With the object of carrying this into execution, he laid siege to Dyrrhachium, the most important Greek city on the Adriatic, and after defeating Alexius Comnenus, who had come to its relief, succeeded in making himself master of the place. Being forced to quit the country, he entrusted the campaign to his son Bohemund, who was defeated by the emperor, and withdrew into Italy. Fortune, however, ordained that these two chieftains should once more be brought into collision in Syria, and hence arose another Norman war, in which Bohemund was foiled by the strength of Dyrrhachium. At a later period, in the reign of Manuel, Greece was invaded by King Roger, who had received an affront from that emperor, and the cities of Thebes and Corinth were sacked in the most barbarous manner. But the most famous of these inroads was in 1185, and resulted in the siege of Thessalonica, which place was taken by the Normans, and treated with a cruelty that almost rivalled that of the Saracens in the former siege. Besides these wars, there were others with the Patzinaks, the Hungarians, the Servians, and the Venetians.

Bulgaro-Wallachian kingdom. But towards the end of this period the empire received a blow from the revolt of a people who on this one occasion appear prominently in history—the Wallachians. This race, who, like the Greeks, claimed the name of Romans or Roumans, were the descendants of the Roman colonists in Dacia, whom the emperor Aurelian transplanted to the southern side of the Danube. There it is probable they intermarried with the natives, but they retained the Latin tongue, from which the modern language is derived. About the 13th century, it would seem, the great body of the nation once more migrated northward to the seats they now occupy; but those of whom we are speaking here were settled on the Balkan, where they had maintained themselves in their mountain fastnesses, owning an allegiance more or less qualified to Constantinople. In the reign of

Isaac Angelus (1186), however, when they were heavily taxed, robbed of their cattle, and oppressed in other ways, they rose under the leadership of three brothers, Peter, Asan, and John, and having made a league with the Bulgarians, raised the standard of revolt, and established what is called the Bulgaro-Wallachian kingdom. Its successive rulers contended with varied fortune against the Byzantine Government, but succeeded in maintaining their position in Thrace and Macedonia, to which countries for a time Thessaly also was added, forming, however, an independent province, with a governor of its own. The emperor Baldwin, the first of the Latin emperors of Constantinople, was captured by them in battle, and put to death. The kingdom continued to exist until the Turks made their appearance on the scene, when, in common with the other independent sovereignties in these regions, it was finally overthrown.

State of Greece. The period from the end of the 9th century to the fourth crusade was to Greece a time of prosperity. Though its inhabitants were looked down upon as provincials by the people of Constantinople, and the country itself was treated with neglect (Basil II. was the only emperor who for several ages visited Athens), yet in material well-being it was one of the most flourishing parts of the empire. Though barbarian inroads were still not wholly unknown,—one of the Uzes in particular is mentioned in 1065,—yet security generally prevailed, and from the middle of the 11th century the coasts had nothing to fear from Saracen corsairs. The land produced corn in abundance, so that it even supplied the capital in a time of dearth. The silk manufactures of Thebes, Athens, and Corinth were a source of great wealth, and much of the commerce of the time was in the hands of the people of Greece. The port of Monemvasia, in eastern Laconia, which gave its name to the Malmsey wine, was especially famous as a mediæval emporium. How far Hellenic feeling and Hellenic traditions survived among the Greeks we have no means of discovering, but the probability is that these to a great extent perished, along with the Hellenic names, at the time of the great Slavonic immigration. The whole population had become Christian, though as late as the 9th century paganism existed among the inhabitants of the mountainous regions of Laconia. But in the latter half of the 12th century decline was ready to set in. Their commerce was passing into the hands of the Western traders; the silk manufacture was transferred by the Norman Roger to Palermo; and the profits of industry were absorbed by taxation, so that no surplus remained to be invested in works of public utility. The writings of Michael Acominatus, the noble and learned archbishop of Athens at the time of the fourth crusade, give clear evidence that in that city the decay had already commenced.

The modern language and literature. It is during the 12th century that we first meet with compositions in the popular Greek tongue, among the earliest specimens being poems by a monk called Ptochoprodromus, addressed to the emperor Manuel Comnenus. The literary language of this time was still the same which had been used throughout the Byzantine period—the "common" dialect of the Macedonian Greeks, as it had been transmitted with various modifications by the later Greek writers and the fathers of the church. The Byzantine histories and other works which were composed in it are usually stilted and pedantic in style, and conventional in their ideas and their treatment of events; but it is possible to treat them too slightingly. Some of the writers, like Michael Psellus and Eustathius of Thessalonica, were men of undoubted ability and learning; and, besides this, it was the taste for these subjects, however faulty, which maintained the high level of cultivation that distinguished the Byzantines from the people of all other contemporary states during the Middle Ages, and caused the ancient literature to be preserved. This language was also that spoken at court, so that it is not till the time of the Palæologi that we find the highest circles and polite composition invaded by the vulgar tongue. But from the 4th century after Christ, if not earlier, there had been a divergence between the written and the spoken language, so that the two formed, so to speak, an upper and a lower stratum. Until the time of the iconoclasts, in all probability, the ancient speech was generally intelligible, but from the end of the 9th century it was a dead language to the great bulk of the nation. The change which the popular idiom was passing through, as might be expected, was twofold, arising, first, from the usual tendency of speech to become more analytical and of words to modify their meaning, and, secondly, from the loss of vocabulary, the mutilation of grammatical forms, and the confusion of syntax, which is produced by want of cultivation. At the same time it passed through no such violent process of disintegration as befell Latin in its change into the Romance languages, so that its historical continuity was never broken. But when it emerges to view in the compositions of the 12th century it is already a modern language, and its forms differ little from those of the Romaic of the present century, though of course the vocabulary was as yet free from the intrusive elements—Italian, Albanian, and Turkish—which subsequently crept into it. The metre in which these poems were composed was regulated entirely by accent, and not by the quantity of the syllables, and the verse usually employed was the so-called "political," *i.e.*, popular verse, which corresponds to some of our longer ballad metres. The favourite subject was romances, and in the treatment of these, as well as to some extent in the stories themselves, subsequently to the Frankish occupation the influence of the French romances is clearly traceable.

V. *Period of Greek Survival: from the taking of Constantinople by the Latins to its Conquest by the Turks*, 1204–1453 A.D.

Partition of the empire. The empire of the East never recovered from the effects of the fourth crusade. It was then broken into a number of separate fragments, and though some of these recovered their cohesion, and the end did not arrive for two centuries and a half, yet the strength of the system was gone, and paralysis crept more and more over the enfeebled frame. In accordance with the provisions of the partition treaty, a Latin emperor was set up at Constantinople, and Baldwin, count of Flanders, was elected to the office; Latin kingdoms were established in different provinces,—one at Thessalonica, which was of short duration, another at Athens under the family of De la Roche, and a third in the Peloponnesus under Champlitte and Villehardouin, which was called the principality of Achaia or the Morea. Of the occupation of the last-named of these countries an account is given in one of the most curious of mediæval Greek poems, *The Book of the Conquest*, the French original of which also exists. But even the districts which remained in the hands of the Greeks did not continue united. An independent empire was established at Trebizond on the Black Sea by a scion of the house of Comnenus. Another principality was founded in Epirus, the despot of which after overthrowing the Latin state of Thessalonica, established at that place an empire of his own. But the headquarters of the legitimate Greek monarchy were at Nicæa, the original capital of the Seljuk sultans in Asia Minor. Empire of Nicæa. Theodore Lascaris, a man of no mean ability, who had been acknowledged as emperor before the capture of Constantinople, having taken up his abode in that place, succeeded in maintaining himself in opposition to the crusaders, the Seljuks of Iconium, and the Greeks of Trebizond; and his successors continued to reside here for nearly sixty years. When the difficulties of the Westerns in Constantinople became increasingly greater, and their downfall appeared imminent, it was for a time a question whether that city should become the prize of the emperor of Nicæa, or of the emperor of Thessalonica, or of the Bulgaro-Wallachian sovereign; and this rivalry involved many alliances and wars. The man who ultimately decided it in favour of Nicæa was Michael Palæologus, who became the founder of the last dynasty that ruled the Greek empire (1261).

The Palæologi.

The character of Michael, which was too faithfully reflected by many of his successors, represented most of the unfavourable qualities of the Greek race. Though a brave soldier, he was intriguing, selfish, and unscrupulous, as he soon showed by the deposition and blinding of the young emperor, whose guardian and colleague he was appointed to be. He entered on the possession of a ruined capital, which the barbarism of the Western nobles had reduced to a state of poverty and filth, and his attempts to restore it were misdirected and unsuccessful. His one object, when he had established himself on the throne, was to maintain his despotism; and while he recovered part of the Peloponnesus to the empire, he ruined his subjects financially by debasing the coinage, and commercially by allowing the Genoese and Venetians to appropriate most of the carrying trade of the Greeks. But the act by which he gave the deepest offence was the reunion of the Eastern and Western Churches, which amounted to the submission of the Greek Church to the pope, to which he consented at the council of Lyons (1274), in order to persuade Gregory X. to prohibit Charles of Anjou from invading the empire. The narrowness of the theological spirit among the Greeks at this period was greater than we can well conceive, but it was a not unnatural outburst of national feeling which roused the people in opposition to this measure. The subsequent attempt in the same direction at the councils of Florence and Ferrara (1438–9), when the nation was reduced to the direst straits, met with no better reception at home. Under the successors of Michael the empire continued for 170 years, but the whole of this time was a long death sickness. The doom of the empire was forecast by the powers that came to prey on its weakness—the Catalans, who plundered those whom they had undertaken to aid; the Knights of St John, who seized Rhodes, a conquest which they rendered memorable by their gallant defence of that island against the Mahometans; and the Servians, who, under Stephen Dushan, established an important empire, which lasted until it was destroyed by Sultan Amurath at the great battle of Cossova (1389). Even the emperors themselves, from the endowments and gifts which they lavishly bestowed on monasteries, especially those of Athos, seemed to be providing beforehand for a day when their possessions would pass into the hands of others.

The [illegible]

The nation was now arriving at the maturity which was to bring this Eastern empire to an end. Shortly before the Greeks regained possession of Constantinople, the Mongols, whose vast hordes had overrun a great part of Europe and Asia and had destroyed the caliphate of Baghdad, entered Anatolia, and shattered the power of the Seljuks of Iconium; but on the ruins of this dynasty another and far more terrible dominion arose. Towards the end of the 13th century Othman, the chief of a Turkish tribe in north-west Phrygia, penetrated through the passes of Mount Olympus, which the careless policy of Michael Palæologus had denuded of the protection of [illegible] and descended into the lowlands of Bithynia. [illegible] Othman, the city of Prusa was captured, which became thenceforth the capital of the Ottoman race. The extraordinarily rapid rise of this people to be one of the greatest powers that the world has seen was due in great measure to the remarkable ability of its successive rulers, but in no slight degree also to the institution of the Janissaries—an inhuman but most efficient system, by which Christian children were torn from their homes and educated as Mahometans in the household of the sultans, to whose personal service, as a bodyguard, they were for life devoted. As early as the year 1346 we find Cantacuzene, then the prime minister of John V., and afterwards himself emperor, entering into alliance with Orchan, and giving him his daughter in marriage. The first step towards a permanent settlement of the Turks in Europe was made in 1354, when Gallipoli was occupied by Orchan's son, Suleiman. Seven years from this time Amurath I. made himself master of Adrianople, and before his death that sultan saw the Greek emperor his vassal and tributary. It seemed now as if the fall of Constantinople could not long be delayed, when, with one of those turns of the wheel of fortune which form the surprises of history, Bajazet, the most powerful of all the Ottoman rulers, was defeated and taken prisoner by Timur the Tartar at the battle of Angora (1402), and civil war setting in between his sons gave the Eastern empire a new lease of existence. But within twenty years again the capital was besieged by Amurath II., though he failed to take it, owing partly to the strength of its fortifications, and partly to a rebellion that broke out in his family. The empire was now reduced to Thessalonica, a part of the Peloponnesus, the city of Constantinople, and a few neighbouring towns.

End of the empire.

In the midst of the gloom which hangs over this last period, it is consoling to find a ray of light that illumines its closing scene, in the heroic end of the last Constantine. The story is a sad one. The city was beleaguered by land and sea by the warlike hosts of Mahomet II.; no further succour could be expected from the West; and the emperor, who had adopted the Latin rite, was thereby estranged from the great mass of his subjects. But he had determined not to survive his empire, and he died in a manner worthy of the greatest of his predecessors. On the eve of the final assault he rode round the positions occupied by his troops, to cheer them by his presence; and then, having partaken of the eucharist in St Sophia's after the Latin form, and having solemnly asked pardon of the members of his household for any offences, he proceeded to occupy his station at the great breach. There on the following morning, after a desperate resistance, he fell fighting amidst a heap of slain, and the young sultan passed his lifeless body as he rode into the captured city.

We have thus passed in review the fortunes of the Greeks during a period of nearly eighteen centuries. We have seen how the Roman system of government and the Greek character and social institutions, mutually influencing and modifying one another, produced the characteristic features of the Eastern empire. We have watched that empire maintaining a conflict on the one side with the invading barbarians, the Bulgarians, and the Western nations, on the other with the Persians, the Saracens, and the Turks, until to the last of these peoples it finally succumbed.

[illegible] the principal histories of this period [illegible] Gibbon's [illegible] Greek, [illegible] (H. F. T.)

SECTION III.—RECENT HISTORY.

The history of Greece from the fall of Constantinople to the present day suggests a problem of profound historic interest. From the year 1453 till the end of the 18th century almost all the occasions on which the Greek people appear on the page of the historian are occasions on which we read of them that they were butchered or sold into slavery. Records tell only of their annihilation or dispersion. Yet in the commencement of the 19th century this apparently annihilated and dispersed people can summon energy enough to resist the Turks, and although in all probability they would have failed to overcome their oppressors if they had been compelled to struggle unaided, yet the courage and self-devotion which they showed in the conflict were such as to gain for them the sympathies of Europe, and they came forth triumphant. But in reading even of their war for independence we are astonished that a remnant was left. Thousands upon thousands perished, and their victory seemed only less terrible than utter defeat. Yet the spirit of life remained. The kingdom of Greece was established, and within forty years, notwithstanding deplorable mistakes in its management, the population is doubled, and the country becomes consolidated into a constitutional realm. To trace how these events were possible and how they actually came to pass is the task of the historian of Modern Greece.

The external events in this history are necessarily few. Greece was during the most of these centuries under the sway of foreigners, and the external history of Greece is formed merely by episodes in the history of these foreigners. When Mahomet II. became master of Constantinople, he did not thereby become master of the Greek empire. The Palæologi had held only a small portion of the territory which had constituted the Greek empire. Most of the islands of the Ægean were under the rule of Italian princes who acted as independent rulers. Rhodes was governed by the knights of St John. But especially the Venetians owned large possessions in Greece and were also powerful by sea. The external history of Greece is occupied mainly with the efforts of Mahomet II. and his successors to spread their conquests. Mahomet himself conquered the kingdoms of Trebizond, Albania, Eubœa, Greece proper, and part of the Peloponnesus. He was also successful in expeditions against several of the islands of the Ægean, but he failed in his attack on Rhodes. It was not till the end of 1522 that the knights of St John capitulated to Suleiman I. after standing a siege in which they showed the greatest bravery, and in which the Ottomans, it is said, lost about 100,000 men. On the 1st of January the knights left the island, to go first to Crete and then to Malta. Cyprus and Crete remained still longer in the hands of the Westerns. In 1489 Catherine Cornara ceded the island of Cyprus to the Venetians, who retained possession of it till, in 1570, Piali and Lala Mustapha attacked it. Nikosia fell in September 1570, and Famagosta in August 1571, after a brave defence conducted by Marcantonio Bragadino. The Turks received a severe defeat at Lepanto from Don Juan d'Austria in command of the combined fleets of Spain and Italy, in which they lost 130 ships and 30,000 men. But the blow was merely temporary. The helpers of Venice were not united among themselves. Again the Turks became the rulers of the Ægean Sea, and in 1573 Venice had to conclude a humiliating treaty in which she gave up Cyprus. In the case of Crete Venice had to pay for her own severity. That island remained for a long time undisturbed in the possession of the queen of the seas, as far as the Ottomans were concerned. But internal commotions agitated it. The Sphakiots or mountaineers of the south-west of Crete—a bold brave and independent race of men—rebelled against the rule of the Westerns; and the Venetians had recourse to the most shameful cruelties and atrocities on all their Greek subjects in order to crush the rebellious spirit. The result was that the Greeks hated the Venetians with the bitterest hatred, and would have gladly welcomed a change to the rule of the Turks. The Venetians saw that they had gone too far, and sent a wise politician, Giacomo Foscarini, to bring matters to a better state. Many prudent reforms were inaugurated, the Sphakiots were reconciled and all seemed to promise well. But Foscarini died before his reforms got firm hold of the people. The Sphakiots indeed from that day to this have never submitted to the Turkish yoke, but the rest of the people were far from willing subjects of the Venetians and favoured an invasion by the Turks. The Turks knew their opportunity, and began an effort to possess the island which, though the Venetians resisted with great perseverance and were backed by other Italians and by the French, ended in the treaty of 6th September 1669, in which they ceded Crete to the Turks. This last acquisition rendered the whole of Greece subject to the Turks with the exception of the Ionian and a few other small islands, which still remained in the hands of the Venetians. The Venetians, however, did not resign their hold on Greece without a final effort to recover possession of it. For this purpose they not only levied soldiers from their own and other Italian communities, but also hired generals and soldiers from Germany. The war began in 1689. The management of it was entrusted to one of the greatest men whom Venice produced, Francesco Morosini, who was ably assisted by a Swedish general, Konigsmark. The contest was carried on with great vigour until at length the Turks were driven from the Peloponnesus. The Venetians wished also to regain possession of Eubœa, but in this they were unsuccessful. The war was brought to an end by the peace of Carlowitz, which left Venice in possession of the Peloponnesus, and the islands of Ægina and Santa Maura. One incident in this war has especially attracted the attention of the civilized world. Morosini, finding his efforts successful in the Morea, resolved to advance towards Eubœa. Athens lay in his way. It was garrisoned by the Turks, who, however, on his approach quitted the lower city and, occupying the Acropolis, prepared to defend it at all hazards. They planted one of their batteries in a breach of the temple of Nike Apteros, and they placed a portion of their powder and many of their valuables in the Parthenon. The Venetians showed no respect for the most beautiful of all buildings; and one of their bombs, falling on the powder in the Parthenon, blew many of the masterpieces of art into a thousand fragments, and utterly defaced the noble building which had remained up till that time very nearly in the condition in which the original architect and sculptor had left it. The Venetians tried to introduce reforms into the Peloponnesus, and had made considerable progress when in 1715 Ali Kumurgi, at the head of a very large Ottoman army, entered the Peloponnesus. The Venetians were unprepared, and they could not easily get assistance from others. The consequence was that in a very short time Kumurgi drove them out of the whole of the peninsula. The Turks got involved at this time in war with Austria; and when peace was finally concluded at Passarowitz, Venice had to give up the Morea as well as the island of Ægina, and practically she disappears from the history of Greece except as the possessor of Santa Maura. But a great change had now begun to take place in European politics. At an early period after the capture of Constantinople the Turks came into collision with their neighbours on the north, the empires of Austria and Russia, and we find these two powers united in resisting the inroads of the Ottomans. Even so late as 1683 the Turks were so bold as to advance as far as Vienna and lay siege to it. But in the 18th century the policy of Russia attracted the attention of the rest of Europe, and caused a considerable change of attitude. Early in that century Peter the Great had declared his resolution to force his way into Constantinople, and though he was completely baulked in his aim, and had to sign an inglorious peace (1711), the desire to have the city on the Bosphorus continued to animate the Russians. It is to Count Münnich, field-marshal and counsellor of the Russian empress Anna, that historians attribute the suggestion that Russia should systematically stir up the Greek Christians against their Turkish masters, and from his time (1736) onward we find Russia continually scheming to rouse the Greeks to insurrection. Most famous amongst these efforts were those of the empress Catharine II. who, influenced partly by the Philhellenism of Voltaire, partly by a desire to withdraw the attention of her subjects from domestic affairs, but principally by a wish to gratify her favourite Orloff, formed the project of emancipating the Greeks from the yoke of the Turks (1769). But all the efforts made to effect this object were exceedingly inadequate. The Greeks were soon taught also that Russia, while willing to free them from the Ottoman yoke, was determined to assist none but those who would readily become Russian subjects. And the expedition to the Peloponnesus undertaken by Orloff was followed by most disastrous consequences to the Greeks. The Russians were more successful in their contests with the Turks in the north, and in 1774 compelled the sultan to accept a peace, called the peace of Kainardji, which contained several provisions bearing upon the Greeks. In some of these the sultan promised to protect the Christian religion and Christian churches, and though no special mention was made of Russia, her statesmen saw in this stipulation an opening for endless opportunities to interfere. And from this time forward Russia has claimed to be the champion of the Christians against the Turks. But the other states of Europe, especially France and England, became suspicious of the designs of Russia, and holding to the balance of power as an essential principle of European statesmanship, they determined to maintain the integrity of the Turkish empire. Austria had frequently joined with Russia in opposing the Turks and had again and again hoped to come in for a share of the spoil when Turkey should be partitioned. But towards the end of the 18th century the increasing power and influence of Russia began to alarm her, and when the Greeks rose to assert their independence, no power more tenaciously adhered to the doctrine that the integrity of the Turkish empire was demanded by the balance of power in Europe. Thus up to the time of the establishment of the Greek kingdom the affairs of the Greeks have been mixed up with those of foreigners,—Ottomans, Venetians, Austrians, Russians, and the other European powers.

The notable fact in Greek history during these ages is the disappearance and the apparent destruction of the nation. Whoever might hold the supreme power in Greece, the Greeks were sure to be the sufferers. When the Turks spread their conquests from Constantinople on to the rest of the empire, every capture of a city was followed by the slaughter of the able-bodied men and the carrying off of the women and children to the harem or slave market. And the Venetian Catholics were not a whit more tender than the Ottomans. The Venetians were wroth with the Greeks, because they did not acknowledge the pope, and in the [illegible] perpetrated the most abominable barbarities on the Greek population. The Turks punished the Greeks because they submitted to the Venetians, and the Venetians punished them because they submitted to the Turks. The piracy [illegible] the Ægean was [illegible] by pirates who, whether Turks, Italians or Greeks, had no mercy on the peaceful inhabitants of the mainland. Human life was disregarded, and men and women were of value only in so far as they were saleable articles in the slave market. If one were to enumerate all the instances in which historians tell us of the utter destruction or transference of the Greek population, a vivid idea might be presented of how terribly hard were the sufferings of the Greek people. We have to add to this record of destruction that vast masses of the people removed to Italy or Sicily or some other place of refuge. Almost all the famous families that ruled the islands of the Ægean escaped from them when they were attacked by the Turks. The knights of St John, for instance, left Rhodes to find a final settlement in Malta. Among the number who thus left their native land were nearly all the learned men, who sought in the West a refuge from Turkish rule, and opportunities for the pursuit of learning.

Yet notwithstanding these destructive forces the Greek people survived. To understand this phenomenon we have to examine into the mode of civil administration adopted by the Ottomans. The Ottomans were pre-eminently a warlike people. Their profession was that of arms. Their two great objects in life were to conquer and enjoy their conquests. They were brave and always ready to fight, but after battle was over they wished to enjoy the luxury and repose which they had earned by arms. They were therefore utterly disinclined to meddle with civil matters. If they got their revenues, and could enjoy their harems and slaves, it was a matter of no consequence to them how the subject races procured the means of paying the taxes, or in what way they governed themselves. The same spirit showed itself in the sultans. To them all Turks as well as Greeks were practically slaves. The sultans saw in the Turks the right hand that could bring them success in war, and in the Greeks or other subject nations the means of ministering to their wealth and enjoyment. Provided they had a sufficiently numerous and brave army and ample supplies of money, they were comparatively indifferent how or by whom local affairs were managed. This freedom from bias and this singleness of purpose enabled them to continue their power for a much longer time than they could possibly have done had they been swayed by national aims or particular ambitions. They had no hesitation in selecting for their purposes the best men they could get, and consequently many of the subject races rose to places of high eminence in the Turkish army and administration. A large proportion of the viziers of the Sublime Porte have been Greeks. Many of the generals that subdued Greece were Greeks. There was thus a constant accession to the ranks of the Turks from the subject nations. Those who thus entered the Turkish service could not do so without adopting Mahometanism. It was the essential condition. But many Greeks found no difficulty in changing their faith. They saw that it was their one hope of rising to eminence. And these men reached such high positions as to arouse the jealousy of the Turks; for the sultans preferred the converts to the original Mahometans. They felt more confidence in them as instruments of their own domination. Indeed at one time there seemed a likelihood that large portions of Greece would become entirely Mahometan. They were urged to it by two opposite influences,—by the high position which Mahometan converts from Greece could attain, and by the utterly wretched condition of those who remained attached to the Christian religion. We have a curious instance of the effect of the latter motive in the conduct of the Caramuratades who occupied about thirty-six villages in the valley of the Aous in Albania. The inhabitants of these villages had long been oppressed by the Mahometans, but had remained Christian until 1760. In that year matters came to a crisis.

The Caramuratades could stand their distress no longer. They argued that either Christianity was not true or it ought to put them in a better position. They resolved to give it one chance more, and to try to conciliate the Divine Being by the most rigid fasts. If He did not listen to them, then they would feel assured that He did not wish them to remain Christians. The chief priest protested against the impiety of this resolution, but the Caramuratades would not listen to him. They observed Lent with the most rigorous severity, and prayed much. No improvement followed in their lot; and accordingly, on Easter day, they told the priests to retire, accused the sacred images of being indifferent to their distress, and in one body went over to the faith of Islam. A very few indeed refused to join their brethren, but they had to retire with the priests. At an earlier period, from 1620 to 1650, the Christian population of a part of Albania fell from 350,000 to 50,000; and to the present day a portion of the Albanians have remained firmly attached to Islamism, and have been the readiest tools in the hands of the Turkish Government, while the other portion have stood by the Greeks in their struggles for independence, and have done great and valuable service to the cause. In fact, so great was the inclination of the Greeks to adopt Mahometanism through the combined motives already mentioned that the sultans were alarmed lest they should have no tribute-paying people at all, and accordingly they became kindlier in their treatment of the rayahs or subject Christians, and did much to reconcile them to their government.

Another mode in which the Greeks passed over to Islamism has been already noticed. Even before the taking of Constantinople Orkhan had ordained that the children of Christians should be taken from them, should be specially trained for military service, and should enjoy such privileges and immunities that they would feel themselves specially bound to the sultan. The practice was continued and extended by Mahomet II. Every fifth Christian child had to be surrendered to the service of the sultan. All connexion with his parents was cut off, and he was set apart and trained for warfare. In this way was formed the corps of the Janissaries. The Janissaries were not at first permitted to marry. Their ranks were constantly recruited from the Christian children. History speaks in the highest terms of the discipline and courage of this body of troops while it flourished. The Janissaries forgot altogether, if they ever knew, their homes and their hearths, and they were equally savage to Turk and Christian in their devotion to the sultan. This hateful sacrifice imposed upon the Christians gradually came to be regarded as an honour. The parents knew that their children were to be removed from the degradation of Christian slavery, and were to occupy the best positions that were open to Mahometans, and the Turks themselves so much envied the honour for their children that they bargained with the Greeks to take their children and give them for Janissaries instead of their own. A change took place at length in the composition of the Janissaries. They were allowed to marry; by degrees a position in the body became hereditary; and thence is dated the falling off of the corps. The tribute children were no longer required, and in the reign of Mahomet IV. (1649–1687) the tribute ceased.

In all these instances the Greeks were practically lost to their own nation. They disappeared from the nation of Greeks and Christians and became Turks and Mahometans. At the same time we cannot help supposing that by this intermixture a new element of progress, or at any rate of restlessness, was thus introduced into the dominant race.

But the Greeks attained to positions of eminence in which they were not compelled to abandon their nationality. Between the Turks and the Greeks existed irreconcilable differences. Not only was their religion different, but they differed widely in their social customs. There was no hope of amalgamating the two races. The Turks could only convert or exterminate the Christians. They did not venture to dream that they could convert all the Greeks by persuasion, and forcible conversion after the age of twelve was forbidden by the Koran. The only other alternative was extermination, and one of the sultans came to the resolution to destroy every Christian. But the Turks saw that such a policy was ruinous to themselves. Every Christian paid a poll-tax from which every Turk was exempt. The Christians cultivated the lands for the benefit of the Turks. The Christians were the drudges of the Turks. The next best thing to extermination then was to get as much out of the Christians as possible while coming as little as possible into personal contact with them. This was the plan adopted. Immediately on the conquest of Constantinople, Mahomet spread the Turkish system of administration over the whole of Greece. The Turkish warriors received lands during their life on condition of being ready to serve in war. These had captains who received the liferent of larger portions of land, and finally pashas acted as military and civil rulers of still larger portions. All these were ready to keep the Greeks in subjection, and crush every effort at rebellion, and they guaranteed the taxes to the sultan. Turkish courts of justice were also established. But Mahomet II. did not disturb the Greek modes of civil administration which he found in force. They merely became subject to his purposes, and appeal could always be made from a Greek to an Ottoman institution. Mahomet II. especially made use of the Greek clergy as his tools for keeping the Greek people quiet and submissive in paying taxes. The Greek emperor had perished in the sack of Constantinople, and the nobles had either fallen or fled or been butchered shortly after. But the Greek Church still remained. The Greek people were devoted to their church. Their quarrels with the pope had only strengthened their attachment to it. Here was an instrument that Mahomet thought might be of great use. Accordingly he made the patriarch of Constantinople the representative of the entire Greek people. He gave him privileges and honours, but he made him responsible for the conduct of the Greeks. The Greek clergy had long before taken an active part in the administration of justice. The bishops had the decision of all questions connected with marriages and wills. They were consulted by their people not merely in spiritual but in nearly all civil matters. The sultan had hold of this clerical influence through the patriarch. He practically appointed the patriarch, the patriarch appointed the bishops. All the great officials of the church thus held their positions under the sanction of the sultan, and could be removed by him. There is no doubt that patriarch and bishops and higher clergy, thus playing the humiliating part of keeping their fellow-countrymen in due subjection to the Porte, did not and could not display very high virtues. They soon contracted all the vices which defile men who have to play a double part; they were true neither to the sultan nor to the Greeks; and they were animated generally by a mean and selfish ambition. By degrees the patriarchate came to be bought from the sultan by higher and higher prices. The patriarch made up his losses by selling the bishoprics, and simony thus became universally prevalent. Notwithstanding all these drawbacks the maintenance of the Greek Church helped to keep the Greeks together, and when a better time came, the high positions which the clergy held enabled them to accomplish much for the spread of enlightenment and the awakening of true national feeling. Even in the darkest times patriarchs appeared who were capable of the greatest sacrifices for their church and nation, and in the war of independence several of the clergy stood in the foremost rank. The inferior clergy throughout the whole time were true to their people; but as they were to a large extent uneducated, and had to maintain themselves by some handicraft, they differed in no respect from the great body of the people, to whose industry and real worth the permanence of the nation is mainly due.

Another circumstance favourable to the Greeks was that the Ottomans allowed them to retain the communal system which had existed in earlier times. By this system, which, however, did not prevail in all parts of Greece, and where it did exist was not carried out always to the same extent, all the males of full age in each district elected a man who was to take special charge of local affairs. These men went by various names, such as demogerontes, gerontes, archontes, proesti, and epitropi. The Ottomans found the system helpful. The proesti had to keep on good terms with the Turks, and were indeed frequently farmers of the taxes from the Turks. They were also often exceedingly ambitious and cruel. But they were often men of intelligence and influence; and when the war of independence broke out, some of them took a prominent part. There cannot be a doubt also that the local self government which was thus allowed to exist helped to keep up the longing for liberty and to prepare the nation for a constitutional government.

The Greeks showed their aptitude for combination and self government also in mercantile affairs. From an early period they had taken to mercantile pursuits, and their position was in many respects advantageous for trading. The Turks were not successful in trade, and indeed did not care to pursue it. They therefore willingly left it in the hands of the Greeks, and various events and circumstances had favoured them. The Turks imposed a heavier duty on goods exported or imported by Greeks than on those possessed by Turks. The result of this regulation was that the sultan saw it to be his interest to encourage Greek rather than Turkish traders, as his revenue from the former was much greater than from the latter. Various privileges were gained by the Russians for their own traders, and the Greeks were permitted to enjoy these under the Russian flag. Then, during the war which France waged against all Europe, Turkey was for a long time neutral, and the subjects of Turkey could trade where no others could. Under these and similar conditions the Greek traders spread themselves over the whole of the Mediterranean, and many of them became very wealthy. In this prosperous state of matters various Greeks combined and formed large joint stock companies. Thus the association of Ampelakia, employed principally on cotton fabrics, embraced twenty-two villages. All the inhabitants of twenty-five years and upwards had a right to vote in the election of the five directors who managed the different departments of the company's activity. The profits were divided at the end of each year [illegible]. Similar [illegible] [illegible] [illegible] [illegible] [illegible] of Hydra, Spetsae, and Psara, by which these islands rose to great wealth and importance, and formed most powerful [illegible] in the struggle for independence.

[illegible]

interpreter. He was succeeded in this office by Alexander Mavrocordatus, who highly distinguished himself in various political transactions of great importance. The office of dragoman became permanent; a Greek was always appointed; and thus Greeks came to have rare opportunities of influencing the sultan. Not long after the establishment of this office another was instituted, that of dragoman or interpreter to the capitan pasha or chief Turkish admiral, whose business it was to arrange all matters connected with the fleet. Still further, the Turks thought it advantageous that the northern provinces of Wallachia and Moldavia should be ruled by Greeks, and generally those who had acted as interpreters to the sultan or to the capitan pasha were appointed as waiwodes or hospodars of Wallachia. These men became practically kings of these provinces, and Greeks from all parts flocked to hold offices under them. The Greeks who received these high appointments lived, when their duties did not call them away, in the part of Constantinople called Phanarion in which the patriarchate was placed, and hence they were called "Phanariots." They increased greatly in number, and at length formed a large, powerful, and wealthy community in the city of the sultan. The character of these phanariots has not been painted in bright colours by historians, but their circumstances were strongly antagonistic to the development of a high moral tone. They had above all to gain the favour of the sultan, and to stand well with the influential Turks. They could accomplish this only through double-dealing and through extortion. They were also ambitious, and had no scruple as to the means employed in attaining the objects of their ambition. It is affirmed that the Wallachians and Moldavians detested their rule even worse than that of the Turks; but this can be accounted for satisfactorily by the consideration that nothing could be more humiliating than to be ruled by men who had the appearance of princes but were in reality slaves, without our supposing that their rule was more than ordinarily cruel and rapacious. And much has to be said in their favour. They had the strong Greek love of culture. They sent their sons to the best universities in Europe, and in this way the phanariots became men of great refinement and intelligence. Many of them take a distinguished place in the history of their country's literature. They also established schools everywhere, and vigorously supported those they found existing. The schools or rather colleges of Bucharest and Jassy rivalled that of Janina in the number of able men they trained to guide and animate their country in its season of perplexity.

It was through these and similar instruments that the Greeks were being prepared during the Turkish and Venetian rule to struggle for their independence. Some of the Greek tribes had never been perfectly subject to the Ottomans, especially the Mainotes of the Peloponnesus and the Sphakiots of Crete. Many Greeks had led an independent life as pirates or as klephts. Piracy was [illegible] put down by the European Governments; but the klephts or brigands remained living on plunder of Greek and Turk alike, proud of their liberty, in their hill fastnesses. There were also in Albania, Thessaly, and Greece proper bodies of Christian warriors, called armatoli, who acted as forces of armed police, but whose [illegible] [illegible] with those of the klephts. [illegible] [illegible] by [illegible] they [illegible].

The reason was that they had no means of taking combined action. The great bond of sympathy which attached the various Greeks together during the 16th and 17th centuries was their religion. But a new inspiration came with the advance of culture in the end of the 18th and the beginning of the 19th century. They began to be animated by the feeling of nationality. The French Revolution roused their minds into activity, and they were ashamed that a nation which had played such a grand part in the early civilization of mankind should be the slaves of an illiterate and barbarous horde of aliens. Circumstances favoured the movement. Especially prominent amongst these was the conduct of Ali Pasha, the tyrant of Jannina. This daring and unscrupulous despot conceived the idea of cutting his connexion with the sultan and assuming the absolute government of Albania. His effort showed how weak the Turkish empire was, and how loosely it held together. Stimulating also was the conduct of the Suliotes, who performed prodigies of valour in their resolution to defend their homes and their liberties. A secret society was formed to make ready for a rising of the people. The people were stimulated by patriotic songs, especially those of Rhigas of Velestino; and the agents of Russia were everywhere.

Accordingly in 1821 the war for independence broke out. It would be impossible in the limits of an article like this to give a proper account of the various conflicts between Greeks and Turks, of the quarrels among the Greeks themselves, and the windings of European diplomacy in its interference in the contest. The principal events may be shortly noted. The insurrection was begun by Prince Alexander Hypsilantes, a phanariot in the service of Russia, who had been elected head of the chief secret society (the φιλικὴ ἑταιρεία). He crossed the Pruth March 6, 1821, with a few followers, and was soon joined by several men of great bravery at the head of considerable troops. But the expedition was badly managed, and in June Hypsilantes fled to Austria, having entirely failed in his object. And in all the efforts to overthrow the power of the Turks in the northern provinces the Greeks failed, though some men fought very bravely. In the Peloponnesus the insurrection broke out also in March in several places, and most prominent among the first movers was Germanos, archbishop of Patras. Everywhere the Greeks drove the Turks before them; they were so successful that in January 1822 the independence of Greece was proclaimed. But they soon began to quarrel among themselves. Several assemblies were held. Mavrocordatos, one of the phanariots, was appointed president. But the aspirants for honours and rewards were numberless, and they could not agree. Accordingly a civil war raged in 1823 and 1824, inspired by Colocotronis, a chief of klephts who attained great influence, and in 1824 another civil war of short duration, called the War of the Primates. During this period the Greek fleet was very active, and did good service. It was ably led by Miaoulis, a man of firm character and great skill. And he was well seconded by the intrepid Canaris, whose fire ships did immense damage to the Turkish fleet, and filled the Turkish sailors with indescribable terror. For the ravages of the Greek fleet the Turks wreaked fearful vengeance on the innocent inhabitants of the lovely island of Chios (April 1822), butchering in cold blood multitudes of its peaceful inhabitants, and carrying off others to the slave market. The savage atrocities then perpetrated caused a thrill of horror throughout the civilized world. Two years after they perpetrated similar outrages on the islands of Kasos and Psara. The sultan now invoked the aid of Mehemet Ali, pasha of Egypt, and his stepson Ibrahim landed on the Peloponnesus with a band of well-disciplined Arabs in 1824. Ibrahim carried everything before him, and the Greeks lost nearly every place that they had acquired. Some towns offered a strong resistance, and especially famous is the siege of Mesolonghi, which lasted from 27th April 1825 to 22d April 1826. Nothing could exceed the firmness and bravery displayed by Greek men and women during that siege; and their glorious deeds and sad fate attracted the attention of all Europe. The interest in the Greeks, which had been to some extent aroused by Lord Byron and other English Philhellenes in 1823, now became intense, and volunteers appeared from France and Germany as well as from England and America. Lord Cochrane was appointed admiral of the Greek fleet, and Sir Richard Church generalissimo of the land forces, but they did not prevent the capture of Athens by the Turks, 2d June 1827. Most of the European Governments had remained indifferent, or had actually discouraged the outbreak of the Greeks. Russia had disowned Hypsilantes. The monarchs of Europe were afraid that the rising of the Greeks was only another eruption of democratic feeling fostered by the French Revolution, and thought that it ought to be suppressed. But the vast masses of the people were now interested, and demanded from their Governments a more liberal treatment of Greece. Canning inaugurated in 1823, and now carried out this new policy in England. An accident came to the aid of the Greeks. The fleets of England, France, and Russia were cruising about the coasts of the Peloponnesus, to prevent the Turkish fleet ravaging the Greek islands or mainland. Winter coming on, the admirals thought it more prudent to anchor in the Bay of Navarino, where the Turkish fleet lay. The Turks regarded their approach as prompted by hostile feelings and commenced firing on them, whereupon a general engagement ensued, in which the Turkish fleet was annihilated, 20th October 1827. Shortly after (18th January 1828) Capodistrias, who had been in the service of Russia, was appointed president of Greece for seven years, the French cleared the Morea of hostile Turks, and Greece was practically independent. But several years had to elapse ere affairs reached a settled condition. Capodistrias was Russian in his ideas of government, and, ruling with a high hand, gave great offence to the masses of the people; and his rule came to an untimely end by his assassination on 9th October 1831. Anarchy followed, but at length Otho of Bavaria was made king, and the protecting powers signed a convention by which the present limits were definitely assigned to the new kingdom (1832). Henceforth Greece has existed as a recognized independent kingdom. Throughout the whole of the war of independence in Greece, the people behaved with great bravery and self-sacrifice. They showed a steady adherence to the idea of liberty. They were sometimes savage in their conduct to the Turks, and barbarities occurred which stain their history. Yet on the whole the historian has much to praise and little to blame in the great mass, especially of the agricultural population. But no single man arose during the period capable of being in all respects a worthy leader. Nor can this be wondered at. All the men who took a prominent part in the movements had received their training in schools where constitutionalism was the last doctrine that was likely to be impressed on them. Several of them had been in the service of Russia, and had full faith only in arbitrary power. Many of them were phanariots, accustomed to double dealing, ambitious and avaricious. Some of them had been brought up at the court of Ali Pasha of Jannina, and had become familiar with savage acts of reckless despotism. Others had been and indeed remained during the continuance of the war chiefs of klephts, having but little respect for human life, and habituated to scenes of cruelty and plunder. Some of them also came from the Mainotes, who owed their independence to the habitual use of arms, and who were not troubled by many scruples. It could not be expected that such men would act with great mercy or prudence in dealing with Turks who had butchered or enslaved their kinsmen and kinswomen for generations. Even amongst the foreigners who volunteered to aid the Greeks, few if any were found of supreme ability, and after the kingdom was established the Greeks were unfortunate in the strangers who came to direct them. Otho had been brought up in a despotic court, and knew no other method of ruling. He brought along with him Bavarians, to whom he entrusted the entire power, and the Greeks had the mortification of knowing that, though their kingdom was independent, no Greek had a chance of being elevated to any ministerial office of importance. Accordingly a revolution broke out in 1843; the Bavarians were dismissed, and Otho agreed to rule through responsible ministers and a representative assembly. But he failed to fulfil his promise. Discontent reached its height in 1862, when another revolution broke out and Otho had to leave Greece. The great mass of the people longed for a constitutional monarchy, and gave a striking proof of this by electing Prince Alfred king of Greece. This choice was determined by universal suffrage, and out of 241,202 Greek citizens who voted 230,016 recorded their votes in favour of the English prince. The vote meant simply that the Greek people were tired of unconstitutional princes, and hoped that they would end their troubles if they had a prince accustomed to see parliamentary government respected and enforced. The three protecting powers,—England, France, and Russia,—had however bound themselves to allow no one related to their own ruling families to become king of Greece. When the Greek people received this news, they begged England to name a king, and after several refusals England found one in Prince William of Schleswig-Holstein, son of the king of Denmark. The Greek people accepted him, and in 1863 he became king with the name of George I. Britain added the Ionian islands to his kingdom. In 1875 the ministry gave great offence to the Greek people by its unconstitutional procedure, but the king persisted in standing by it. The people, however, persevered in the use of legitimate means to oust the ministry; the king at last prudently yielded; and thus a revolution was prevented. The effort of the Greeks to extend their boundaries is the last phase of their history, and is still in progress. In 1853 when the Crimean war broke out, the Greeks sided with the Russians, and in 1854 they made inroads into Thessaly and Epirus, but English and French troops landed at the Piræus, and forcibly put an end to the Russian alliance and to Greek ideas of acquiring additional territory. In 1866 to 1869 the Cretans struggled bravely but unsuccessfully to throw off the Turkish yoke and become a part of the Greek kingdom. And recently when the Russians made war on the Turks the Greeks were eager to enter Thessaly and Epirus to aid their fellow-countrymen in asserting their freedom. But England interfered with the promise that Greece would gain more by maintaining a peaceful attitude. A clause in the Berlin Treaty affords a basis for the fulfilment of this promise; but the promise has still to be fulfilled. The Greeks themselves believe that with the extension of their boundaries there will be less occasion for intrigue, ministries will be more permanent, and the Greeks who now flock from all parts to the little kingdom of Greece for official employment will have a wider sphere and will be more contented.

The authorities for this section, some of which have been mentioned in the previous article, are very numerous. See, *e.g.*, the ἱστορία of Paparrhegopoulos, vols. v. and vi., and his French work *Histoire de la civilisation Hellénique*; Finlay, vols. v. vi. and vii.; Herzberg, vols. iii. and iv.; Karl Mendelssohn Bartholdy's *Geschichte Griechenlands von der Eroberung Konstantinopels durch die Türken im Jahre* 1453 *bis auf unsere Tage*; Sathas, Ἑλλὰς Τουρκοκρατουμένη, and the Chroniclers in his *Bibliotheca Græca Medii Ævi*; and Gervinus, *Geschichte des neunzehnten Jahrhunderts*, vols. v. and vi. For the Greek Revolution, besides the four first mentioned, there are Gordon and (in modern Greek) Trikoupis. There are many treatises on special portions, such as those of Philemon, Perrhævos, Phrantzes, Colocotronis, Von Maurer, Prokesch-Osten, Parish, and many monographs on the history of the various islands. More recent English works are an article by Mr Gladstone, "The Hellenic Factor in the Eastern Problem," published first in the *Contemporary Review*, and now in his *Gleanings*; Freeman's *Ottoman Power in Europe*; Sargeant's *New Greece*; and "Mr Gladstone and the Greek Question," being iii. of *Diplomatic Sketches by an Outsider*. (J. D.)

PART III.—GREEK LANGUAGE.

The possession of a common language was always regarded by the Greeks themselves as the most significant and important of the bonds which united the scattered members of the Hellenic nationality. Wherever there was a community speaking the Greek tongue, whether in Europe, Asia, or Africa, from Olbia on the Hypanis to Cyrene in Libya, from Salamis in Cyprus to Mælaca near the Pillars of Hercules, there was a portion of the Hellenic people linked to the rest by mutual intelligibility, and sharply marked off from the jabbering and inarticulate *βάρβαροι* who surrounded them. The earliest written records of this speech are probably to be found in what was at the same time the most precious common possession of this great nationality, the poems that bear the name of Homer. It is possible indeed that, in the form in which they have come down to us, they are later than the fragments of the earliest elegiac and iambic poets, such as Callinus, Mimnermus, Archilochus, and Simonides of Amorgus; but it cannot be doubted that in substance they go back to an earlier date. These, however, are in a literary language,—a language which bears the most evident marks of a free combination for artistic purposes of various popular dialects, along with many reminiscences of archaic forms and usages, and not a few formations due only to false analogy. For the early history of the Greek language we are obliged to have recourse to the reconstructions of linguistic science.

Origin of the Greek Language.

The common Indo-Germanic language.

Comparative philology shows us that there was a time when the ancestors of the various nations which speak what are generally known as Indo-Germanic[1] languages lived together and had a common speech. From the extent and character of the agreement between these various languages at the time when they first become known to us from written records, it is possible to a certain extent to determine which groups remained the longest in connexion with each other, and which parted off the soonest from the common stock. Unfortunately scholars are as yet by no means at one as to the results to which this method of inquiry leads us. Schleicher, *e.g.*, held that the agreement between the Aryan or Asiatic group of languages and the South-European (in which he includes not only Greek and Italian, but also Celtic) is closer and more significant than that between the latter and the North-European, *i.e.*, the Teutonic and the Letto-Slavonic group. Max Muller and Joh. Schmidt maintain that the relations of the various languages are so complicated that it is impossible to establish any "genealogical tree," or to determine the order in which they separated from each other (see Schmidt's *Die Verwandtschaftsverhaltnisse der Indogermanischen Sprachen*, Weimar, 1872). But the prevailing view is still that of Lottner, Curtius, Jolly, Fick, and Scherer, that we may with confidence assume the first division to have been that between the Aryan or Asiatic (Indo-Persian) and the European groups, and that there are sufficient points of agreement between all the European languages to warrant us in assuming that there was a period of some duration during which the European peoples remained united.

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[1] The numerous and forcible objections to the term "Aryan" have been often pointed out, and the word finds little favour with most philologists. For the most recent defence of it see Zimmer in Bezzenberger's *Beiträge*, vol. iii. pp. 137-158. The name "Indo-European" is apparently, but not really, more exact.

The common European language.

Of these points of agreement the most important are the following :—

1. The vowel *a* is found to have "split" on European soil into the three vowels *e*, *a*, *o*,—that is to say, there are numerous instances in which the European languages agree in degrading a primitive *a* into *e* or *o* when the Asiatic tongues either retain the *a* or weaken it quite independently into *i*.
2. The Europeans agree in softening a primitive *r* into *l*, where the Asiatics have retained *r*.
3. There are a large number of new words, and apparently even some new roots, common to most, if not to all, the European languages, of which no trace is to be found among the Indo-Persians.[1]

These facts cannot be set aside by instances of agreement in inflexion or syntax between Greek and Sanskrit, for example, for it is much easier to believe that at the comparatively late date at which any Teutonic language is known to us,—and much more so, at the far later date of the earliest Celtic records,—the inflexions which they presumably once had in common with Greek had become to a large extent worn away and unrecognizable and the syntactic constructions modified, than to suppose that such numerous instances of agreement were wholly fortuitous.

The Græco-Italic language.

A similar course of argument fairly leads to the presumption of a common Græco-Italic nationality. The agreement in vocabulary is still closer than that between the various members of the united European group: for instance, while the general terms for agriculture are shared not only by Greeks and Italians, but also by Teutons, Celts, Slavs (though not by Indo-Persians), there are many special terms which are only found on Greek and Italian soil, the most interesting among them being perhaps the words for *wine* and *oil*. Other words, again, which are used with a more indefinite meaning by the Europeans generally are specialized and differentiated in Græco-Italic (Fick, *Vergl. Wörterb.*, ii. pp. 1–288; Curtius's *Principles*, 230b, 234, 597, &c.). Whether we may also assume (as is done, *e.g.*, by Professor E. Curtius, *History of Greece*, vol. i. p. 19) that there was a common Græco-Italic law of accentuation is very doubtful, in face of the arguments advanced by Corssen in favour of a freer law of accents in the earlier times, both in Greek and in Latin. It is much more probable that the rigidity of the Latin system, and the exquisite flexibility and harmony of the Greek, were developed quite separately from a more fluid state. But undoubtedly there is a far greater similarity in the inflexional system of Greek and Latin than can be established between either of these and any other member of the group.[2]

Stages of development in inflexion.

At the time when the common Indo-European unity was first broken up, the language had reached a stage of development which may be given with some confidence as follows. The steps assumed are those which have been established by Professor Curtius in his monograph, *Zur Chronologie der Indogermanischen Sprachforschung* (2d edition, Leipsic, 1873). In spite of the criticisms to which this scheme has been subjected, by far the most important of which are those by Max Muller and Ascoli, it may fairly be said to maintain its ground, and it is reasserted with full confidence in Curtius's admirable work on the Greek verb.

Roots.

We start with the period in which roots alone were employed as words. As to the origin of these roots, philology is as yet quite unable to speak with any positiveness: all that can be said is that the imitative or onomatopoetic theory has not been proved to be capable of producing all the roots which we are compelled to postulate, while, on the other hand, no theory has been generally recognized as fit to be regarded as a serious rival. It is clear, however, that we must admit an extremely early, if not an absolutely primitive, distinction of roots into verbal and pronominal roots, *i.e.*, (1) such combinations of sound as were significant, and carried with them a notion which was vague and general, if not philosophically abstract, and (2) such as had no meaning in themselves, but only served to denote relations.

Roots "determined."

The second stage is that of the "determination" of roots, wherein, by the addition of different phonetic elements, they acquired a differentiated meaning—*e.g.*, when the very vague *ju*, "join," became *ju-g*, "join together," *ju-dh*, "join in battle." (It may here, however, be open to question whether the fuller forms were developed from the shorter by additions, or the shorter abstracted from the group of similar fuller forms, as Max Müller is rather inclined to hold.)

Verbs

The third stage is that of the formation of verbs, by the close combination of a verbal root with one or more pronominal roots, to denote the character of the subject of the verb. It is in the nature of this combination that we find the distinguishing feature of the Indo-Germanic stock of languages. At the same time we find (1) the "strengthening" of the vowel of the root, by the addition of the simplest vowel-sound *a*, to denote repeated or continuous as distinct from momentary action; (2) *reduplication*, originally producing the same effect, but afterwards, in a specialized form, denoting the continued result in the present of an act done in the past; (3) the *augment*, a particle, originally demonstrative in its nature, prefixed to a verb to denote that the action expressed by the verb took place at a time removed from the present, *i.e.*, in the past. To the same stage (though possibly to a later part of it) belongs the further development of terminations, so as to mark an action as having a special reference to the subject; this produces what is in Greek conventionally called the middle voice, but what is really a reflexive formation. We may take as types of the words created during this stage such forms as *da-ta*, "give there," *i.e.*, he gives; *da-da-ta*, "he is giving;" *a-da-m*, "I gave;" *da-da-mai*, "I give with a view to myself."

Stems.

In a fourth stage we get the expansion of the root into a stem, occasioned apparently, in the first instance, by the increasing need of distinguishing the noun from the verb. The earliest method of forming a stem was by the addition of a "thematic vowel" *a* to the root, to convey the notion of a continuous action; thus from *bhar*, "carry," came *bhar-a*, "carrying." Sometimes the vowel of the root was "strengthened" along with the addition of the thematic vowel; thus *rik*, "leave;" *raika*, "leaving." Afterwards other similar formative elements (or pronominal roots) such as *ta*, *na*, *ma*, *tra*, &c., were added to produce nominal stems of many various kinds. There is no reason to suppose that these were at first strictly differentiated in meaning; thus *par-nu-* is "filled" not "filling," but *su-nu-* may be taken either actively or passively, "the begetter" or "the begotten," and *tap-nu-* is "the burning" fever. Subsequently the instinct of language availed itself of variations in form to distinguish various relations, especially of gender. Again, when noun-stems came to be used, as the roots had previously been used, to form verbs by the addi tion of the personal terminations, this modification of the stem served to distinguish mood. Thus when the vowel a was added to a root from which a verb was already formed, the inflexions of this extended root or stem denoted an action intended to be performed, and thus acquired the force of a conjunctive mood. The addition of the vowel having thus obtained this differentiating power, it was afterwards affixed with the same force to stems already provided with *a*, the contraction of *a + a* giving *ā*; hence, just as *han-ti* is "he kills," *han-a-ti*, "let him kill," so *bhara-ti*, "he is carrying," *bharā-ti*, "let him be carrying."

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[1] See Curtius, *Ueber die Spaltung des A-Lautes*, Leipsic, 1864; Fick, *Die ehemalige Spracheinheit der Indogermanen Europas*, Gottingen, 1873; *Vergleichendes Worterbuch der Indogermanischen Sprachen*, 3d edition, Gottingen, 1876, where the list of common European words fills vol. i. pp. 471–843. Compare *Grundzuge*, p. 93.

[2] Schleicher's doctrine as to the close relation of the Latin and the Celtic inflexions is not now generally accepted.

Compound stems.

In a fifth stage compound verbal forms make their appearance, *i.e.*, tense-stems are produced by the union of primary verb-stems with the roots of verbs which have become simply auxiliary. That this must have been at a later stage than the preceding processes is clear from the fact that verbs only gradually lose their full meaning, and with it their independence. The verbs so used are (1) *as*, originally "breathe," afterwards "be", (2) *ja*, "go", (3) *dhā*, "do." From the composition of the first with a verb-stem we get forms like those of the compound or so-called first aorist—*e.g.*, *a-dik-sa-t*, "he pointed" (= *ἐ-δεικ-σε-τ*). Here we have the union of a root (in this case acting as a noun-stem) with the auxiliary verbs in the third person, preceded by the augment; *a-dik-sa-t* is to the earlier form *a-dik-t* much as "tum docens erat" is to "tum dans." These formations belong to the earliest stratum of this period, inasmuch as the stem appears in its simplest form. For a like reason we must assign to the same stratum the compounds of *ja* with the simple stem. This auxiliary is used to denote relations which were at first somewhat indefinite but were afterwards more precisely differentiated. There is (1) the present of duration: *e.g.*, *svid-jā-mi*, "I am sweating;" (2) the passive force thus derived, as in Sanskrit *ja* is a sign of the passive: *e.g.* *bodh-a-ti*, "he knows," *budh-jā-te*, "he is known;" (3) the tendency to do a thing, *i.e.*, the *optative* mood: as in *as-jā-m*, the primitive form of *siēm* (*sim*) and *εἴην*. There is also to be noted, as belonging to this stage, the very important present of duration from the root *as*, *i.e.*, *as-jā-mi*, which acquired for itself, and when affixed to roots or stems gave to them, the force of a future. With regard to the root *dhā*, the widely varying force which its compounds have in the different cognate languages prevents us from determining with certainty the manner in which it was originally employed in composition (*cf.* Curtius, *Das Verbum*, ii. 362). To a second stratum of the same period must be assigned the compound verbal formations in which the stem is not a pure root, but has already been developed into a stem which has the character of a noun. If we compare, *e.g.*, *bhara-jā-mi* ([illegible]), "I am bearing," with *svid-jā-mi*, we find in the first a nominal theme employed for composition and inflexion, in the second a simple root. It is of much importance to notice that here too the verbal formation must have preceded the formation of cases. Had the accusative *bharam* been in use, it would have been impossible not to employ it in connexion with a verb-form like *jā-mi*, just as the Romans said *venum ire*, *datum iri*, and the like, and as Sanskrit forms the periphrastic perfect of the tenth conjugation, by uniting the auxiliary verb with the accusative: *e.g.*, *bodhayām chakāra*, *bodhayām babhūva*, &c. We are led to the same conclusion by considering forms like *a-dik-sa-nt*, by which the absence of plural inflexion is not less clearly indicated than the lack of case-inflexion by *bhara-jā-mi*. It has been urged, *e.g.*, by Professor Max Müller, that this argument is a weak one, because our ancestors must have felt the need for clearly distinguishing the plural from the singular, and the nominative from the accusative, before the need for denoting the differences between the persons. To this it may be replied (1) that the argument from what *must* have been is one of the most dangerous that can possibly be used in philology; conclusions *a priori* have again and again been disproved by a more complete acquaintance with the facts of the history of language; (2) that, as a fact, incompletely developed languages do find it more easy to do without distinct marks of the cases than to dispense with personal inflexions, and that this is confirmed by languages like English and French, which have returned to an uninflected state more completely in the case of nouns than in that of verbs; (3) that in the inflexion of nouns the sign of the plural is added to the case-suffix and not *vice versa* (*e.g.*, λύκοις = λυκοι-ς = *varkā-m-s*), so that the use of the sign of case must have preceded that of the sign of number, although the latter might have seemed to us the more indispensable. Professor Müller's argument that composition might have taken place in times subsequent to nominal inflexion, because the stem-forms show themselves in certain cases of declension, and therefore might have remained present in the consciousness of those using the language, breaks down upon the essential distinction between the nature of the composition of the verbal forms in primitive times and of the construction of compound verbs within the historical period. We may therefore safely follow Curtius in holding it as at least highly probable that verbs were already inflected according to person, tense, mood, and voice at a time when nouns were still in the state either of simple roots (*e.g.*, *vāk*) or nominal themes (*bhara*, *akra*, *sunu*, *pati*, and the like). The needs of language at this stage were probably helped out (as at present in uninflected languages) by the position of the words, by the stress of the voice, and by a free use of pronominal roots, which may have been already acquiring somewhat of a prepositional force. But one of the most important means of expression was undoubtedly composition. The form which the elements of compounds take, rarely (and apparently never in any early word) appearing with any case-inflexion of the first element (as in *οὐδενόσωρα*, *διοτρεφής*, *ἀμφορεαφόρος*), but presenting themselves simply as stems (*λογο-γράφο-ς*, &c.), shows that at any rate the mould in which they were cast, the analogy on which later compounds were freely fashioned, was constructed at a time when nouns were not inflected. The various relations which the factors of the compounds bear to each other point to the same fact. We find in Greek, according to the very clear and careful statement of Curtius (*Grammar*, § 359, *cf.* *Elucidations*, pp. 172-178) three kinds of compounds: (1) *determinative*, in which the second factor is the principal, which, without altering its meaning, has it defined by the first, *e.g.*, *ἀκρό-πολις* = *ἄκρα πόλις*; (2) *attributive*, where the first factor defines the second, but so as to alter its meaning, the two combining to form a new idea; *e.g.*, *μακρό-χειρ* = *μακρὰς χεῖρας ἔχων*; (3) *objective*, in which one of the two words is grammatically governed by the other, so that in paraphrasing one of the two must be put in an oblique case; *e.g.*, *ἡνί-οχο-ς* = *τὰ ἡνία ἔχων*, *φιλό-μουσο-ς* = *ὁ τὰς Μούσας φιλῶν*, *ἀξιό-λογο-ς* = *λόγου ἄξιος*, *θεο-βλαβής* = *ὑπὸ θεοῦ βεβλαμμένος*, *χειρο-ποίητο-ς* = *χερσὶ ποιητός*. (Similarly Max Müller, *Sanskrit Grammar*, § 513, gives six classes of Tatpurusha compounds, according as the first element stands in an accusative, instrumental, dative, ablative, genitive, or locative relation to the second, with numerous examples.) Curtius justly calls attention to the epithet *πατροφονῆα* as applied in the *Odyssey* to Ægisthus in relation to Orestes, "one who had slain his father." It is evident that composition, used as freely as forms like these indicate, could have taken very largely the place of case-inflexions.

Compounds.

Cases.

The origin of the cases, which marks a sixth stage, presents much more difficulty than the origin of verbal forms. But one broad division may at once be made. The vocative, nominative, and accusative are connected together much more closely than the remaining cases; they coincide in the neuter gender, and no one of them ever interchanges with or becomes equivalent to any one of the other group. On the other hand, in Sanskrit the ablative often coincides with the genitive, and the locative in the dual with the genitive or dative, while in Greek the instrumental is replaced by the dative, in Latin by the ablative; dative and genitive coincide in the Greek dual, dative and ablative in the Latin plural, and the locative always in Latin coincides in form with genitive, dative, or ablative. The vocative may be regarded as a relic of the preceding uninflected stage. The nominative and accusative are closely connected with theme formation, and seem to have been but a new development of the same principle. From a root *sup*, "sleep," came, as has been seen, at an early stage *sup-na*, "sleeping"; from *kar*, "make," came *kar-ta*, "made." It was only an extension of the same method when the pronominal *sa* and *ma* were added to the themes thus formed. Nominal inflexion was created as soon as it came to be recognized that the last additions were movable, and that the same stem might, according to circumstances, appear with one or the other or with neither. The fact that *-m* is found as the suffix of the nominative in some pronouns (*e.g.*, Sanskrit *aham* = ἐγών, *tvam* = *tu*, &c.) seems to point to a time when this was used as a determinative for nominative and accusative alike, but it soon became specialized as a characteristic of the latter. There is reason to believe that this process was facilitated, if not occasioned, by the use of the *m*-suffix to denote gender, or more strictly the absence of gender, in neuter nouns. It was only natural that the same suffix which distinguished the theme as a living being should be applied to mark it out as the subject or source of an action, while, conversely, that which denoted the absence of life should be used to mark the object. It is no improbable conjecture which finds in this accusative character of the sign of the neuter the explanation of the ordinary Greek idiom which constructs a neuter plural substantive with a singular verb; τὰ ζῷα τρέχει, "the animals are running." Further, the wide and varied usage of the accusative case in Greek appears to point to a time when it was the only oblique case. At a later period the second group of cases made its appearance; this includes at least the genitive, ablative, dative, locative, instrumental, and sociative. Whether we are also to regard the various terminations which appear in some adverbs, which cannot be referred to any one of these, as originally case-suffixes is a question not easy to determine, and one which is, after all, rather one of terminology than of any real importance. The theory of the purely local force of the cases, attractive as it is at first sight from its simplicity, and its apparent conformity with the sound theory which bids us, in dealing with language, proceed from the concrete to the abstract, and not *vice versa*, breaks down when we come to apply it in detail. For the genitive, at any rate, it is much safer to postulate an original adjectival force, a view borne out both by striking similarity of formation in some instances (*cf.*, *e.g.*, δημο-σιο, the earlier form of the Homeric δήμοιο, the Attic δήμου, and δημό-σιο-ς, "belonging to the people") and by numerous analogies from various languages. It has even been conjectured, though perhaps on inadequate grounds, that the genitive had originally the final *s*, which was dropped only when the sense of its origin became obscured. In the ablative we have apparently a use of the pronominal element *-ta* corresponding to that of *sa* in the genitive, and originally in the nominative, the *a* being afterwards dropped, so that *vāk-a-s* = *vocis* is to *vāk-a-t* = *voc(d)* as *ja-s* = *is* is to *ja-t* = *i-d*. The syntactic force of the ablative may often be represented as adjectival; and the differentiation of the two cases may well be a product of later times. The earliest forms of the other cases, the formation of which has not hitherto been satisfactorily explained, will be pointed out below.

Second group of cases.

Adverbs and prepositions.

In the seventh period assumed by Curtius we have the petrifaction of some forms of particular themes with case-suffixes, which were no longer declined throughout, and thus gave rise to adverbs and prepositions. The adverbial force was undoubtedly the earlier, as we can see from indications in the Homeric poems; the prepositional force came later, first perhaps in connexion with verbs, and afterwards as governing cases. To the same period probably belongs the peculiarly interesting form of petrified cases presented by infinitives. These have long been recognized as cases of verbal nouns (*nomina actionis*) no longer inflected throughout. The agreement of the cognate languages in the use of this device for extending the range of language seems to be a sufficient indication that it had been introduced before the original unity broke up. At the same time the great variety of the forms actually selected by different languages as the basis of this construction is a clear proof that no well defined system of infinitives had then been brought into use.

Infinitives.

Reconstruction of the Indo-Germanic languages.

Such were the stages by which, according to our greatest living authority, that language grew which was destined to be the mother, not only of Greek and Latin, but of almost all the tongues in which human culture has found an utterance. It is by no means impossible to reconstruct it, at least in outline, as it must have been spoken before the original unity broke up. This task has been attempted, so far as its phonetic laws and inflexional forms are concerned, by Schleicher in his well-known *Compendium der vergleichenden Grammatik der Indogermanischen Sprachen* (3d edition, Weimar, 1871); and its vocabulary has been reconstructed by Fick in his *Vergleichendes Wörterbuch* already referred to. Schleicher indeed ventured to narrate a brief story in this primitive language (Kuhn's *Beiträge*, vol. v. pp. 206 *sqq.*).[1] On particular points he may well have been mistaken. The tendency of modern philology is to admit within the period of the united national life a fuller development than that assumed by Schleicher. Several scholars, working along different lines of research and entirely independently, have established the great probability of a bifurcation of the gutturals; and it is by no means certain that the vowel system was not already becoming more rich and varied. We have probably to admit that dialectic differences already existed, such as could hardly have failed to arise, even before the nation broke up completely, so soon as it attained any considerable magnitude. And above all it must never be forgotten that we are dealing with the products of a period to which chronological limits cannot well be fixed, but which language gives us strong reasons to believe must have been at least as long as that to which the data of other branches of anthropology appear to point. It is impossible to be sure that all the elements which are introduced were ever strictly contemporaneous. Our review of the history of the language thus far is enough to show that one form may have begun to show traces of phonetic decay at a time when another form was not yet created. Hence M. Bréal (*Mélanges*, p. 376) does well to warn us against the common error of philologists in endeavouring to get more out of the reconstructed "primitive speech" than the facts on which it is based will warrant. But used with discretion it affords a highly convenient means for stating the results to which the comparison of languages brings us.

For our present purpose it will be well to mark one intermediate stage between the source of the Greek language thus revealed to us and the language itself as given in its earliest records, by noting the common Græco-Italic modifications of the primitive speech.[1]

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[1] Mr J. P. Postgate has published a similar composition (*Academy*, June 14, 1879), re-written by Mr T. C. Snow (*ib.*, June 28) on the principles of Brugman and De Saussure.

Indo-Germanic sounds.

The original sounds of Indo-Germanic speech may be conveniently tabulated thus:—

	Consonants.						Vowels.
	Momentary.			Continuous.			
	Unaspirated.		Aspirated.	Spirant.		Nasal.	
	Surd.	Sonant.	Sonant.	Surd.	Sonant.		
Guttural	k	g	gh	...		...	a
Palatal ..		...	..	...	j (y)	...	i ai
Lingual .	...	...	...	...	...	r	...
Dental ...	t	d	dh	s		n	..
Labial ...	p	b (v)	bh	.	[illegible]	[illegible]	u au

Changes in time of Græco-Italic unity.

That the later surd aspirates (*kh*, *th*, *ph*) were developed from the sonant by the influence of the aspiration seems to have been clearly proved by the very careful researches of Curtius. The fact that while Greek has surd (χ, θ, ϕ) the Latin representatives of the same are initially the pure aspirate (*h*) or the spirant *f* and medially the corresponding sonants (*b*, *d*, *g*) is enough to show that they had not lost their sonant character in Græco-Italic times.

On the whole the mutes must have remained unchanged. The numerous modifications of the *k* found in Greek (κ, γ, π, τ) are not to be traced in Latin, and although *p* often replaces it in Oscan and Umbrian, the fact that it rarely if ever does in Latin proves that the guttural was unchanged at the time of the separation except in the way of generating a parasitic *w* (*v*) or *y* (*j*).

In the same way Latin shows no trace of the change of *g* to β, though it has the parasitic *v* which sometimes causes the loss of the *g*; thus βίος and *vivus* point to a Græco-Italic *guigva-s*. It is doubtful whether the primitive language ever used *b* unaccompanied by the aspiration; but Greek and Latin furnish us with sufficient words agreeing in this respect—Fick quotes 25—to make it clear that this letter was so used before the separation.

If Schleicher is right in denying *l* to the primitive language—and this seems very doubtful in face of the facts collected by Curtius (*Principles*, ii. 174)—there can be no doubt that this was abundantly developed by the European unity; and there seems to be no single instance of an *r* retained in Latin where Greek has λ, while *villus* as compared with ἔριον is the only case of the converse. The spirants undoubtedly remained in their full vigour.

But while the Græco-Italic consonants are on the whole the same as those of the primitive tongue, there is a highly important and significant change in the vowel system. The original *a*, retained for the most part in Sanskrit, and modified in Zend only under conditions which make it plain that this is not a phenomenon of very ancient date there, has in Europe undergone a change in two directions. The very valuable paper by Curtius previously mentioned contains five tables, from which it clearly appears that *a*

(1) is retained in 166 Greek and Latin words;
(2) becomes *e* (ι) in 102;
(3) becomes *o* (*u*) in 56;
(4) (*a*) is retained in Greek, becoming *e* (*i*) in Latin in 21;
 (*b*) ditto, becoming *o* (*u*) in Latin in 18;
 (*c*) retained in Latin, but becomes ε in Greek in 18;
 (*d*) ditto, becoming ο in Greek in 11;

while there are

 (*e*) 10 words in which Greek ε (ο) answers to Latin [illegible], and
 (*f*) 10 in which Greek ο answers to Latin *e* (*i*).

Hence it is absolutely plain that the "thinning" of the primitive *a* to *e* and its "dulling" to *o* must have taken place in the great majority of instances during the Græco-Italic period. The instances of agreement are three times as numerous as those of disagreement, and most of the latter are to be ascribed to the operation of well-known phonetic tendencies distinctive of the two stocks after their separation. It is worth noticing as to the other members of the European stock that, while there is a striking agreement in the cases of the retention of the *a* or of its weakening into *e*, this is not found with the third process, the dulling of *a* into *o*; it is therefore legitimate to assume that the first was common to the European family, while the second was specifically Græco-Italic. Thus the numeral *octo*, the roots *gno*, "know," *mor*, "die," *od*, "smell," (*derk*), "see," and the words *ovis*, *potis*, *porko-s*, [illegible], are all Græco-Italic but not European.

Inflexion of nouns.

The inflexion of nouns was complete before the time of the separation of languages. We have no reason to believe that any new case-form was developed either in the European unity or in any individual nation after this date. The changes are wholly in the direction of loss. The cases which can be shown to have existed, and the terminations by which they were denoted, were as follows:—

	Singular.	Plural.	Dual.
Nominative	-s	(s)a-s	-(s)ā(s).
Accusative	-am	am-s	,,
Ablative	-at	bhjam-s	bhjām.
Genitive	-as (asja)	(s)ām-s	-aus(?).
Locative	-i	sva	,,
Dative	-ai	-bhjam-s	bhjām-s.
Instrumental (i.)	-ā		,,
Instrumental (ii.) ...	-bhi	-bhi-s	,,
(Sociative)			
Vocative	(no sign).		

In some cases these were modified according to the termination of the stem to which they were suffixed; and the stems themselves suffered phonetic adaptation to the termination. Otherwise there was no distinction of declension, except that the fuller form of the genitive was used for the most part in the case of *a*-stems.

Græco-Italic changes.

If we examine the changes which may be assumed for the Græco-Italic period we find (1) the first instrumental case is retained only in a few Greek and (possibly) Latin adverbs, so that this may be supposed to have dropped out of ordinary flexion; (2) the ablative is retained in Latin, and hence it was a Græco-Italic case, though it appears in historic Greek only in adverbs (καλῶς, ὥς, &c.); (3) the loss of the dual in Latin makes it impossible for us to determine exactly the form of its inflexions at this period; probably they had already become worn down to something like the form in which we find them in Greek; (4) the existence of a final *s* in the nom. plur. of *a*-stems in some Italian dialects (Old Latin *equis*, Oscan -*os*, Umbrian -*ūs*, Oscan fem. -*as*, Umbrian -*as*, -*ar*) shows that the analogy of the pronominal declension had not yet established exclusively the -*oi*, -*ai* terminations, though these were doubtless already in use.

In the flexion of adjective pronouns there is an agreement in the nom. plur. (*cf.* τοί, ταί, *is-ti*, *is-tæ*) which may be a Græco-Italic development, the origin of the termination being obscure.

In the declension of the personal pronouns it is to be noticed that the complete distinction of the stem used in the first and second persons plural [illegible], as compared with [illegible], proves that the parallel forms [illegible], to which Sanskrit points as apparently existing, were still used side by side.

The comparison of adjectives was made by the employment of the same stem-suffixes [illegible], and [illegible], though a different selection became the normal one in Greek and in Latin.

The inflexion of verbs underwent far greater changes than that of nouns, after the separation, but mainly in the way of a fuller development. In Latin, however, we must assume a very extensive replacing of earlier formations by those of later origin, for of many inflexions which are shown to have been Græco-Italic by the coincidence of Greek and Sanskrit, there are few if any traces to be found in Latin. The following principles of verbal flexion, the chief stages of whose development we have noticed above, had been established in the parent language:—

1. St[illegible] the three [illegible] singular, dual, and plural.
2. T[illegible] the stems, [illegible] Greek and Latin agree essentially [illegible] present tenses.
3. M[illegible] developed by the aid of the [illegible] of the active verb. In Latin this system appears to have lost its significance by the gradual [illegible] of inflexions, and to have been replaced by one based on a wholly different principle.
4. A distinction grew up between primary inflexions, used for present and future tenses, and secondary inflexions, used for past tenses, where the increased length given to the word by the use of the augment caused the lightening of the terminations, usually by the loss of the final vowel.
5. To form the conjunctive and optative moods *a* and *ja* (*i*) were added to the tense stems before inflexion.
6. A past tense was formed by the use of the augment and the secondary terminations. This became differentiated afterwards in Greek into (1) past imperfect, (2) simple aorist, according as the theme was or was not used without modification for the present tense. In Latin this tense was as a rule dropped in favour of the compounded past imperfect or perfect, but Curtius has discovered some traces of it still in use.
7. A compound aorist was formed by the help of the verbal root *as*. This is also replaced in Latin by a tense of later creation—the perfect; but its occurrence in Sanskrit establishes it as Græco-Italic.
8. A future was formed by the combination of the roots *as* and *ja*. Of this, again, there are but slight traces in Latin, the ordinary future being either a later compound with the root [illegible], or an optative in origin; but the agreement of Sanskrit and Greek establishes it for this period.
9. Participles or verbal adjectives were formed by the use of the suffixes *ant*, *vant* for the active and *mana* (*meno*), *ta* for the passive respectively.
10. The dative or (possibly) locative case of a neuter verbal substantive was used as an infinitive. It is certain that Latin in all cases adopted a substantive with the suffix *as* (giving *-asai* [illegible]), while Greek in some instances employed one with the suffix *man* or *an* (giving -μεναι, -εναι, and perhaps in the accusative form μεν); it is not clear whether the more common Greek termination -ειν is closely connected with the Latin *-ere* (λέγειν = λεγε(σ)εν = legese = legere) as Curtius is inclined to think, or is of distinct origin.

The researches of Curtius on the Græco-Italic vowel-system enable us to determine with some confidence the phonetic character assumed by these inflexions. We may give as the common possession, not *bharami*, &c., but

bherōmi, bheresi, bhereti,
bheromes, bheretes, bheronti;

not *akvos*, &c., but

ekvas, ekvom, ekvōd, ekvois, ekvoi, ekvōi, ekve, &c.

Phonetic [illegible]

It was at this stage of inflexional development, and with a stock of roots and words which can still be ascertained with some approach to completeness, that the Greek language started on its separate career and commenced its independent history. The shape which it has assumed when it first becomes known to us from literary and epigraphic records is due to the action of its characteristic laws, some purely phonetic, and some due rather to the intellectual tendencies of those who used it. Of the phonetic laws four are especially distinctive:—

1. *Loss of Spirants.*—This is most extensive and important in its results: *j* (*y*) has entirely disappeared from the written language, and its existence is only to be detected from isolated traces in Homer, and perhaps in some inscriptions where ϝ is probably used to denote it; *v* (*w*) in the form of ϝ is found on some of the older inscriptions, and its introduction into the text of Homer is often required by the metre; but it is unknown to the ordinary written language; *s* remains when final, and when in immediate contact with mutes, and also when it has been assimilated to another consonant; but before vowels it passes into the rough breathing, and between vowels it is generally dropped. As an instance of the effect of this loss of the spirants all round, we may take the [illegible], which becomes [illegible], νεοο, νεου, and so on.
2. *Weakening of the Gutturals by Labialism.*—It has been calculated that not less than one-sixth of the roots originally containing *k* or *g* present π or β in Greek. Hence the reduplicated past tense [illegible] *vak*, "speak," [illegible], in Greek becomes [illegible], the Homeric ἔειπον, Attic εἶπον.
3. *Dislike of Final Consonants.*—Greek allows no consonant to end a word except ν, ς, and ρ, and shows a marked preference for vowel endings. Hence we often find one or more consonants dropped at the end. This gives a liquid flow to the language in which it has few rivals.
4. *Rich Development of the Vowel System.*—In this again Greek is almost unrivalled. While Latin shared with it the original splitting of the *a*, by its tendency to the loss of the diphthongs this language soon impaired the variety and expressiveness of its vocalisation, while Greek retained the full range undiminished. This was an advantage not merely for the euphony of the language, it added greatly to its expressiveness. Curtius has shown by many examples (*Comparative Philology and Classical Scholarship*, p. 33 *ff.*) how easily distinctions in meaning were given by this variety of vowels, which are expressed far more clumsily in other languages.

We may notice here also the wide influences of *zetacism*. This is not limited to Greek, as Schleicher showed in the essay which first set forth its importance properly; but it is more operative in Greek than in any language owing to the more complete disappearance of the *j*, which coalesces with some other consonant, usually a *d*, original, modified, or parasitic, to produce it. Thus *sad-ja-mai* became ἕζομαι, *varg-ja-mi*, ῥέζω, &c.

New creation of verbal forms.

While these laws act naturally, and, so to say, mechanically, we must ascribe to the intellectual character of the Greeks another marked feature of this language, the enormous development given to their verbal system. Six wholly new tenses were created after the separation from the Italian stock,—the future perfect, the compound pluperfect, two passive aorists, and two future passives. Besides, the whole system was worked out with wonderful completeness; so that while an ordinary Latin verb has 143 possible inflexions, a corresponding Greek verb has no less than 507. In some instances we can see the creative process still at work, as, *e.g.*, in the case of the perfects in -κα, which are all but unknown to Homer.

The Historic Stage of Greek.[1]

Divisions of the Greek race.

The legend of the sons of Hellen, as we find it in Apollodorus, is of course entirely destitute of historical authority, but it serves as an indication of what the Greeks felt to be a natural division of their race; and from this point of view it is largely confirmed by language. The story runs that Hellen left his kingdom to Æolus his eldest son, while he sent forth Dorus and Xuthus, the father of Ion, to make conquests in different lands. We see from this that the Æolic dialect was regarded as the oldest representative of Hellenic speech, that the Dorian came next to it, and that the Ionian, out of which the Attic subsequently sprung, was regarded as belonging properly to a later period. On the whole this view is not misleading; but it requires some qualification. In the first place this division is more satisfactory for literature than for history; the names Æolic, Doric, Ionic, and Attic cover well enough the written literature of Greece, but are hardly comprehensive enough for all the spoken dialects. These were literally innumerable,—we are told that the tiny island of Peparethus had three clearly distinct,—and they shaded off one into another by slight gradations. The influence of mixed populations is often seen to tell upon their language; and sometimes race distinctions do not tally with those of dialect; thus the Æolians of the Peloponnesus adopted a dialect essentially Dorian, while the Dorians of Halicarnassus spoke Ionian. It is often a matter of dispute under which head a particular dialect shall be placed, and whatever division may be made, connecting links are sure to be found between members of different groups.

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[1] In dealing with this part of the subject no attempt has been made to record the ordinary forms of inflexion as given in grammars, a knowledge of which is assumed. For the Greek alphabet reference may be made to the article ALPHABET, vol. i., especially pp. 609-610. Much [illegible] connected with the history of the language finds its place more properly under the head of Literature.

Æolic.

Æolic.—This is generally subdivided into four chief dialects:—(1) Lesbian, (2) Thessalian and (?) Macedonian, (3) Bœotian, (4) Elean and Arcadian. It has been maintained by some high authorities, *e.g.*, by Kirchhoff, that Lesbian alone ought to be considered Æolic, and that not only Elean and Arcadian, which Ahrens admits come nearer to Doric, but even Bœotian and Thessalian ought to be ranked as Doric. On the other hand, Professor E. Curtius denies to Æolic the character of a dialect, and holds that it is rather a name for those remains, preserved in different localities, of the more ancient form of the language, and that everything which was not Doric or Ionic was called by the ancients Æolic. We shall find, however, that some of the distinctive features of the Lesbian dialect, which has the fullest right to be called Æolic, were certainly not primitive, but of later origin, so that we can hardly accept this view. The extent to which various dialects admit of being grouped together will be best examined after a survey of their special characteristics.

Lesbian Æolic.

Lesbian Æolic.—The sources for this dialect are (1) inscriptions, and (2) the statements of grammarians, based mainly upon quotations from Alcæus and Sappho. Of the former, there are only three of great importance,—one found at Mytilene, recording the return of some exiles in the time of Alexander the Great (*Corpus Inscrip. Græc.*, No. 2166), another found at Porhoselena, an island close to Lesbos, of a few years later (*ib.*, 2166c); and a third, of the same date as the first, found at Eresus and edited by Conze and Sauppe. The poets are of great value, because they appear to have written in the pure dialect of their country, and not to have framed a conventional language for themselves. The 28th and 29th idylls of Theocritus, called by the scholiast Æolic, are naturally a more suspicious source.

The grammarians with one accord lay stress upon the tendency to barytone pronunciation as a mark of Æolism. The word is accented on the last syllable for σοφός, θυμός, Ἀχιλλεύς, Βαρύς, and the like, the Lesbians said σόφος, θῦμος, Ἀχίλλευς, Βάρυς. This tendency has often been adduced, along with the loss of the dual, to prove a closer connexion of Æolic than of any other Greek dialect with Latin; it is rather a striking proof of the danger of drawing such deductions from phenomena of purely independent origin (cf. Schrader in Curtius's *Studien*, x. 259). The grammarians also tell us that Æolic did not use the rough breathing. The inscriptions date from a time when the aspirate was not written; and the MSS. are not sufficiently trustworthy to give us much help. But there are instances enough in which a tenuis preceding a syllable which in ordinary Greek begins with the rough breathing appears in Æolic as an aspirate—Ahrens quotes nine, besides the article and the demonstrative and relative—to show that aspiration was not unknown. It is to be noticed that in all these instances the rough breathing represents a primitive *s* or *j*. The same authorities assert that Æolic was distinguished by its retention of the digamma, and hence this letter is called by Quintilian and Priscian "Æolicum digammon;" but inscriptions show that, though more common in Æolic than in Ionic, it was much less faithfully retained in the former than among the Bœotians and Dorians. Before ρ it was commonly hardened into β, between vowels vocalized into υ. Of the distinctively Æolic phonetic laws, the following deserve special notice. When in other dialects ζ has originated in δj, it usually appears as σδ, Βρισδα = [illegible]. Liquids are very frequently doubled, usually as a result of assimilation, *e.g.*, νν = σν or [illegible], as ἐγέννατο, κτέννας, [illegible], ἔμμι, ἀργέννος, νν = νj, as κέννος, κλίννω, so φθέρρω, [illegible] γόννος = [illegible]. Σσ is retained, where primitive, while Attic often drops it: μέσσος, ἐτέλεσσα, ἴσσος. Π assimilates a following μ instead of being assimilated by it: ὄππατα = ὄμματα (ὄπ-ματα), [illegible] = γράμματα [illegible]. Before σ, ν generally passes into ι, forming a diphthong with a preceding vowel: τάλαις, Att. τάλας for τάλανς; παῖς, Att. πᾶς for παντς, so [illegible], σοφαις, Att. σοφάς for σοφάνς, λέγοισι, Att. λέγουσι.

Of the vowels, α is frequently retained, when it has been "dulled" in Attic, *e.g.*, [illegible], but more commonly it passes into ο, especially when in contact with liquids, *e.g.*, στρότος, [illegible]; this may be regarded as a characteristic mark of Æolism, [illegible], *e.g.*, [illegible]; [illegible] when Ionic has η, but η has its proper place where it has [illegible], *e.g.*, μάτηρ, τὰν πόλιν, [illegible]. And ου η and ω are commonly used (συμφέρην, χέρ, κῆνος, ὤρανος, κῶρος). The ι of diphthongs is often omitted (ἀλάθεα = ἀλήθεια; λαχόνν for λαχοίην (*cf.* the popular Attic ποεῖν). In contraction αο becomes α, Κρονίδα; εο ευ, Βελευς; οο ω, ἀνθρώπω. The apparent [illegible] of diphthongs is sometimes due to a retention of the uncontracted form, sometimes, as in ἄδα in Alcæus, & in inscriptions, it is real.

In noun-inflexion, besides the changes produced by these phonetic laws, we may notice the loss of the dual, and also a tendency to metaplastic forms, especially the accusative in ν from consonantal stems.

In verb-inflexion there is a 2d sing. in -σθα, ἔχεισθα, but not the Doric 1st plur. in -μες; the 3d plur. ends in [illegible] (as noticed above); and contracted verbs commonly follow the conjugation in -μι, φίλημι, &c. [illegible] the grammarians add, but probably [illegible], γέλαιμι.

The general character of Æolic was much less hard and vigorous than that of Doric; it was distinguished by [illegible] with the Doric also [illegible]; the verse of the Æolic poets also [illegible] in its style and [illegible]. To the Athenians the language of Lesbos sounded somewhat outlandish, so that, though it [illegible], it was [illegible] one, for Plato (*Protag.*, 341c) to represent Prodicus as saying of Pittacus ἅτε Λέσβιος ὢν καὶ ἐν φωνῇ βαρβάρῳ τεθραμμένος.

Thessalian.

The *Thessalian* dialect is known only by a few inscriptions, the most important of which were discovered by Leake and Rangabé. It forms a kind of link between Lesbian and Bœotian, doubling liquids, changing α into ο, and dropping the ι of diphthongs with the former, but agreeing with the latter in the use of an infinitive in -μεν. It is also characterized by the use of ου for ω, *e.g.*, Ἀπλοῦν for Ἀπόλλων, ὀνάλουμα = ἀνάλωμα, *cf.* ἀπὸ τᾶς τοῦν ταγοῦν γνώμας; and the genitive sing. ends in -οι (for οιο) instead of -ου, *e.g.*, Ἀντιγενείοι Λεξάνδρος, Αἰσχύλις Σατύροι. The general character of the dialect confirms the tradition that the earlier common home of the Lesbians and the Bœotians was in Thessaly.

Bœotian.

The *Bœotian* dialect is known mainly from inscriptions. The scanty fragments of Corinna have come down to us mixed with Ionic forms; and the specimens of the Bœotian dialect given by Aristophanes in the *Acharnians* and Eubulus in his *Antiope* are still more corrupted by an intermixture of Attic. The Bœotians differed from the Lesbians in many not unimportant points. (1) They had no tendency to throw the accent back. (2) They liked the rough breathing. (3) They retained an earlier τ, or changed it into θ, where the Lesbians had σ. (4) A Lesbian σδ (= ζ) appears in Bœotian as δδ. (5) The Lesbian doubling of liquids and change of νς to ις are unknown in Bœotian. (6) In inflexion Bœotian retains -αο and -αων, which Lesbian contracts. (7) The Bœotian genitives are ἐμοῦς, τεοῦς, ἑοῦς, the Lesbian ἔμεθεν, σέθεν, ἔθεν. Further, Bœotian changes ε to ι before vowels, υ to ου, η to ει, ει to ι, and οι to υ, all which changes are unknown to Lesbian; *cf.*, *e.g.*, Bœot. θιός, κοίνες, οὑμές, ἀνέθεικε, [illegible], Βασιλῖος, τῦ δάμυ, Fοικία &c. As against these numerous differences there are but few points of resemblance, except such as would be shared by all the Dorian dialects. A few peculiar words shared by both are noticed by Beermann (Curt., *Stud.*, ix. p. [illegible]), and he lays stress upon their agreement in -εσσι (dat. plur.) as contrasted with the Doric [illegible], on the feminine terminations -ις and -ω (Ἄλεξις, Σάπφω, Ματτώ, &c.), and on the common use of patronymic adjectives instead of the genitive of the father's name. But it may fairly be said that these would not have been regarded as sufficient indications of a close connexion, unless the traditional evidence in its favour had been so strong. We must assume that the Lesbian emigrants changed their language more rapidly than those who had moved less far from their earlier home.

Elean.

The *Elean* dialect is represented by Strabo (viii. p. 333) as being also Æolic. This tradition is decidedly rejected by Ahrens and is very doubtful. The most recent discussion of the question (by Schrader in Curtius's *Studien*, x. 267 *sq.*) advocates the theory that the Eleans separated from the rest of the Greeks at a time anterior to the distinction between Æolic and Doric. This practically coincides with the view of Ahrens that, while it has many points of contact with Doric, and especially with Laconian, it is really a distinct dialect, and is contained by the inscriptions, of which the most important are the ancient bronze plate brought back from Olympia by Sir W. Gell (C. I. G. 11) recording a treaty between the Eleans and the Heræans, and the recently discovered inscription of [illegible], edited by Kirchhoff (*[illegible]*, 187[illegible]). It agrees with Lesbian in the nom. sing. masc. in α, τελεστα, and the [illegible] in -οις for -ους. It resembles the northern Doric in the [illegible] with the [illegible], in the [illegible], [illegible] plur. in [illegible], and Laconian in a complete retention of the digamma (dropped in the later inscriptions [illegible]), in the change of final ς into ρ, [illegible], and in the change of a medial [illegible]. The last two, and [illegible] are much less used in the early than in the later inscriptions, [illegible], hence [illegible] to a later [illegible] of the dialect upon the other than to a close original connexion. Much light may be [illegible] cast upon the Elean dialect by the researches at Olympia, [illegible] almost every week [illegible] of great [illegible].

Arcadian. The Arcadian dialect [illegible] inscriptions, of which the most important is one found at Tegea in 1860, edited by Bergk, and commented on by Michaelis, with valuable notes by Curtius. [illegible] published by Schrader [illegible] many points in common with Doric [illegible] to single points in which it agrees with the [illegible] of the latter, where it does not [illegible]. It agrees with Lesbian [illegible] points, which seem to have been independent [illegible]. Hence the [illegible] may be [illegible] given up. Among the [illegible] which it presents, we may [illegible] as for the [illegible] of [illegible], such as the dative (or [illegible]) [illegible] is used for εἰς and ἐν, [illegible] the [illegible] participles [illegible] (ἀδικήμενος, cf. καδα[illegible] [illegible] κεχρημένος, &c.)

The Cyprian dialect [illegible]; for the results of its [illegible] confirm the statements of Herodotus (vii. 90) and Pausanias (viii. 5, 2) that Arcadians were among the colonists of Cyprus. This was first asserted by Bergk on the strength of a few glosses; but recently the inscriptions have been deciphered by Dr Birch, followed with more complete success by Brandis, Schmidt, and Deecke and Siegismund. They are not written in Greek characters, but in an alphabet of their own, which is syllabic in its character, i.e., each sign represents a consonant followed by a vowel. Of these signs there are 55 as yet identified; there is no distinction between tenues, medials, and aspirates, nor is there any mark of rough or smooth breathing; the signs therefore stand for *a*, *e*, *i*, *o*, *u*, *ka*, [illegible], &c., *te*, &c., *me*, &c., *na*, &c., *pa*, &c., *ra*, &c., *sa*, &c., and *ya*, &c. The number is made up by [illegible] (not having yet been discovered), *xa*, *xe*, and [illegible]. If a word ends in a consonant, the sign of that consonant when followed by *e* is used; but an article or a preposition is often treated as coalescing with its noun. When two consonants come together, the first is denoted by the sign of that syllable which it makes either with the vowel attached to the second consonant (*e.g.*, [illegible] = πτόλιν) or with the preceding vowel (*e.g.*, *a-ra-ku-ro* = ἄργυρο[illegible]). A nasal is always omitted before an explosive ([illegible]). Cyprian agrees with Arcadian in the genitive in -αυ, in ἀπύ for ἀπό (sometimes followed in both by the dative), in the preposition ἰν (often with acc.), and in many less important points.

Doric. Doric.—The Doric dialect was divided by Ahrens, following the Greek grammarians, into two main groups—(1) the severer Doric, (2) the milder, the one being more closely connected with Æolic, the other with Ionic. To the former belonged the speech of Laconia, Crete, Cyrene, and the Greek colonies in Italy, to the latter the language of Argolis, Messenia, Megara, and northern Greece, and the colonies of Asia Minor and Sicily. The basis of this distinction is the use of η and ω in the severer as against ου and ει in the milder dialect. But the division can hardly be maintained in practice, and hence it is abandoned by most modern scholars. The northern Doric, for instance, which is assigned by Ahrens to the second division, has been shown by Merzdorf (*Sprachwissensch. Abhandl.*, &c., Leipsic, 1874, pp. 23-42) to form a bridge between Æolic and Doric. Again, while we find ου in use at Thera, at Cyrene, a colony of Thera, ω is retained; hence this cannot point to a deep division. We may enumerate first the authorities for the particular dialects, and then treat the characteristics of Doric generally.

Sources for the various dialects. The *Laconian* dialect is known from few and unimportant inscriptions, from the fragments of Alcman, which, however, are in a language much modified for poetic purposes, and from the specimens in the *Lysistrata* of Aristophanes and in other Attic comedies. There are also a good many Laconian glosses in Hesychius, and Thucydides (v. 77) gives a treaty in the Spartan dialect. Our knowledge is largely supplemented by the bronze tables of Heraclea, a colony of Tarentum, which itself was founded by Sparta. These were found in the bed of the river Cavone in 1732 and 1735, and are now partly in the Museo Borbonico at Naples and partly in the British Museum.

From *Crete* there are numerous important inscriptions, chiefly treaties between various towns. It is conjectured that some of the most valuable of these were found in the ruins of the splendid temple of Dionysus in the island of Teos; this temple enjoyed the rights of an asylum, and the inscriptions are mainly treaties acknowledging these rights on the part of various Cretan cities. They contain some highly interesting [illegible] of form.

For *Thera* there is an important inscription containing the will of a wealthy lady Epicteta (*C. I. G.*, 2448), for its more famous colony, Cyrene, there are only brief and fragmentary records.

The *Argive* dialect appears on a very ancient helmet found at Olympia (*C. I. G.*, 29) and on an inscription very recently dug up at the same place, as well as on several others of less importance.

From *Messenia* there is a long and very interesting inscription found at Andania, dealing with the cultus of certain deities; it is of comparatively late date (probably 93 B.C.) and in a much modified Doric, but it contains some striking forms.

The *Corinthian* dialect is learnt mainly from inscriptions at its colonies of Corcyra and Syracuse, both of which cities supply some very ancient and valuable records. In the same way the Doric of *Megara* is preserved most fully on Byzantine inscriptions. For this we have also the Megarian in the *Acharnians* of Aristophanes.

For the *Locrian* dialect Ahrens had but few and fragmentary inscriptions and no literary evidence; recently a bronze tablet containing a treaty between Chaleion and Œanthea (of the 4th century B.C.) has been dug up at the latter place; and also a tablet containing the regulations for founding a colony at Naupactus (*cf.* Curt., *Stud.*, ii. 441-449, iii. 205-279). These throw much new light on the dialect, and enable us to set it down with confidence as a link between Doric and Æolic.

General Doric characteristics. The general character of the Doric dialect was that of a slow, deliberate, and emphatic speech; it is the speech of the warrior and the ruler, not of the orator or merchant. The πλατειασμός, which the ancient authorities ascribe to the Dorians, is not distinctive of them, but was shared by the Bœotians and other Æolians; it is to be regarded rather as a mark of an earlier stage of the language, which was retained like many other similar characteristics by the Dorians much more extensively than by contemporary Ionians. It is quite the exception for any Doric characteristic to be of recent origin. A natural hypothesis finds in the full and broad sounds of the dialect of these "men of the mountain-forests" signs of the chest strengthened by mountain air and mountain life. To pass to details:—

In accentuation Doric shewed no inclination to the barytone pronunciation of Lesbos; on the contrary, it has more oxytone forms even than Attic. In many words the Doric accent is of especial interest as bearing valuable testimony to the origin of the inflexions; we find not only ἀγγελοί, ἀνθρωποί, and τυπτομενοί, but also ἐλέγον, ἐλύσαν, παιδές, πτωκάς, and ἀμπελός (acc. plur.),—these forms all pointing back to a time when the final syllable was long, and thus demanding from philology an account of this length.

In vowels a short α is often retained where Attic has ε (ἰαρός, τράφω, τράχω) or ο (ϝεικατι = εἴκοσι). υ in Laconian became ου, but probably only as an indication that the earlier pronunciation of the vowel was retained, when in ordinary Greek it had sunk into *ü*. Wherever η in Ionic has come from an earlier α, Doric retains ᾱ, but where it has originated in ε, η is retained as in Lesbio-Æolic (πατήρ, Bœot. πατείρ); it is also retained in augments (ἠρχόμαν), and as a contraction for αε (ἐνίκη). On the other hand αο and αω contract into α (Ἀτρείδα, γελᾶν). The contractions of εο, εω, vary much in different dialects. The severer Doric gives η for ει and ω for ου: ἦς for εἶς, ἦμεν for ἔσμεν, ἄγωσα, Μῶσα, ἐγϝηληθίωντι = ἐξειληθῶσι, βωλά (Lesb. βόλλα), Κῶρος, &c. A noteworthy phenomenon is presented by the shortening of long final syllables, almost exclusively where the length is due to compensatory lengthening in the place of a lost consonant (δημότάς, κατὰ τὸς νόμος, πράξὰς, πός [= ποδ-s], λέγες, τίκτεν, τεκέν); of all forms of the dialect the Cretan especially favoured this.

Of the consonants, the digamma was retained longer by the Doric than by any other dialect, but we find it gradually disappearing. It is used in the old Laconian, Argolic, Corinthian, and Corcyræan inscriptions, but not in the Cretan, with the exception of the proper name ϝάξιοι; on the Heraclean tables it is very common, but there are some strange exceptions, as οἰκιά, ἐργάζομαι, and ἀφέργω; some have held that it is there wrongly inserted in ϝεξ, but this is really a valuable confirmation of the labial spirant to which other languages also bear witness. The digamma is often changed to β (as in Elean), but never before ρ, as in Æolic; whether it ever actually passed into γ, or whether the numerous forms which give this in the place of an earlier digamma are all due to the mistakes of copyists, is a question still under discussion (Curtius's *Princ.*, ii. 229 *ff.*). T is constantly retained, where the Ionians have weakened it into σ, especially in τι: φατί = φησί, so τύπτοντι = τύπτουσι, τίθεντι = τέθεισι; *cf.* πλάτιος, πλούτιος, δῶτις, Σελινούντιοι.

Laconian peculiarities. Three changes characteristic of Laconian came in at a comparatively late date; for they do not appear in the Heraclean tables, and consequently they must be later than the foundation of Tarentum. (1) Θ becomes σ; this is very common in the Spartan of the *Lysistrata*; *e.g.*, σέλει, σιγῆν (= θιγεῖν), σιός (= θεός); *cf.* τῶ σιῶ σίματος (Thuc. v. 77), σεῖος ἀνήρ Ar., *Eth. Nic.*, vii. 1). (2) Final *s* becomes ρ; this is still later, and does not appear in Aristophanes, but is very common in the more recent inscriptions. (3) Medial σ between vowels becomes ʽ; this is found in Aristophanes (Μῶά, πᾶά, &c.) and in later inscriptions (Ποοίδανι), but not in Alcman.

The traditional change of γ into δ is denied by Ahrens and Curtius, who altogether reject, with very good reason, the asserted identity of δᾶ and γῆ. The appearance of ξ in the future and compound aorist of verbs in -ζω (*e.g.*, δοκιμάξοντι, ἐμέριξαν, &c. in the *Tabb. Heracl.*, μερίξαι in Aristoph., *Lysist.*) has been rightly explained by Curtius (*Princ.*, ii. 218) as a hardening of the original spirant γ (*j*) before the σ, the only possible alternative to its complete loss, which we find in the ordinary Greek δοκιμάσω. The change of ζ into σδ, ascribed by the grammarians to Doric, is more properly Lesbian, and is unknown to pure Doric; here ζ is as a rule retained, but in the Laconian dialect when initial it becomes δ ([illegible]), when medial δδ ([illegible] μεσίζω, [illegible] = προσδέχου).

A double σσ is retained where this is the more ancient form, changed in ordinary Greek into σ; thus the Heraclean tables give [illegible], μέσσος, ἔσσονται, &c. The σσ often found in Doric inscriptions and sometimes in the earlier Attic also, where there is no historical explanation of its presence, seems to be an attempt to represent the sound of the earlier sibilant san, which was retained by the side of sigma. For the earlier guttural [illegible], the distinctive sign Ϙ is found in old inscriptions, almost but not quite exclusively before ο, υ, [illegible], [illegible].

We may notice finally a free use of assimilation especially in Laconian ([illegible] = [illegible], [illegible] = κρείσσων, i.e., καρτίας, ἀκκόρ = ἀσκός), and on the other hand the retention of νς by the Argives and Cretans (τόνς, [illegible], ἔνς, τιθένς, Τίρυνς, &c.).

The characteristic Doric inflexions are almost entirely such as are due to these phonetic laws, or to the tendency to metaplastic or heteroclite formations, already noticed.

Ionic.

Ionic.—The Ionic dialect is commonly divided into three stages,—the Old Ionic or Epic dialect, the New Ionic, represented most completely by Herodotus and Hippocrates, and the Attic. This division is not satisfactory; for, in the first place, the Epic is a mixed dialect or more properly a *style*, and cannot be taken as a faithful representative of a spoken language; and, in the second place, Attic is not a later stage of the New Ionic, but in many respects remains faithful to forms in which even the Old Ionic has departed from the earlier usage. The three *sub-dialects*, however, agree on the whole much more closely than any one of them does with either Æolic or Doric, and they may therefore be grouped together. We know from an express statement of Herodotus (i. 142) that there were many subordinate varieties of the ordinary Ionic; he mentions four within a comparatively narrow extent; but neither the extant inscriptions nor the statements of grammarians enable us to distinguish these with any precision. It is probable that the differences lay rather in slight shades of pronunciation than in any extensive variations, and that, on the whole, the varieties closely resembled each other. As the general character of Doric is due, at least in a measure, to the hardy mountain life of the Dorians, so the Ionic type was determined by the easier and more effeminate life of the Ionians. All harshness is carefully avoided; the spirants, especially the ϝ, were dropt here earlier and more completely than in any other dialect; the α is more extensively changed into ε and ο; aspiration is frequently lost or transposed so as to be easier to pronounce; τ, especially before ι, regularly passes into σ; gutturals are replaced by dentals or labials. The vowel system is especially rich and free; sometimes an easy flow is given by the avoidance of contraction; sometimes again a full colouring is produced by the variety of the diphthongs. The varied literary activity of the Ionians in different directions gave a manifold development to their language, which makes it especially well adapted to poetry, and adds not a little of poetical charm even to their prose.

Epic Dialect.—The language of the Homeric poems is doubtless based upon the popular spoken dialect of the district in the midst of which they grew up. But as every scholar would now admit that they were constructed out of a large mass of previously existing material, however widely opinions may differ as to the person or school to which they owe their present form, and as much of this material must have dated from a great antiquity, it need not surprise us to find in the text of a [illegible] which is of a much [illegible] type than Æolic or Doric, [illegible] respects than anything to be found [illegible]. It is one of the [illegible] which comparative philology has done for the interpretation of these poems, [illegible] [illegible]

[illegible] Bekker [illegible]

many words were inaccurately represented. The limits of this sketch do not admit of a statement of the characteristic epic forms. They will be found given with very full references in the introduction to La Roche's school edition of the *Iliad* (Berlin, 1870), and with admirable clearness and scientific exactness in the sketch of Homeric grammar prefixed by Mr D. B. Monro to his edition of the First Book of the *Iliad* (Oxford, 1879).

The *New Ionic* dialect is found first in the writings of the iambic and elegiac poets, Archilochus, Callinus, and Mimnermus (where the digamma has already entirely disappeared), and is known more completely from Herodotus and Hippocrates. We are told that the language of the former was varied (ποικίλη) as compared with the pure (καθαρή) Ionic of preceding logographers; this is due partly to the occasional introduction of epic forms and expressions which give a delightful poetic tinge to his language ([illegible] ix. 4, 18, [illegible]) and not to any dialectic variations. Besides the general tendencies of Ionic mentioned above we may notice the retention of the earlier κ for π in interrogative and relative words (κοῖος, ὅκοσος, &c.), the interchange of ει and ου with the simple vowels (εἴρομαι, κεινός, ξεῖνος, but μέζων, δέξω, τάχεα; and μοῦνος, οὔνομα, τὸ οὖρος, νοῦσος), the contraction of [illegible] ω (βῶσαι, ἐβώθεε, ἐνυάσας), the use of η for α (θαλάσση, [illegible]), the Ionic crasis in ὠνήρ, ὦλλοι, &c., the entire absence of the appended ν, the gen. plur. in -εων for Homer's -άων, Att. -ῶν, and the use of -αται, -ατο for νται and -ντο wherever these are added directly to the tense-stems (cf. ἐσκεδάδαται, ἀπίκαται, βεβλέαται, τιθέαται, ἀγοίατο, &c.). The dialect of Herodotus has been most fully discussed by Bredow, *Quaestionum criticarum de dialecto Herod. libri duo*, 1846; there are some excellent remarks upon it by Mr Woods in an introduction to his edition of Book i. pp. 40–45. The text of Hippocrates is in too unsettled a state, and the genuineness of many of the treatises ascribed to him too doubtful, to make it possible for us to build much upon his authority. From inscriptions but little can be gained. See Erman in Curtius's *Studien*, vol. v. pp. 250 *ff.*

Attic.

The *Attic* dialect may be regarded as on the whole a slightly modified representative of the Ionic spoken before the foundation of the Ionic colonies. It is not so much a daughter of Ionic as its mother, as Bergk justly calls it. In Ionic the tendency to soften the language which had already commenced before the separation went on its way unrestrained in the luxurious life of the Asiatic cities[1]. In Attica, possibly owing to the free admission of non-Ionic citizens by Solon and Cleisthenes, this tendency was checked, and there are even some signs of a reaction in the direction of the earlier and more vigorous speech. There is a celebrated inscription found at Sigeum in the Troad (*C. I. G.*, 8), the antiquity of which, though attacked by Boeckh, has been established by Kirchhoff; this is in two parts,—the upper in Ionic dialect, the lower (which is probably a little later, but also belonging to the time of Pisistratus) in Attic, and we can already see the reaction at work. The Attic dialect thus adapted itself admirably to the character of the Athenian people, which knew better than any other Hellenic community how to unite energy and dignity with grace and refinement, to preserve the σεμνότης of the Dorian without sacrificing the χάρις of the Ionian. The Attic of the inscriptions may be most conveniently divided according as these are written in the old alphabet of sixteen letters or in the so-called Ionic alphabet of twenty-four. The letter was introduced for public documents in the archonship of [illegible] 403 B.C.); the inscriptions written before that date have been collected and edited by Kirchhoff in the first volume of the new Berlin *Corpus Inscriptionum Græcarum*, and their linguistic peculiarities well summed up by [illegible] in Curtius's *Studien*, vol. viii. pp. 223–[illegible] and [illegible]–242. The Attic of literature is divided into the Old and the New, the point of division being rather than the archonship of [illegible] [illegible] nearly with the beginning of the [illegible] [illegible], however, [illegible] [illegible]

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[1] [illegible]

[2] [illegible] of [illegible]

[illegible] sound which marks the ordinary course of language : e.g., σύν [illegible] for [illegible], the same is probable in the instances where a single vowel represents an earlier diphthong, as in ἀεί, ἀετός, ἐλάα, and [illegible], and with the tendency to [illegible] to aspirates, e.g., [illegible], Att. [illegible], and the [illegible] (γε), for [illegible]. It is less easy to account for the change of [illegible] (εα) to ε.

Qualities of the Greek language. In the New Attic the Greek language may be said to have reached its perfection of grace, expressiveness, and symmetry ; and hence the [illegible] place for a few remarks on the qualities which have [illegible] made the Greek language quite unrivalled as a means for the expression of human thought.

In the first place we may notice its purity and consequent transparency. The Greeks felt themselves to be sharply marked off from the barbarians around them, and in consequence rarely allowed their language to be contaminated by foreign influences. Latin teems with borrowed words, often ill adapted to the genius of the language ; Greek has very few, and these almost invariably Hellenized in form. Hence the etymologist feels himself to have a far firmer footing on Greek than on Italian soil. Hence too the etymological structure of Greek retains its regularity, and the orthography is well established and rarely fluctuating. Then there is the phonetic harmony of the language. Dissonance was everywhere avoided; there is no undue predominance of consonants, as in Latin and still more strikingly in Etruscan. The endings of the words are light, no harsh consonant being allowed, except the liquids ν and ρ and the sibilant ς. The brightest of the vowels, α, ε, η, are far more common than the harder and thinner ι and υ, Greek here again contrasting sharply with Latin. The abundance of diphthongs—practically lost in the modern pronunciation of Greek—gives a rich variety of sound, besides supplying admirable means for the differentiation of meanings. The careful observation of accent, by the side of and quite distinct from the due marking of quantity, lent a varied modulation to the rhythm, which the rapid utterance of the Athenians especially prevented from ever becoming wearisome. The range of different forms at the disposal of poets and the freedom allowed in the order of words permitted the writer to choose the rhythmical effect most conducive to the harmony of his period. With regard again to the expressiveness of the language, the completeness of the verbal inflexion enabled various shades of meaning to be expressed with unrivalled precision and terseness. It is perhaps impossible to estimate with any approach to accuracy the extent of the vocabulary of a language known to us only from a literature which, in some of its most important branches, has come down to us in a sadly fragmentary state; but some approximation may be made from the fact that Herodian is said to have determined the accent of 60,000 words. But the free power of word-formation and composition to which this marvellous richness was largely due was no mechanical process. It sprang from the lively fancy of the most poetic of nations,—a fancy which shows itself alike in the significant individual names borne by every Greek citizen, which contrast so sharply with the obscure, trivial, and stereotyped hereditary labels of the Romans, and in the characteristic and often sportive appellations of plants and animals. Nor can we omit that which was according to Aristotle the despair of the barbarian of old, as it is of the modern schoolboy, the exquisitely exact and delicate use of the particles. Of all the qualities which make Greek really untranslatable, even into German, the only one of modern languages which approaches it in this respect, perhaps the most characteristic is the abundance of these tiny atoms of speech, not one of which can be neglected with impunity, while it is impossible to reproduce them all except at an expenditure of our means of expression which ruins the lightness and grace of the sentence. The history of the development of the period, that device in which the symmetry of form is inseparably wedded to the artistic balance of thought,—a device which is found in no language which has not borrowed it directly or mediately from Greece,—belongs to the region of literature rather than language. But many a construction, for which formal syntax finds it hard to discover a name and a classification, can only be understood aright if we look upon it as the outcome of a national life unrivalled in its bold and vivid freshness, delighting in variety, and shaping at its will a language still fluid and plastic.

Pronunciation of Greek. With regard to the *pronunciation* of Greek, the best modern scholars are at one in regarding the modern pronunciation, advocated at the revival of learning by Reuchlin, as wholly misleading for an earlier period. On the other hand, the current pronunciation in England is hardly more correct than the conventional pronunciation of Latin, and even the Continental pronunciation, as established by Erasmus, needs to be modified on many points. The vowels and consonants present no difficulty : ᾱ, α, η, ε, ῑ, ι, ω, ο were undoubtedly pronounced as the corresponding vowels are now in French, German, or Italian ; ῡ and υ were the French û and u, i.e., very nearly the German ü. The consonants may be pronounced as in English, γ being however always hard, and ζ being dz, while, as [illegible] the aspirates φ, θ, χ = p-h, t-h, c-h. It is much more difficult to determine the pronunciation of the diphthongs. Undoubtedly they were originally strictly diphthongal, i.e., the two vowels were each pronounced, but ran rapidly one into the other : cf. παῖς and the Homeric πάϊς, οἶς and ὄϊς. But at an early period the diphthongal pronunciation was lost, and in modern Greek the sound ι is given alike to ει, οι, and υι. This cannot be correct for the Attic period ; it probably began to creep in in the time of the Diadochi ; αι at this date began to pass into ε, and much later sank into ι ; ου had always the force of our oo, and is used even when the syllable is short : e.g., in Bœot. [illegible] it was pronounced as u in "put." It is altogether erroneous to pronounce υ in diphthongs as v, as is done in modern Greek ; ευ was doubtless pronounced much as eu, but with more stress laid on the first element.

History of Greek The dialects long continued to exist in the mouths of the common people ; but the influence of extended commercial intercourse, and later especially of the commanding position which Athens had gained as the centre of education and the home of science, literature, and philosophy, gave an increasing predominance to one, the Attic dialect. The Ionic was the first to disappear ; there are but few traces of this after the Peloponnesian War ; the Æolic and the Doric are found, but always in diminishing extent, as late as the time of the Roman emperors. But Attic lost in purity as it gained in range ; new words and constructions crept in especially from the increasing influence of the East ; until at last the grammarians gave the distinctive name of ἡ κοινὴ διάλεκτος to the language popularly current. The rise of the Alexandrian school of critics gave a new stimulus to the study of literary Attic ; on the other hand the vulgar speech continued its own course of free combination and assimilation from various quarters. Thus in the Roman times we have three main divisions of Greek :—(1) the revived Attic of the schools, the purity of which was jealously guarded by grammarians such as Phrynichus ; (2) the common (κοινή) literary language, employed by such writers as Polybius and Plutarch , and (3) the popular spoken language, which much more freely absorbed foreign elements than the κοινή, and which may be described as Hellenistic. This is the basis of the diction of the Septuagint and the New Testament. Of course the dividing lines cannot be sharply drawn. Of the authors belonging to this period some, like Lucian, endeavoured to approach as closely as possible to the standard of pure Attic ; others, like Babrius, came nearer to the popular diction. The peculiarities of this stage of the language consist rather in new words and new inflexions than in extensive syntactical changes. The former are too numerous to state here (cf. Winer's *Grammar*, part ii. pp. 69–128, ed. Moulton) ; of the latter we may notice—

1. A negligent use of the moods with particles : *e.g.*, ὅταν with a past indicative, εἰ with the conjunctive, ἵνα with the present indicative.
2. A construction of verbs with cases unknown in Attic : *e.g.*, γενέσθαι with accusative, προσκυνεῖν and προσφωνεῖν with dative, &c.
3. The extension of the genitive of the infinitive (τοῦ ποιεῖν) beyond its original and natural limits.
4. The use of the conjunctive for the optative after past tenses, and the gradual disuse of the latter mood, which has wholly disappeared in modern Greek. (*Ib.*, p. 38.)

Under the Greek empire, the language of literature was still based upon an artificial and often a lamentably unsuccessful imitation of Attic ; and an interesting parallel might be worked out in detail between the Greek and the Latin writers of this period. But, just as in the Western empire, the popular dialect went on its way, for the most part unrecognized in literature, but constantly exerting its effect upon the written language, and from time to time coming to the surface. The first writer who boldly adopted the popular dialect was Theodorus Ptochoprodromus, a monk of Constantinople who lived under the emperor Manuel Comnenus (1143–1180) ; his language, though with some traces of the more ancient forms, is essentially modern Greek. To the same period belongs Simon Sethos, a chronicler, the first prose writer of the modern language. In the 14th century we have the romance in verse, *Belthandros and Chrysantza*, a work highly spoken of for imaginative power and free command of the language in its new form. The poems of Gorgilas (cent. xv.), Chortakes and Kornaros (cent. xvii), and Rhegas (cent. xviii.) suffice to show that the popular language never entirely ceased to be used as an organ of literary utterance. An epoch in the history of modern Greek is marked by the long and fruitful activity of the illustrious scholar and patriot Coraes (1748–1833). He made it his object to purify the popular dialect, not by an artificial resuscitation of the ancient Attic, but by a strenuous endeavour to preserve and to render current all classical forms not wholly extinct, and to replace foreign and barbarous words by genuine Greek ones, often freshly coined for the purpose. Greece now can number poets, historians, scholars, and orators who bring forth from their native language no feeble echoes of the immortal notes with which its prime was made musical for every age.

Authorities. *Authorities.*—For all that concerns the formation and history of the Greek language the writings of Professor G. Curtius of Leipsic are unrivalled in soundness of judgment and full mastery of all the results of modern philological science, which owes to him some of its most important advances. The chief are *Grundzüge der*

Griechischen Etymologie, 5th edition, Leipsic, 1879, translated into English by A. S. Wilkins and E. B. England, 2 vols. 1875-6; *Das Verbum der griechischen Sprache* (vol. i. 2d edition, 1877, vol. ii. 1876; English translation in one volume, 1880); a *School Grammar* (4th English edition, 1878), and *Elucidations* of the same (2d English edition, 1875). The fullest statement of the facts of inflexion and of syntax is Kühner's *Ausführliche Grammatik* (2d edition, 1870). For the Greek dialects Ahrens's *De Græcæ Linguæ Dialectis* (2 vols. 1839, 1843) remains the best work; but recent discoveries have made it necessary to supplement it in many places; indispensable material for this is furnished by the series of monographs in Curtius's *Studien zur Griechischen und Lateinischen Grammatik* (10 vols. Leipsic, 1868-78), and in many scattered programmes and dissertations. Mr Merry's *Specimens of Greek Dialects* (Clarendon Press, 1875) contains admirably clear and useful introductions for junior students. Bergk's *Griechische Literaturgeschichte* contains much that is useful, but needs to be used with caution. For modern Greek, the standard works are Sophocles's *Glossary of Later and Byzantine Greek* (Boston, 1870), and Mullach's *Grammatik der Griechischen Vulgarsprache* (Berlin, 1856). (A. S. W.)

PART IV.—GREEK LITERATURE.

The history of Greek literature has had three great stages:—the Old Literature, from the earliest times to 529 A.D., when the edict of Justinian closed the schools of pagan philosophy; the Byzantine Literature, from 529 A.D. to the taking of Constantinople by the Turks in 1453; and the Modern Literature, which may be said to have begun with the satirical poetry of Theodorus Prodromus in the 12th century.

SECTION I.—THE OLD GREEK LITERATURE.

The Old Literature, to 529 A.D., falls into three periods. I. *The Early Literature*, to about 475 B.C. Epic, elegiac, iambic, and lyric poetry; the beginnings of literary prose. II. *The Attic Literature*, 475–300 B.C. Tragic and comic drama; historical, oratorical, and philosophical prose. III. *The Literature of the Decadence*, 300 B.C. to 529 A.D.,—which may again be divided into (1) the Alexandrian period, 300-146 B.C., and (2) the Græco-Roman period, 146 B.C. to 529 A.D.

It is not the purpose of the present article to enter into details regarding particular works or the lives of their authors. These will be found in the separate articles devoted to the principal Greek writers. The object of the following pages will be to sketch the literary development as a whole, to show how its successive periods were related to each other, and to mark the dominant characteristics of each.

I. *The Early Literature.*

A process of natural growth may be traced through all the best work of the Greek genius. The Greeks were not literary imitators of foreign models; the forms of poetry and prose in which they attained to such unequalled excellence were first developed by themselves. Their literature had its roots in their political and social life; it is the spontaneous expression of that life in youth, maturity, and decay; and the order in which its several fruits are produced is not the result of accident or caprice. The series of its seasons is as much the result of natural laws as the sequence of spring, summer, and autumn. Further, the old Greek literature has a striking completeness, due to the fact that each great branch of the Hellenic race bore a characteristic part in its development. Ionians, Æolians, Dorians, in turn contributed their share. Each dialect corresponded to a certain aspect of Hellenic life and character. Each found its appropriate work.

The Ionians.

The Ionians on the coast of Asia Minor—a lively and genial people, delighting in adventure, and keenly sensitive to every form of beauty and joyousness—created artistic epic poetry out of the lays in which Æolic minstrels sang of the old Achæan wars. And among the Ionians arose elegiac poetry, the first variation on the epic type. These found a fitting instrument in the harmonious Ionic dialect, the flexible utterance of a quick and versatile intelligence. The Æolians of Lesbos next created the lyric of personal passion, in which the traits of their race,—its chivalrous pride, its bold but sensuous fancy,—found a fitting voice in the fiery strength and tenderness of Æolic speech. The Dorians of the Peloponnesus, Sicily, and Magna Græcia then perfected the choral lyric for festivals and religious worship; and here again an earnest faith, a strong pride in Dorian usage and renown, had an apt interpreter in the massive and sonorous Doric. Finally, the Attic branch of the Ionian stock produced the drama, blending elements of all the other kinds, and developed an artistic literary prose in history, oratory, and philosophy. It is in the Attic literature that the Greek mind receives its most complete interpretation.

A natural affinity was felt to exist between each dialect and that species of composition for which it had been specially used. Hence the dialect of the Ionian epic poets would be adopted with more or less thoroughness even by epic or elegiac poets who were not Ionians. Thus the Æolian Hesiod uses it in epos, the Dorian Theognis in elegy, though not without alloy. Similarly, the Dorian Theocritus wrote love-songs in Æolic. The Attic Tyrtæus used Doric forms for his marching songs. All the faculties and tones of the language were thus gradually brought out by the co-operation of the dialects. Old Greek literature has an essential unity—the unity of a living organism; and this unity comprehends a number of distinct types, each of which is complete in its own kind.

Pre-Homeric poetry.

Songs of the seasons.

Hymns.

Extant Greek literature begins with the Homeric poems. These are works of art which imply a long period of antecedent poetical cultivation. Of the pre-Homeric poetry we have no remains, and very little knowledge. Such glimpses as we get of it connect it with two different stages in the religion of the prehistoric Hellenes. The first of these stages is that in which the agencies or forms of external nature were personified indeed, yet with the consciousness that the personal names were only symbols. Some very ancient Greek songs of which mention is made may have belonged to this stage—as the songs of Linus, Ialemus, and Hylas. Linus, the fair youth killed by dogs, seems to be the spring passing away before Sirius. Such songs have been aptly called "songs of the seasons." The second stage is that in which the Hellenes have now definitively personified the powers which they worship. Apollo, Demeter, Dionysus, Cybele, have now become to them beings with clearly conceived attributes. To this second stage belong the hymns connected with the names of the legendary bards, such as Orpheus, Musæus, Eumolpus, who are themselves associated with the worship of the Pierian Muses and the Attic ritual of Demeter. The seats of this early sacred poetry are not only "Thracian"—i.e., on the borders of northern Greece—but also "Phrygian" and "Cretan." It belongs, that is, presumably to an age when the ancestors of the Hellenes had left the Indo-European home in central Asia, but had not yet taken full possession of the lands which were afterwards Hellenic. Some of their tribes were still in Asia, others were settling in the islands of the Ægean, others were passing through the lands on its northern seaboard. If there was a period when the Greeks possessed no poetry but hymns forming part of a religious ritual, it may be conjectured that it was not of long duration. Already in the *Iliad* a secular character belongs to the marriage hymn and to the dirge for the dead, which in ancient India were chanted by the priests. The bent of the Greeks was to view poetry and music as public joys; they would not long have suffered them to remain sacerdotal mysteries. And among the earliest themes on which the impulse to poetry was employed were probably war ballads, sung by minstrels in the houses of the chiefs whose ancestors they celebrated.

Epos.

Such war ballads were the materials from which the earliest epic poetry of Greece was constructed. By an "epic" poem the Greeks meant a narrative of heroic action in hexameter verse. The term *epē* meant at first simply "verses"; it acquired its special meaning only when *melē*, lyric songs set to music, came to be distinguished from *epē*, verses not set to music, but merely recited. Epic poetry is the only kind of extant Greek poetry which is older than about 700 B.C. The early epos of Greece is represented by the *Iliad* and the *Odyssey*, Hesiod, and the Homeric hymns; also by some fragments of the "Cyclic" poets.

The *Iliad* and the *Odyssey*.

After the Dorian conquest of the Peloponnesus, the Aeolian emigrants who settled in the north-west of Asia Minor brought with them the warlike legends of their chiefs, the Achaean princes of old. These legends lived in the ballads of the Aeolic minstrels, and from them passed southward into Ionia, where the Ionian poets gradually shaped them into higher artistic forms. Among the seven places which claimed to be the birthplace of Homer, that which has the best title is Smyrna. Homer himself is called "son of Meles"—the stream which flowed through old Smyrna, on the border between Aeolis and Ionia. The tradition is significant in regard to the origin and character of the *Iliad*, for in the *Iliad* we have Achaean ballads worked up by Ionian art. A preponderance of evidence is in favour of the view that the *Odyssey* also, at least in its earliest form, was composed on the Ionian coast of Asia Minor. According to the Spartan account, Lycurgus was the first to bring to Greece a complete copy of the Homeric poems, which he had obtained from the Creophylidae, a clan or guild of poets in Samos. A better authenticated tradition connects Athens with early attempts to preserve the chief poetical treasure of the nation. Pisistratus is said to have charged some learned men with the task of collecting all "the poems of Homer", but it is difficult to decide how much was comprehended under this last phrase, or whether the province of the commission went beyond the mere task of collecting. Nor can it be determined what exactly it was that Solon and Hipparchus respectively did for the Homeric poems. Solon, it has been thought, enacted that the poems should be recited from an authorized text (ἐξ ὑποβολῆς); Hipparchus, that they should be recited in a regular order (ἐξ ὑπολήψεως). At any rate, we know that in the 6th century B.C. a recitation of the poems of Homer was one of the established competitions at the Panathenaea, held once in four years. The reciter was called a *rhapsodist*,—properly one who weaves a long, smoothly flowing chant, then an epic poet who chants his own or another's poem. The rhapsodist did not, like the early minstrel, use the accompaniment of the harp; he gave the verses in a flowing recitative, bearing in his hand a branch of laurel, the symbol of Apolline inspiration. In the 5th century B.C. we find that various Greek cities had their own editions (αἱ κατὰ πόλεις ἐκδόσεις) of the poems, for recitation at their festivals. Among these were the editions of Massilia, of Chios, and of Argos. There were also editions bearing the names of the individual editors (αἱ κατ' ἄνδρα), the best known being that which Aristotle prepared for Alexander. The recension of the poems by Aristarchus (156 B.C.) became the standard one, and is probably that upon which the existing text is based. The oldest Homeric MS. extant, Venetus A of the *Iliad*, is of the 10th century; the first printed edition of Homer was that edited by the Byzantine Demetrius Chalcondyles (Florence, 1488). The first Aldine edition appeared twelve years later.

The Homeric question.

The ancient Greeks were almost unanimous in believing the *Iliad* and the *Odyssey* to be the work of one man, Homer, to whom they also ascribed some extant hymns, and probably much more besides. Aristotle and Aristarchus seem to have put Homer's date about 1044 B.C., Herodotus about 850 B.C. It was not till about 170 B.C. that the grammarians Hellanicus and Xenon put forward the view that Homer was the author of the *Iliad*, but not of the *Odyssey*. Those who followed them in assigning different authors to the two poems were called the Separators (or *Chorizontes*). Aristarchus combated "the paradox of Xenon," and it does not seem to have had much acceptance in antiquity. Vico, a Neapolitan (1668–1744), seems to have been the first modern to suggest the composite authorship and oral tradition of the Homeric poems; but this was a pure conjecture in support of his theory that the names of ancient lawgivers and poets are often mere symbols. F. A. Wolf, in the *Prolegomena* to his edition (1795), was the founder of a scientific scepticism. The *Iliad*, he said (for he recognized the comparative unity and consistency of the *Odyssey*), was pieced together from many small unwritten poems by various hands, and was first committed to writing in the time of Pisistratus. This view was in harmony with the tone of German criticism at the time; it was welcomed as a new testimony to the superiority of popular poetry, springing from fresh natural sources, to elaborate works of art; and it at once found enthusiastic adherents. For the course of Homeric controversy since Wolf the reader is referred to the article HOMER. The general result has been, not to prove any precise theory of authorship, but rather to establish certain general propositions, and so far to limit the question. It is now generally admitted that the *Iliad* and the *Odyssey*, whatever their absolute or relative ages, must at least be regarded as belonging to the maturity of a poetical school in Ionia, which had gradually created an epic style. Next, it can no longer be doubted that the *Iliad* contains elements of various age and origin; the form and the matter alike show this, though we cannot with certainty point to any one group of these elements as the original nucleus around which our *Iliad* grew. Comparing the *Odyssey* with the *Iliad*, we perceive greater unity of design and of colouring, and indications of a somewhat later time; but not even here can we affirm that the poem, as we have it, is the work of one man.

Cyclic poems.

The Ionian school of epos produced a number of poems founded on the legends of the Trojan war, and intended as introductions or continuations to the *Iliad* and the *Odyssey*. The grammarian Proclus (140 A.D.) has preserved the names and subjects of some of these; but the fragments are very scanty. The *Nostoi* or *Homeward Voyages*, by Agias of Trœzen, filled up the gap of ten years between the *Iliad* and the *Odyssey*; the *Lay of Telegonus*, by Eugammon of Cyrene, continued the story of the *Odyssey* to the death of Odysseus by the hand of Telegonus, the son whom Circe bore to him. Similarly the *Cyprian Lays*, by Stasinus of Cyprus, was introductory to the *Iliad*; the *Aethiopis* and the *Sack of Troy*, by Arctinus of Miletus, and the *Little Iliad*, by Lesches of Mitylene, were supplementary to it. These and many other names of lost epics—some taken also from the Theban myths—serve to show how prolific was that epic school of which only two great examples remain. The name of *epic cycle* was properly applied to a prose compilation of abstracts from these epics, pieced together in the order of the events. The compilers were called "cyclic" writers; and the term has now been transferred to the epic poets whom they used.

Hesiodic epos.

The epic poetry of Ionia celebrated the great deeds of heroes in the old wars. But in Greece proper there arose another school of epos, which busied itself with religious lore and ethical precepts, especially in relation to the rural life of Bœotia. This school is represented by the name of Hesiod. The legend spoke of him as vanquishing Homer in a poetical contest at Chalcis in Eubœa; and it expresses the fact that, to the old Greek mind, these two names stood for two contrasted epic types. Nothing is certainly known of his date, except that it must have been subsequent to the maturity of Ionian epos. He is conjecturally placed about 850–800 B.C.; but some would refer him to the early part of the 7th century B.C. His home was at Ascra, a village in a valley under Helicon, whither his father had migrated from Cyme in Æolis on the coast of Asia Minor. In Hesiod's *Works and Days* we have the earliest example of a didactic poem. The seasons and the labours of the Bœotian farmer's year are followed by a list of the days which are lucky or unlucky for work. The *Theogony*, or "Origin of the Gods," describes first how the visible order of nature arose out of chaos; next, how the gods were born. Though it never possessed the character of a sacred book, it remained a standard authority on the genealogies of the gods. So far as a corrupt and confused text warrants a judgment, the poet was piecing together—not always intelligently—the fragments of a very old cosmogonic system, using for this purpose both the hymns preserved in the temples and the myths which lived in folklore. The epic lay in 480 lines called the *Shield of Heracles*—partly imitated from the 18th book of the *Iliad*—is the work of an author or authors later than Hesiod. In the Hesiodic poetry, as represented by the *Works and Days* and the *Theogony*, we see the influence of the temple at Delphi. Hesiod recognizes the existence of *daimones*—spirits of the departed who haunt the earth as the invisible guardians of justice; and he connects the office of the poet with that of the prophet. The poet is one whom the gods have authorized to impress doctrine and practical duties on men. A religious purpose was essentially characteristic of the Hesiodic school. Its poets treated the old legends as relics of a sacred history, and not merely, in the Ionian manner, as subjects of idealizing art. Such titles as the *Maxims of Cheiron* and the *Lay of Melampus*, the seer—lost poems of the Hesiodic school—illustrate its ethical and its mystic tendencies.

The Homeric Hymns.

The *Homeric Hymns* form a collection of thirty-three pieces, some of them very short, in hexameter verse. Their traditional title is *Hymns* or *Preludes of Homer and the Homeridæ*. The second of the alternative designations is the true one. The pieces are not "hymns" used in formal worship, but "preludes" or prefatory addresses (προοίμια) with which the rhapsodists ushered in their recitations of epic poetry. The "prelude" might be addressed to the presiding god of the festival, or to any local deity whom the reciter wished to honour. The pieces range in date perhaps from 750 to 500 B.C., and it is probable that the collection was formed in Attica, for the use of rhapsodists. The style is that of the Ionian or Homeric epos, but there are also several traces of the Hesiodic or Bœotian school. The five principal "hymns" are those (1) to the Delian Apollo, i. 1–177; (2) to the Pythian Apollo, i. 178 to end; (3) to Hermes, ii.; (4) to Aphrodite, iii.; and (5) to Demeter, v. The hymn to the Delian Apollo, quoted by Thucydides (iii. 104) as Homer's, is of peculiar interest on account of the lines describing the Ionian festival at Delos. Two celebrated poems of a sportive kind passed under Homer's name. The *Margites*—a comic poem on one "who knew many things, but knew them all badly"—is regarded by Aristotle as the earliest germ of comedy, and was possibly as old as 700 B.C. Only a few lines remain. The *Battle of the Frogs and Mice* probably belongs to the decline of Greek literature, perhaps to the 2d century B.C. About 300 verses of it are extant.

Transition from epos to elegy.

In the *Iliad* and the *Odyssey* the personal opinions or sympathies of the poet may sometimes be conjectured, but they are not declared, or even hinted. Hesiod, indeed, sometimes gives us a glimpse of his own troubles or views. Yet Hesiod is, on the whole, essentially a prophet. The message which he delivers is not from himself; the truths which he imparts have not been discovered by his own search. He is the mouthpiece of the Delphian Apollo. Personal opinion and feeling may tinge his utterance, but they do not determine its general complexion. The egotism is a single thread; it is not the basis of the texture. Epic poetry was in Greece the foundation of all other poetry; for many centuries no other kind was generally cultivated, no other could speak to the whole people. Politically, the age was monarchical or aristocratic; intellectually, it was too simple for the analysis of thought or emotion. Kings and princes loved to hear of the great deeds of their ancestors; common men loved to hear of them too, for they had no other interest. The mind of Greece found no subject of contemplation so attractive as the warlike past of the race, or so useful as that lore which experience and tradition had bequeathed. But in the course of the 8th century B.C. the rule of hereditary princes began to disappear. Monarchy gave place to oligarchy, and this—often after the intermediate phase of a tyranny—to democracy. Such a change was necessarily favourable to the growth of reflection. The private citizen is no longer a mere cipher, the Homeric τις, a unit in the dim multitude of the king-ruled folk; he gains more power of independent action, his mental horizon is widened, his life becomes fuller and more interesting. He begins to feel the need of expressing the thoughts and feelings that are stirred in him. But as yet a prose literature does not exist; the new thoughts, like the old heroic stories, must still be told in verse. The forms of verse created by this need were the Elegiac and the Iambic.

Elegy.

The elegiac metre is, in form, a simple variation on the epic metre, obtained by docking the second of two hexameters so as to make it a verse of five feet or measures. But the poetical capabilities of the elegiac couplet are of a wholly different kind from those of heroic verse. *Elegos* seems to be the Greek form of a name given by the Carians and Lydians to a lament for the dead. This was accompanied by the soft music of the Lydian flute, which continued to be associated with Greek elegy. The non-Hellenic origin of elegy is indicated by this very fact. The flute was to the Greeks an Asiatic instrument,—string instruments were those which they made their own,—and it would hardly have been wedded by them to a species of poetry which had arisen among themselves. The early elegiac poetry of Greece was by no means confined to mourning for the dead. War, love, politics, proverbial philosophy, were in turn its themes; it dealt, in fact, with the chief interest of the poet and his friends, whatever that might be at the time. It is the direct expression of the poet's own thoughts, addressed to a sympathizing society. This is its first characteristic. The second is that, even when most pathetic or most spirited, it still preserves, on the whole, the tone of conversation or of narrative. Greek elegy stops short of lyric passion. English elegy, whether funereal as in Dryden and Pope, or reflective as in Gray, is usually true to the same normal type. Roman elegy is not equally true to it, but sometimes tends to trench on the lyric province. For Roman elegy is mainly amatory or sentimental; and its masters imitated, as a rule, not the early Greek elegists, not Tyrtæus or Theognis, but the later Alexandrian elegists, such as Callimachus or Philetas. Catullus introduced the metre to Latin literature, and used it with more fidelity than his followers to its genuine Greek inspiration.

Iambic verse.

Elegy, as we have seen, was the first slight deviation from epos. But almost at the same time another species arose which had nothing in common with epos, either in form or in spirit. This was the iambic. The word ἴαμβος (ἰάπτω, to dart or shoot) was used in reference to the licensed raillery at the festivals of Demeter; it was the maiden Iambe, the myth said, who drew the first smile from the mourning goddess. The iambic metre was at first used for satire; and it was in this strain that it was chiefly employed by its earliest master of note, Archilochus of Paros (670 B.C.). But it was adapted to the expression generally of any pointed thought. Thus it was suitable to fables. Elegiac and iambic poetry both belong to the borderland between epic and lyric. While, however, elegy stands nearer to epos, iambic stands nearer to the lyric. Iambic poetry can express the personal feeling of the poet with greater intensity than elegy does; on the other hand, it has not the lyric flexibility, self-abandonment, or glow. As we see in the case of Solon, iambic verse could serve for the expression of that deeper thought, that more inward self-communing, for which the elegiac form would have been inappropriate.

But these two forms of poetry, both Ionian, the elegiac and the iambic, belong essentially to the same stage of the literature. They stand between the Ionian epos and the lyric poetry of the Æolians and Dorians. The earliest of the Greek elegists, Callinus and Tyrtæus, use elegy to rouse a warlike spirit in sinking hearts. Archilochus too wrote warlike elegy, but used it also in other strains, as in lament for the dead. The elegy of Mimnermus is the plaintive farewell of an ease-loving Ionian to the days of Ionian freedom. In Solon elegy takes a higher range; it becomes political and ethical. Theognis represents the maturer union of politics with a proverbial philosophy. Xenophanes gives a philosophic strain to elegy. With Simonides of Ceos it reverts, in an exquisite form, to its earliest destination, and becomes the vehicle of epitaph on those who fell in the Persian wars. Iambic verse was used by Simonides of Amorgus, as by Archilochus, for satire,—but satire directed against classes rather than persons. Solon's iambics so far preserve the old associations of the metre that they represent the polemical or controversial side of his political poetry. Hipponax of Ephesus was another iambic satirist—using the "scazon" or "limping" verse, produced by substituting a spondee for an iambus in the last place. But it was not until the rise of the Attic drama that the full capabilities of iambic verse were seen.

Lyric poetry.

The lyric poetry of early Greece may be regarded as the final form of that effort at self-expression which in the elegiac and iambic is still incomplete. The lyric expression is deeper and more impassioned. Its intimate union with music and with the rhythmical movement of the dance gives to it more of an ideal character. At the same time the continuity of the music permits pauses to the voice,—pauses necessary as reliefs after a climax. Before lyric poetry could be effective, it was necessary that some progress should have been made in the art of music. The instrument used by the Greeks to accompany the voice was the four-stringed lyre, and the first great epoch in Greek music was when Terpander of Lesbos (660 B.C.), by adding three strings, gave the lyre the compass of the octave. Further improvements are ascribed to Olympus and Thaletas. By 500 B.C. Greek music had probably acquired all the powers of expression which the lyric poet could demand. The period of Greek lyric poetry may be roughly defined as from 670 to 440 B.C. Two different parts in its development were taken by the Æolians and the Dorians.

Æolian school.

The lyric poetry of the Æolians—especially of Lesbos—was essentially the utterance of personal feeling, and was usually intended for a single voice, not for a chorus. Lesbos, in the 7th century B.C., had attained some naval and commercial importance. But the strife of oligarchy and democracy was active; the Lesbian nobles were often driven by revolution to exchange their luxurious home-life for the hardships of exile. It is such a life of contrasts and excitements, working on a sensuous and fiery temperament, that is reflected in the fragments of Alcæus. In these glimpses of war and love, of anxiety for the storm-tossed state and of careless festivity, there is much of the cavalier spirit; if Archilochus is in certain aspects a Greek Byron, Alcæus might be compared to Lovelace. The other great representative of the Æolian lyric is Sappho, the only woman of Greek race who is known to have possessed poetical genius of the first order. Intensity and melody are the characteristics of the fragments that remain to us. Probably no poet ever surpassed Sappho as an interpreter of passion in exquisitely subtle harmonies of form and sound. Anacreon of Teos, in Ionia, may be classed with the Æolian lyrists in so far as the matter and form of his work resembled theirs, though the dialect in which he wrote was mainly the Ionian. A few fragments remain from his hymns to the gods, from love-poems and festive songs. The collection of sixty short pieces which passes current under his name dates only from the 10th century. The short poems which it comprises are of various age and authorship,—all of them probably of the Christian era. They have not the pure style, the flexible grace, or the sweetness of the classical fragments; but the verses, though somewhat mechanical, are often pretty.

Dorian school

The Dorian lyric poetry, in contrast with the Æolian, had more of a public than of a personal character, and was for the most part choral. Hymns or choruses for the public worship of the gods, and odes to be sung at festivals on occasions of public interest, were its characteristic forms. Its central inspiration was the pride of the Dorians in the Dorian past, in their traditions of worship, government, and social usage. The history of the Dorian lyric poetry does not present us with vivid expressions of personal character, like those of Alcæus and Sappho, but rather with a series of artists whose names are associated with improvements of form. Thus Alcman (660 B.C.) is said to have introduced the balanced movement of strophe and antistrophe. Stesichorus, of Himera in Sicily, added the epode, sung by the chorus while stationary after these movements; Arion gave a finished form to the choral hymn ("dithyramb") in honour of Dionysus, and organized the "cyclic" or circular chorus which sang it at the altar.

Simonides and Pindar.

The culmination of the lyric poetry is marked by two great names, Simonides and Pindar. Simonides was an Ionian of the island of Ceos, but his lyrics belonged by form to the choral Dorian school. Many of his subjects were taken from the events of the Persian wars: his epitaphs on those who fell at Thermopylæ and Salamis were celebrated. In him the lyric art of the Dorians is interpreted by Ionian genius, and Athens—where part of his life was passed—is the point at which they meet. Simonides is the first Greek lyrist whose significance is not merely Æolian or Dorian but Panhellenic. The same character belongs even more completely to his younger contemporary. Pindar was born in Bœotia of a Dorian stock; thus, as Ionian and Dorian elements meet in Simonides, so Dorian and Æolian elements meet in Pindar. Simonides was perhaps the most tender and most exquisite of the lyric poets. Pindar was the boldest, the most fervid, and the most sublime. His extant fragments represent almost every branch of the lyric art. But he is known to us mainly by forty-four *Epinicia*, or odes of victory, for the Olympian, Pythian, Nemean, and Isthmian festivals. The general characteristic of the treatment is that the particular victory is made the occasion of introducing heroic legends connected with the family or city of the victor, and of inculcating the moral lessons which they teach. No Greek lyric poetry can be completely appreciated apart from the music, now lost, to which it was set. Pindar's odes were, further, essentially occasional poems; they abound in allusions of which the effect is partly or wholly lost on us; and the glories which they celebrate belong to a life which we can but imperfectly realize. Of all the great Greek poets, Pindar is perhaps the one to whom it is hardest for us to do justice; yet we can at least recognize his splendour of imagination, his strong rapidity, and his soaring flight.

II. *The Attic Literature.*

The Ionians of Asia Minor, the Æolians, and the Dorians had now performed their special parts in the development of Greek literature. Epic poetry had interpreted the heroic legends of warlike deeds done by Zeus-nourished kings and chiefs. Then, as the individual life became more and more, elegiac and iambic poetry had become the social expression of that life in all its varied interests and feelings. Lastly, lyric poetry had arisen to satisfy a twofold need—to be the more intense utterance of personal emotion, or to give choral voice, at stirring moments, to the faith or fame, the triumph or the sorrow, of a city or a race. A new form of poetry was now to be created, with elements borrowed from all the rest. And this was to be achieved by the people of Attica, in whose character and language the distinctive traits of an Ionian descent were tempered with some of the best qualities of the Dorian stock.

Origin of drama. The drama arose from the festivals of Dionysus, the god of wine, which were held at intervals from the beginning of winter to the beginning of spring. A troop of rustic worshippers would gather around the altar of the god, and sing a hymn in his honour, telling of his victories or sufferings in his progress over the earth. Tragedy. "Tragedy" meant "the goat song," a goat being sacrificed to Dionysus before the hymn was sung. "Comedy," "the village-song," is the same hymn regarded as an occasion for rustic jest. Then the leader of the chorus would assume the part of a messenger from Dionysus, or even that of the god himself, and recite an adventure to the worshippers, who made choral response. The next step was to arrange a dialogue between the leader (*coryphæus*) and one chosen member of the chorus, hence called "the answerer" (*hypocrites*, afterwards the ordinary word for "actor"). This last improvement is ascribed to the Attic Thespis (about 536 B.C.). The elements of drama were now ready. The choral hymn to Dionysus (the "dithyramb") had received an artistic form from the Dorians; dialogue, though only between the leader of the chorus and a single actor, had been introduced in Attica. Phrynichus, an Athenian, celebrated in this manner some events of the Persian wars; but in his "dramas" there was still only one actor.

Æschylus. Æschylus (born 525 B.C.) became the real founder of tragedy by introducing a second actor, and thus rendering the dialogue independent of the chorus. At the same time the choral song—hitherto the principal part of the performance—became subordinate to the dialogue; and drama was mature. Æschylus is also said to have made various improvements of detail in costume and the like, and it was early in his career that the theatre of Dionysus under the Acropolis was commenced—the first permanent home of Greek drama, in place of the temporary wooden platforms which had hitherto been used. The system of the "trilogy" and the "tetralogy" is further ascribed to Æschylus,—the "trilogy" being properly a series of three tragedies connected in subject, such as the *Agamemnon*, *Choephori*, *Eumenides*, which together form the *Oresteia* or Story of Orestes. The tetralogy was a trilogy with a "satyric drama" added, in which satyrs, the grotesque woodland beings who attended on Dionysus, formed the chorus, as in the earlier dithyramb from which drama sprang. The *Cyclops* of Euripides is a satyric drama. In the seven tragedies which alone remain of the seventy which Æschylus is said to have composed, the forms of kings and heroes have a grandeur which is truly Homeric; there is a spirit of Panhellenic patriotism such as the Persian wars in which he fought might well quicken in a soldier-poet; and, pervading all, there is a strain of speculative thought which seeks to reconcile the apparent conflicts between the gods of heaven and of the underworld by the doctrine that both alike, constrained by necessity, are working out the law of righteousness. Sophocles. Sophocles, who was born thirty years after Æschylus (495 B.C.), is the most perfect artist of the ancient drama. No one before or after him gave to Greek tragedy so high a degree of ideal beauty, or appreciated so finely the possibilities and the limitations of its sphere. He excels especially in drawing character; his *Antigone*, his *Ajax*, his *Œdipus*—indeed, all the chief persons of his dramas—are typical studies in the great primary emotions of human nature. He gave a freer scope to tragic dialogue by adding a third actor; and in one of his later plays, the *Œdipus at Colonus*, a fourth actor is required. From the time when he won the tragic prize against Æschylus in 468 to his death in 405 B.C. he was the favourite dramatist of Athens; and for us he is not only a great dramatist, but also the most spiritual representative of the age of Pericles. The distinctive interest of Euripides is of another kind. Euripides. He was only fifteen years younger than Sophocles; but when he entered on his poetical career, the old inspirations of tragedy were already failing. Euripides marks a period of transition in the tragic art, and is, in fact, the mediator between the classical and the romantic drama. The myths and traditions with which the elder dramatists had dealt no longer commanded an unquestioning faith. Euripides himself was imbued with the new intellectual scepticism of the day; and the speculative views which were conflicting in his own mind are reflected in his plays. He had much picturesque and pathetic power; he was a master of expression; and he shows ingenuity in devising fresh resources for tragedy—especially in his management of the choral songs. Æschylus is Panhellenic, Sophocles is Athenian, Euripides is cosmopolitan. He stands nearer to the modern world than either of his predecessors; and though with him Attic tragedy loses its highest beauty, it acquires new elements of familiar human interest.

In Attica, as in England, a period of rather less than fifty years sufficed for the complete development of the tragic art. The two distinctive characteristics of Athenian drama are its originality and its abundance. The Greeks of Attica were not the only inventors of drama, but they were the first people who made drama a complete work of art. And the great tragic poets of Attica were remarkably prolific. Æschylus was the reputed author of 70 tragedies, Sophocles of 113, Euripides of 92; and there were others whose productiveness was equally great.

Comedy. Comedy represented the lighter side, as tragedy the graver side, of the Dionysiac worship; it was the joy of spring following the gloom of winter. The process of growth was nearly the same as in tragedy; but the Dorians, not the Ionians of Attica, were the first who added dialogue to the comic chorus. Susarion, a Dorian of Megara, exhibited about 580 B.C. pieces of the kind known as "Megarian farces." The more artistic form of comedy seems, however, to have been developed in Attica. The greatest names before Aristophanes are those of Cratinus and Eupolis; but from about 470 B.C. there seems to have been a continuous succession of comic dramatists. Aristophanes. Aristophanes came forward as a comic poet in 427 B.C., and retained his popularity for about forty years. He presents a perhaps unique union of bold fancy, exquisite humour, critical acumen, and lyrical power. His eleven extant comedies may be divided into three groups according as the licence of political satire becomes more and more restricted. In the *Acharnians*, *Knights*, *Clouds*, *Wasps*, and *Peace* (425–421) the poet uses unrestrained freedom. In the *Birds*, *Lysistrata*, *Thesmophoriazusae*, and *Frogs* (414–405) a greater reserve may be perceived. Lastly, in the *Ecclesiazusae* and the *Plutus* (392–388) personal satire is almost wholly avoided. The same general tendency continued. The so-called "Middle Comedy" (390–320) represents the transition from the Old Comedy, or political satire, to satire of a literary or social nature. The "New Comedy" (320–250) resembled the modern "comedy of manners." These successive periods cannot be sharply or precisely marked off. The change which gradually passed over the comic drama was simply the reflexion of the change which passed over the political and social life of Athens. The Old Comedy, as we see it in the earlier plays of Aristophanes, was probably the most powerful engine of public criticism that has ever existed in any community. Unsparing personality was its essence. The comic poet used this recognized right on an occasion at once festive and sacred, in a society where every man of any note was known by name and sight to the rest. The same thousands who heard a policy or a character denounced or lauded in the theatre might be required to pass sentence on it in the popular assembly or in the courts of law.

Literary prose.

The development of Greek poetry had been completed before a prose literature had begun to exist. The earliest name in extant Greek prose literature is that of Herodotus; and, when he wrote, the Attic drama had already passed its prime. There had been, indeed, writers of prose before Herodotus; but there had not been, in the proper sense of the term, a prose literature. The causes of this comparatively late origin of Greek literary prose are independent of the question as to the time at which the art of writing began to be generally used for literary purposes. Epic poetry exercised for a very long period a sovereign spell over the Greek mind. In it was deposited all that the race possessed of history, theology, philosophy, oratory. Even after an age of reflexion had begun, elegiac poetry, the first offshoot of epic, was, with iambic verse, the vehicle of much which among other races would have been committed to prose. The basis of Greek culture was essentially poetical. A political cause worked in the same direction. In the Eastern monarchies the king was the centre of all, and the royal records afforded the elements of history from a remote date. The Greek nation was broken up into small states, each busied with its own affairs and its own men. It was the collision between the Greek and the barbarian world which first provided a national subject for a Greek historian. The work of Herodotus, in its relation to Greek prose, is so far analogous to the *Iliad* in its relation to Greek poetry, that it is the earliest work of art, and that it bears a Panhellenic stamp.

Early prose-writers.

The sense and the degree in which Herodotus was original may be inferred from what is known of earlier prose-writers. For about a century before Herodotus there had been a series of writers in philosophy, mythology, geography, and history. The earliest, or among the earliest, of the philosophical writers were Pherecydes of Syros (550 B.C.) and the Ionian Anaximenes and Anaximander. The Ionian writers, especially called *logographi*, "narrators in prose" (as distinguished from *epopoei*, makers of verse), were those who compiled the myths, especially in genealogies, or who described foreign countries, their physical features, usages, and traditions. Hecataeus of Miletus (500 B.C.) is the best-known representative of the *logographi* in both these branches. Hellanicus of Mitylene (450 B.C.), among whose works was a history of Attica, appears to have made a nearer approach to the character of a systematic historian.

Herodotus.

Herodotus was born in 484 B.C.; and his history was probably not completed before the beginning of the Peloponnesian War (431 B.C.). His subject is the struggle between Greece and Asia, which he deduces from the legendary rape of the Argive Io by Phoenicians, and traces down to the final victory of the Greeks over the invading host of Xerxes. His literary kinship with the historical or geographical writers who had preceded him is seen mainly in two things. First, though he draws a line between the mythological and the historical age, he still holds that myths, as such, are worthy to be reported, and that in certain cases it is part of his duty to report them. Secondly, he follows the example of such writers as Hecataeus in describing the natural and social features of countries. He seeks to combine the part of the geographer or intelligent traveller with his proper part as historian. But when we turn from these minor traits to the larger aspects of his work, Herodotus stands forth as an artist whose conception and whose method were his own. His history has an epic unity. Various as are the subordinate parts, the action narrated is one, great and complete; and the unity is due to this that Herodotus refers all events of human history to the principle of divine Nemesis. If Sophocles had told the story of Œdipus in the *Œdipus Tyrannus* alone, and had not added to it the *Œdipus at Colonus*, it would have been comparable to the story of Xerxes as told by Herodotus. Great as an artist, great too in the largeness of his historical conception, Herodotus fails chiefly by lack of insight into political cause and effect, and by a general silence in regard to the history of political institutions. Both his strength and his weakness are seen most clearly when he is contrasted with that other historian who was strictly his contemporary, and who yet seems divided from him by centuries.

Thucydides.

Thucydides was only thirteen years younger than Herodotus; but the intellectual space between the men is so great that they seem to belong to different ages. Herodotus is the first artist in historical writing; Thucydides is the first thinker. Herodotus interweaves two threads of causation—human agency, represented by the good or bad qualities of men, and divine agency, represented by the vigilance of the gods on behalf of justice. Thucydides concentrates his attention on the human agency (without, however, denying the other), and strives to trace its exact course. The subject of Thucydides is the Peloponnesian War. In resolving to write its history, he was moved, he says, by these considerations. It was probably the greatest movement which had ever affected Hellas collectively. It was possible for him as a contemporary to record it with approximate accuracy. And this record was likely to have a general value, over and above its particular interest as a record, seeing that the political future was likely to resemble the political past. This is what Thucydides means when he calls his work "a possession for ever." The speeches which he ascribes to the persons of the history are, as regards form, his own essays in rhetoric of the school to which Antiphon belongs. As regards matter, they are always so far dramatic that the thoughts and sentiments are such as he conceived possible for the supposed speaker. Thucydides abstains, as a rule, from moral comment; but he tells his story as no one could have told it who did not profoundly feel its tragic force; and his general claim to the merit of impartiality is not invalidated by the possible exceptions—difficult to estimate—in the cases of Cleon and Hyperbolus.

Xenophon.

Strong as is the contrast between Herodotus and Thucydides, their works have yet a character which distinguish both alike from the historical work of Xenophon in the *Anabasis* and the *Hellenica*. Herodotus gives us a vivid drama with the unity of an epic. Thucydides takes a great chapter of contemporary history and traces the causes which are at work throughout it, so as to give the whole a scientific unity. Xenophon has not the grasp either of the dramatist or of the philosopher. His work does not possess the higher unity either of art or of science. The true distinction of Xenophon consists in his thorough combination of the practical with the literary character. He was an accomplished soldier, who had done and seen much. He was also a good writer, who could make a story both clear and lively. But the several parts of the story are not grouped around any central idea, such as a divine Nemesis is for Herodotus, or such as Thucydides finds in the nature of political man. The seven books of the *Hellenica* form a supplement to the history of Thucydides, beginning in 411 and going down to 362 B.C. The chief blot on the *Hellenica* is the author's partiality to Sparta, and in particular to Agesilaus. Some of the greatest achievements of Epaminondas and Pelopidas are passed over in silence. On the whole, Xenophon is perhaps seen at his best in his narrative of the *Retreat of the Ten Thousand*—a subject which exactly suits him. The *Cyropædia* is a romance of little historical worth, but with many good passages. *The Recollections of Socrates*, on the other hand, derive their principal value from being uniformly matter-of-fact. In his minor pieces on various subjects Xenophon appears as the earliest essayist. It may be noted that one of the essays erroneously ascribed to him—that *On the Athenian Polity*—is probably the oldest specimen in existence of literary Attic prose.

Oratory.

The steps by which an Attic prose style was developed, and the principal forms which it assumed, can be traced most clearly in the Attic orators. Every Athenian citizen who aspired to take part in the affairs of the city, or even to be qualified for self-defence before a law-court, required to have some degree of skill in public speaking; and an Athenian audience looked upon public debate, whether political or forensic, as a competitive trial of proficiency in a fine art. Hence the speaker, no less than the writer, was necessarily a student of finished expression; and oratory had a more direct influence on the general structure of literary prose than has ever perhaps been the case elsewhere. A systematic rhetoric took its rise in Sicily, where Corax of Syracuse (466 B.C.) devised his *Art of Words* to assist those who were pleading before the law courts; and it was brought to Athens by his disciple Tisias. The teaching of the Sophists, again, directed attention, though in a superficial and imperfect way, to the elements of grammar and logic, and Gorgias of Leontini—whose declamation, however turgid, must have been striking—gave an impulse at Athens to the taste for elaborate rhetorical brilliancy.

[illegible] orators.

Antiphon represents the earliest, and what has been called the "grand," style of Attic prose; its chief characteristics are a grave, dignified movement, a frequent emphasis on verbal contrasts, and a certain austere elevation. The interest of Andocides is mainly historical, but he has graphic power. Lysias, the representative of the "plain style," breaks through the rigid mannerism of the older school, and uses the language of daily life with an ease and grace which, though the result of study, do not betray their art. He is, in his own way, the model of an Attic style, and his speeches, written for others, exhibit also a high degree of dramatic skill. Isocrates, whose manner may be regarded as intermediate between that of Antiphon and that of Lysias, wrote for readers rather than for hearers. The type of literary prose which he founded is distinguished by ample periods, by studied smoothness, and by the temperate use of rhetorical ornament. From the middle of the 4th century B.C. the Isocratic style of prose became general in Greek literature. From the school of Rhodes, in which it became more florid, it passed to Cicero, and through him it has helped to shape the literary prose of the modern world. The speeches of Isæus in will-cases are interesting,—apart from their bearing on Attic life,—because in them we see, as Dionysius says, "the seeds and the beginnings" of that technical mastery in rhetorical argument which Demosthenes carries to perfection. Isæus has also, in a degree, some of the qualities of Lysias. Demosthenes excels all other masters of Greek prose not only in power but in variety; his political speeches, his orations in public or private causes, show his consummate and versatile command over all the resources of the language. In him the development of Attic prose is completed, and the best elements in each of its earlier phases are united. The modern world can more easily appreciate Demosthenes as a great natural orator than as an elaborate artist. But, in order to apprehend his place in the history of Attic prose, we must remember that the ancients felt him to be both; and that he was even reproached by detractors with excessive study of effect. Æschines is the most theatrical of the Greek orators; he is vehement, and often brilliant, but seldom persuasive. Hyperides was, after Demosthenes, probably the most effective; he had much of the grace of Lysias, but also a wit, a fire, and a pathos which were his own. The one oration of Lycurgus which remains to us is earnest and stately, reminding us both of Antiphon and of Isocrates. Dinarchus was merely a bad imitator of Demosthenes. There seems more reason to regret that Demades is not represented by larger fragments. The decline of Attic oratory may be dated from Demetrius of Phalerum (318 B.C.), the pupil of Aristotle. Cicero names him as the first who impaired the vigour of the earlier eloquence, "preferring his own sweetness to the weight and dignity of his predecessors."

Demosthenes.

Philosophical prose—Plato and Aristotle.

The place of Plato in the history of Greek literature is as unique as his place in the history of Greek thought. The literary genius shown in the dialogues is many-sided: it includes dramatic power, remarkable skill in parody, a subtle faculty of satire, and, generally, a command over the finer tones of language. In passages of continuous exposition, where the argument rises into the higher regions of discussion, Plato's prose takes a more decidedly poetical colouring—never florid or sentimental, however, but lofty and austere. In Plato's later works—such, for instance, as the *Laws*, *Timæus*, *Critias*—we can perceive that his style did not remain unaffected by the smooth literary prose which contemporary writers had developed. Aristotle's influence on the form of Attic prose literature would probably have been considerable if his *Rhetoric* had been published while Attic oratory had still a vigorous life before it. But in this, as in other departments of mental effort, it was Aristotle's lot to set in order what the Greek intellect had done in that creative period which had now come to an end. His own chief contribution to the original achievements of the race was the most fitting one that could have been made by him in whose life-time they were closed. He bequeathed an instrument by which analysis could be carried further, he founded a science of reasoning, and left those who followed him to apply it in all those provinces of knowledge which he had mapped out. Theophrastus, his pupil and his successor in the Lyceum, opens the new age of research and scientific classification with his extant works on botany, but is better known to modern readers by his lively *Characters*, the prototypes of such sketches in our own literature as those of Hall, Overbury, and Earle.

III. *The Literature of the Decadence.*

The period of decadence in Greek literature begins with the extinction of free political life in the Greek cities. So [illegible] So long as the Greek commonwealths were independent and vigorous, Greek life rested on the identity of the man with the citizen. The city was the highest unit of social organization; the whole energies and interests of the man were devoted primarily to the well-being of the city. The market-place, the assembly, the theatre, were places of frequent meeting, where the sense of citizenship was quickened, where common standards of opinion and feeling were formed. Poetry, music, sculpture, literature, art in all their forms, were matters of public interest. Every citizen had some degree of acquaintance with them, and was in some measure capable of judging them. The poet and the musician, the historian and the sculptor, did not live a life of studious seclusion or engrossing professional work. They were, as a rule, in full sympathy with the practical interests of their time. Their art, whatever its form might be, was the concentrated and ennobled expression of their political experience. Æschylus breathed into tragedy the inspiration of one who had himself fought the great fight of national liberation. Sophocles was the colleague of Pericles in a high military command. Thucydides describes the operations of the Peloponnesian War with the practical knowledge of one who had been in charge of a fleet. Ictinus and Phidias gave shape in stone, not to mere visions of the studio, but to the more glorious, because more real and vivid, perceptions which had been quickened in them by a living communion with the Athenian spirit, by a daily contemplation of Athenian greatness, in the theatre where tragic poets idealized the legends of the past, in the ecclesia where every citizen had his vote on the policy of the state, or in that free and gracious society, full of beauty, yet exempt from vexatious constraint, which belonged to the age of Pericles. The tribunal which judged these works of literature or art was such as was best fitted to preserve the favourable conditions under which they arose. Criticism was not in the hands of a literary clique or of a social caste. The influence of jealousy or malevolence, and the more fatal influence of affectation, had little power to affect the verdict. The verdict was pronounced by the whole body of the citizens. The success or failure of a tragedy was decided, not by the minor circumstance that it gained the first or second prize, but by the collective opinion of the citizens assembled in the theatre of Dionysus. A work of architecture or sculpture was approved or condemned, not by the sentence of a few whom the multitude blindly followed, but by the general judgment of some twenty thousand persons, each of whom was in some degree qualified by education and by habit to form an independent estimate. The artist worked for all his fellow-citizens, and knew that he would be judged by all. The soul of his work was the fresh and living inspiration of nature: it was the ennobled expression of his own life; and the public opinion before which it came was free, intelligent, and sincere.

[illegible] Philip of Macedon did not take away the municipal independence of the Greek cities, but he dealt a death-blow to the old political life. The Athenian poet, historian, artist, might still do good work, but he could never again have that which used to be the very mainspring of all such activity,—the daily experience and consciousness of participation in the affairs of an independent state. He could no longer breathe the invigorating air of constitutional freedom, or of the social intercourse to which that freedom lent dignity as well as grace. Then came Alexander's conquests; Greek civilization was diffused over Asia and the East by means of Greek colonies in which Asiatic and Greek elements were mingled. The life of such settlements, under the monarchies into which Alexander's empire broke up, could not be animated by the spirit of the Greek commonwealths in the old days of political freedom. But the externals of Greek life were there,—the temples, the statues, the theatres, the porticos. Ceremonies and festivals were conducted in the Greek manner. In private life Greek usages prevailed. Greek was the language most used; Greek books were in demand. The mixture of races would always in some measure distinguish even the outward life of such a community from that of a pure Greek state; and the facility with which Greek civilization was adopted would vary in different places. Syria, for example, was rapidly and completely Hellenized. Judea resisted the process to the last. In Egypt a Greek aristocracy of office, birth, and intellect existed side by side with a distinct native life. But, viewed in its broadest aspect, this new civilization may be called Hellenism. As *hellenizo* means "to do like a Hellene," Hellenism means the adoption of Hellenic ways; and it is properly applied to a civilization, generally Hellenic in external things, pervading people not necessarily or exclusively Hellenic by race. What the Hellenic literature was to Hellas, that the Hellenistic literature was to Hellenism. The literature of Hellenism has the Hellenic form without the Hellenic soul. The literature of Hellas was creative; the literature of Hellenism is derivative.

The Alexandrian period. 1. Alexandria was the centre of Greek intellectual activity from Alexander to Augustus. Its "Museum" or college, and its library, both founded by the first Ptolemy (Soter), gave it such attractions for learned men as no other city could rival. The labours of research or arrangement are those which characterize the Alexandrian period. Even in its poetry spontaneous motive was replaced by erudite skill, as in the hymns, epigrams, and elegies of Callimachus, in the enigmatic verses of Lycophron, in the highly finished epic of Apollonius Rhodius, and in the versified lore, astronomical or medical, of Aratus and Nicander. The pastoral poetry of the age—Dorian by origin—was the most pleasing; for this, if it is to please at all, must have its spring in the contemplation of nature. Theocritus is not exempt from the artificialism of the Hellenizing literature; but his true sense of natural beauty entitles him to a place in the first rank of pastoral poets. Bion of Ionia and Moschus of Syracuse also charm by the music and often by the pathos of their bucolic verse. But it is not for its poetry of any kind that this period of Greek literature is memorable. Its true work was in erudition and science. Aristarchus (156 B.C.), the greatest in a long line of Alexandrian critics, set the example of a more thorough method in revising and interpreting the ancient texts, and may in this sense be said to have become the founder of scientific scholarship. The critical studies of Alexandria, carried on by the followers of Aristarchus, gradually formed the basis for a science of grammar. Translation was another province of work which employed the learned of Alexandria,—where the Septuagint version of the Old Testament was begun, probably about 300–250 B.C. Chronology was treated scientifically by Eratosthenes, and was combined with history by Manetho in his chronicles of Egypt, and by Berosus in his chronicles of Chaldæa. Euclid was at Alexandria in the reign of Ptolemy Soter. The general results of the Alexandrian period might perhaps be stated thus. Alexandria produced a few eminent men of science, some learned poets (in a few cases, of great literary merit), and many able scholars. The preservation of the best Greek literature was due chiefly to the unremitting care of the Alexandrian critics, whose appreciation of it partly compensated for the decay of the old Greek perceptions in literature and art, and who did their utmost to hand it down in a form as free as possible from the errors of copyists. On the whole, the patronage of letters by the Ptolemies had probably as large a measure of success as was possible under the existing conditions; and it was afforded at a time when there was special danger that a true literary tradition might die out of the world.

Poetry.

Erudition and science.

Summary.

The Græco-Roman period. 2. The Græco-Roman period in the literature of Hellenism may be dated from the Roman subjugation of Greece. "Greece made a captive of the rough conqueror," but it did not follow from this intellectual conquest that Athens became once more the intellectual centre of the world. Under the empire, indeed, the university of Athens long enjoyed a pre-eminent reputation. But Rome gradually became the point to which the greatest workers in every kind were drawn. Greek literature had already made a home there before the close of the 2d century B.C. Sulla brought a Greek library from Athens to Rome. Such men as Cicero and Atticus were indefatigable collectors and readers of Greek books. The power of speaking and writing the Greek language became an indispensable accomplishment for highly educated Romans. The library planned by Julius Cæsar and founded by Augustus had two principal departments, one for Latin, the other for Greek works. Tiberius, Vespasian, Domitian, and Trajan contributed to enlarge the collection. Rome became more and more the rival of Alexandria, not only as possessing great libraries, but also as a seat of learning at which Greek men of letters found appreciation and encouragement. Greek poetry, especially in its higher forms, rhetoric and literary criticism, history and philosophy, were all cultivated by Greek writers at Rome.

First part: 146-30 B.C. The first part of the Græco-Roman period may be defined as extending from 146 B.C. to the close of the Roman republic. At its commencement stands the name of one who had more real affinity than any of his contemporaries with the great writers of old Athens, and who, at the same time, saw most clearly how the empire of the world was passing to Rome. The subject of Polybius was the history of Roman conquest from 264 to 146 B.C. His style, plain and straightforward, is free from the florid rhetoric of the time. But the distinction of Polybius is that he is the last Greek writer who in some measure retains the spirit of the old citizen life. He chose his subject, not because it gave scope to learning or literary skill, but with a motive akin to that which prompted the history of Thucydides—namely, because, as a Greek citizen, he felt intensely the political importance of those wars which had given Rome the mastery of the world. The chief historical work which the following century produced—the *Universal History* of Diodorus Siculus—resembled that of Polybius in recognizing Rome as the political centre of the earth, as the point on which all earlier series of events converged. In all else Diodorus represents the new age in which the Greek historian had no longer the practical knowledge and insight of a traveller, a soldier, or a statesman, but only the diligence, and usually the dulness, of a laborious compiler.

Second part: 30 B.C.-529 A.D. The Greek literature of the Roman empire, from Augustus to Justinian, was enormously prolific. The area over which the Greek language was diffused—either as a medium of intercourse or as an established branch of the higher education—was co-extensive with the empire itself. An immense store of materials had now been accumulated, on which editors, commentators, compilers, imitators, were employed with incessant industry. In very many of its forms the work of composition or adaptation had been reduced to a mechanical knack. If there is any one characteristic which broadly distinguishes the Greek literature of these five centuries, it is the absence of originality either in form or in matter. Lucian is, in his way, a rare exception; and his great popularity—he is the only Greek writer of this period, except Plutarch, who has been widely popular—illustrates the flatness of the level above which he stands out. The extraordinary abundance of literary production under the empire was partly due to the fact that there was no open political career. Never, probably, was literature so important a resource for educated men; and the habit of reciting before friendly or obsequious audiences swelled the number of writers whose taste had been cultivated to a point just short of perceiving that they ought not to write.

Departments of prose literature. In the manifold prose work of this period, four principal departments may be distinguished. (1) *History*, with *Biography* and *Geography*. It would exceed the limits of the present summary to notice in detail the works which belong to this and to the other provinces; but it may be useful for purposes of reference and classification, to give some chief names in each. History is represented by Dionysius of Halicarnassus,—also memorable for his criticisms on the orators and his effort to revive a true standard of Attic prose,—by Josephus, Arrian, Appian, and Herodian. In biography, the foremost names are Plutarch, Diogenes Laertius, and Philostratus; in geography, Strabo and Pausanias. (2) *Erudition* and *Science*. The learned labours of the Alexandrian schools were continued in all their various fields. Under this head may be mentioned such works as the lexicon of Julius Pollux; the commentaries of Galen on Plato and on Hippocrates; the learned miscellanies of Athenæus, Ælian, and Stobæus; and the *Stratagems* of Polyænus. (3) *Rhetoric* and *Belles Lettres*. The most popular writers on the theory of rhetoric were Hermogenes, Aphthonius, and Cassius Longinus—the last the reputed author of the essay *On Sublimity*. Among the most renowned teachers of rhetoric—now distinctively called "Sophists," or rhetoricians—were Dion Chrysostom, Ælius Aristides, Themistius, Himerius, Libanius, and Herodes Atticus. Akin to the rhetorical exercises were various forms of ornamental or imaginative prose—dialogues, letters, essays, or novels. Lucian, in his dialogues, exhibits more of the classical style and of the classical spirit than any writer of the later age; he has also a remarkable affinity with the tone of modern satire, as in Swift or Voltaire. His Attic prose, though necessarily artificial, was at least the best that had been written for four centuries. The emperor Julian was the author both of orations and of satirical pieces. The chief of the Greek novelists are Xenophon of Ephesus and Longus, representing a purely Greek type of romance, and Heliodorus,—with his imitators Achilles Tatius and Chariton,—representing a school influenced by Oriental fiction. There were also many Christian romances in Greek, usually of a religious tendency. Alciphron's fictitious *Letters*—founded largely on the New Comedy of Athens—represent the same kind of industry which produced the letters of Phalaris and many similar collections. (4) *Philosophy* is represented chiefly by Epictetus and Marcus Aurelius, in both of whom the Stoic element is the prevailing one; by the Neoplatonists, such as Plotinus, Porphyry, Iamblichus, and by Proclus, of that eclectic school which arose at Athens in the 5th century A.D.

Verse. The Greek poetry of this period presents no work of high merit. Babrius versified the Æsopic *Fables*; Oppian wrote didactic poems on fishing and hunting; Nonnus and Quintus Smyrnæus made elaborate essays in epic verse; and the Orphic poets composed some poems and hymns of a mystic character. The so-called *Sibylline Oracles*, in hexameter verse, range in date from about 170 B.C. to 700 A.D., and are partly the expression of the Jewish longings for the restoration of Israel, partly predictions of the triumph of Christianity. The Anthology. By far the most pleasing compositions in verse which have come to us from this age are some of the short poems in the Greek Anthology, which includes some pieces as early as the beginning of the 5th century B.C., and some as late as the 6th century of the Christian era.

The 4th century may be said to mark the beginning of the last stage in the decay of literary Hellenism. From that point the decline was rapid and nearly continuous. The attitude of the church towards it was no longer that which had been held by Clement of Alexandria, by Justin Martyr, or by Origen. There was now a Christian Greek literature, and a Christian Greek eloquence of extraordinary power. The laity became more and more estranged from the Greek literature—however intrinsically pure and noble—of the pagan past. At the same time the Greek language—which had not retained its purity in Italian seats—was becoming corrupted in the new Greek Rome of the East. In 529 A.D. Justinian put forth an edict by which the schools of heathen philosophy were formally closed. The act had at least a symbolical meaning. It is necessary to guard against the supposition that such assumed landmarks in political or literary history always mark a definite transition from one order of things to another. But it is practically convenient, or necessary, to use such landmarks. And, in this case, if a line is to be drawn at any one point between the Old and the Byzantine literature, it may be said that the edict of Justinian was the official record of the fact that the old literature of Greece was dead. Then came the Byzantine age, with its massive but formless erudition, its commentaries, annals, and lexicons, represented by such works as those of Eustathius, Photius, and Suidas. The golden time of the Byzantine literature was from about 850 to 1200 A.D. Just as this was drawing to an end, a poetry—at first satirical—arose in the popular dialect, which had now decidedly diverged from the literary; and thus the link was made which connects the Byzantine period with the Greek literature of to-day. The Greek language has never died, and the continuity of Greek literature has never been broken.

See *History of the Literature of Ancient Greece*, by K. O. Muller, continued by J. W. Donaldson; *Critical History of the Language and Literature of Ancient Greece*, by William Mure; *Histoire de la Littérature Grecque*, by Emile Burnouf (1869); *Griechische Litteraturgeschichte*, by Theodor Bergk (1872); *Grundriss der griechischen Litteratur*, by G. Bernhardy (1872-1876); *Griechische Litteraturgeschichte*, by R. Nicolai (1873-1876); *Primer of Greek Literature*, in Macmillan's Series, by R. C. Jebb. (R. C. J.)

SECTION II.—THE BYZANTINE LITERATURE.

The literature of the Byzantine period, from the death of Justinian to the capture of Constantinople by the Turks, is singularly destitute of interest for the general reader. There is not a single work of intense human passion. Not one man appeared gifted with anything like genius. The most notable books are books of history written by those who were themselves actors in the scenes, or at the least were contemporaries or nearly contemporaries of the events recorded. There is always a sense of reality about such works, however hazy our general conception of the times may be. Of these historians a full account is given in the article BYZANTINE HISTORIANS. Some of these writers discussed other subjects. Remarkable amongst these is Constantine VII., Porphyrogenitus, who wrote or caused to be written a whole series of books, treating of the administration of the empire, the ceremonies of the court, war, and jurisprudence. He got up a cyclopædia of history and politics, of agricultural science, of the veterinary art, and of medicine, and ordered the preparation of an epitome of Aristotle's work on animals, of a collection of Greek epigrams, and a collection of the histories of saints. Constantine's works do not give so much an insight into what he could do as into what he wished to do. Some of the historians were really men of wide culture. Nicephorus Gregoras (born 1295) received a liberal education in rhetoric, astronomy, and other subjects, and his literary activity ranged over the entire field of human knowledge. Others again combined the study of rhetoric or philosophy with that of history. Pachymeres, for instance, wrote declamations of a pedantic and frigid nature on historical subjects, blending imagination with what he gathered from history.

History.

Poetry

The character of the Byzantine period is seen in the kind of poetry that it produced. There were some good epigram writers in the reign of Justinian, but after his time the anthology received very few additions. The first versifier of importance that we meet in the progress of time is Georgius of Pisidia, who was deacon of the church of St Sophia in the reign of the emperor Heraclius (610-641). His muse celebrates various wars in iambic verse, such as the war against the Persians, the Avaric war, and the exploits of Heraclius. He also wrote several Christian pieces. Leo VI., called the Wise, who was emperor from 886 to 912, versified astronomical and ecclesiastical subjects, and wrote some prose works besides, most of which, if not all, deserve to lie in oblivion. Theodosius, deacon in the church of St Sophia towards the end of the 10th century, used the iambic trimeter to narrate the capture of Crete, a work which derives all its value from the historical matter contained in it. Theodorus Prodromus is perhaps of all the Byzantine writers the one that comes nearest to the rank of a poet, yet even this approach is made only in some of his poems in the popular dialect, which have a strong satiric turn and a vein of humour. His more ambitious efforts have no claim to the title of poetry. The subjects are of wide range and various form—epistles, congratulatory addresses, historical and didactic poems. Some of them are in a dramatic form, such as the *Catamyomachia*, recently edited by Hercher in the *Teubner Bibliotheca*, in which besides the ordinary characters Prodromus introduces a chorus and semi chorus, and the κῆρυξ and ἄγγελος so common in ancient plays. His largest poem is a romance called τὰ κατὰ Ῥοδάνθην καὶ Δοσικλέα, consisting of nine books in iambic trimeter. It is entirely destitute of originality, and overladen with rhetorical and unpoetic passages. It is given by Hercher in his *Scriptores Erotici*. Prodromus flourished in the reign of Manuel I., Comnenus (1143-1180). Another Byzantine, Nicetas Eugenianus, apparently of the same age, wrote a fictitious poem, τὰ κατὰ Δρόσιλλαν καὶ Χαρικλέα, which bears traces on every page of a close connexion with the similar work of Prodromus. Constantine Manasses also lived during the reign of Manuel I., Comnenus, and wrote a fiction in the versus politicus, characterized by absurdity and poverty of thought and expression. Both of these romances are given in Hercher's *Scriptores Erotici*. Verse was during this period used for the most prosaic purposes. Michael Psellus the younger, about 1018 A.D., employed it to give a synopsis of laws, Tzetzes to give an exposition of history. The work of Tzetzes is now called *Chiliades*, from its being divided into books of a thousand lines. It is written in the versus politicus, and is a very heterogeneous mixture of fact and fiction, but occasionally contains references to customs and incidents which are not handed down to us elsewhere. Another critic, Joannes Pediasimus, wrote iambic verses, περὶ γυναικὸς κακῆς καὶ ἀγαθῆς ἢ Πόθος. Such were the subjects which the Byzantine muse treated, and as we have given a rather full catalogue of the poetical works produced in the Byzantine period in the ancient language, nothing requires to be said of the sterile nature of the poets and their poetry.

Drama

Dramatic poetry was also neglected, but enough was produced to keep up the continuity in the tradition of the drama. Sathas has tried to show that dramas were acted up to the latest period of the Byzantine empire, and though the notices are not numerous nor very conclusive, he seems to us to have proved his point (K. N. Σάθα ἱστορικὸν δοκίμιον περὶ τοῦ θεάτρου καὶ τῆς Μουσικῆς τῶν Βυζαντίνων, Venice, 1878). We have already seen that Prodromus composed dramas. The most voluminous writer in this department is Manuel Philes of Ephesus, who flourished from about 1280 to 1330, and who himself probably acted on the stage. His dramas are occupied with the exhibition of the great deeds of his patrons, or resemble in some respects our Moralities, making characters of the various virtues.

Hymns. The Byzantine period produced a considerable number of hymn writers. Among them may be mentioned Germanus, who was patriarch of Constantinople in the reign of Leo the Isaurian; Theodorus Studites, a theologian of some mark (759–826); the emperors Constantine Porphyrogenitus and Leo the king; and Photius, patriarch of Constantinople. The hymn writers who stand highest are Cosmas, who flourished in the 8th century, and whom W. Christ calls "princeps melodorum Græcorum"; Joannes Damascenus, a contemporary of Cosmas; and Theophanes ὁ Γραπτός, who lived nearly a hundred years after Cosmas (see *Anthologia Græca Carminum Christianorum adornaverunt W. Christ et M. Paranikas*, Leipsic, 1871).

Anthology. The Byzantines occupied themselves with collections of poems, but the works of Cephalas and Planudes Maximus of this nature have already been discussed in the article ANTHOLOGY.

Prose writings. When we pass from poetry to prose we meet with the same want of creative power. The Byzantines collect the writings of others and annotate, but they give us no original works. They performed two services to literature. They handed down the forms of literary expression, and by their indefatigable energy in excerpting and embodying in their own works the works of others, they have preserved for us many valuable documents of antiquity, or at least portions of them. During the Byzantine period there were also various phases of literary life. After the death of Justinian literary activity became gradually less, until in the time of the Iconoclasts intellectual culture was repressed, manuscripts were destroyed, and literature fell into disrepute and neglect. A revival took place under the Macedonian dynasty, but when the Latin empire was established in Constantinople, a relapse into semi-barbarism again took place. Under the Palæologi the literary spirit once more came to life. Amidst these changes it was impossible for a vigorous creative literature to flourish, and the bright periods are mainly characterized by efforts to destroy the effects of the previous dark era by gathering together all kinds of information. Hence arose the compilations of Porphyrogenitus that have been already mentioned, and similar attempts were made at similar periods.

Several of the Byzantines attained to high eminence in the cultivation of science, but sometimes their exertions took a fruitless direction, especially when they aimed at discovering the method of converting the baser metals into gold. It is in the study of grammar, in the production of lexicons and the annotation of the classical writers, that their best men have gained for themselves a name. The works of the writers on these subjects are of no interest to the common reader, but they furnish the scholar with many attractive problems. Who were the authors from whom the Byzantines borrowed? How far are their works interpolated? How far are the original authorities mutilated? These and such like inquiries crop up in connexion with almost every one of these writings. The writers who are best known as contributing to our knowledge of the ancients are Tzetzes, Eustathius, Moschopulus, Thomas Magister, Joannes Pediasimus, and Demetrius Triclinius. Tzetzes (probably the same word as Cæcius) lived in Constantinople about the year 1180. His *Chiliades* have been already mentioned. He wrote notes on Homer, Hesiod, and Æschylus, but he was especially copious on Aristophanes.

Commentators. Eustathius is well known to scholars for an elaborate commentary on Homer. He was brought up in Constantinople, and in 1160 became archbishop of Thessalonica and in 1174 archbishop of Myra in Lycia. Besides his labours on Homer he wrote many theological and several historical works. Manuel Moschopulus belonged to the 13th century. He wrote many works on different points of grammar, and scholia on Pindar, the Tragedians, and Theocritus. Thomas Magister of Thessalonica flourished in the reign of Andronicus II. (1283–1332), and composed articles on ancient literary history, and scholia on Æschylus and other Greek writers. Joannes Pediasimus, who lived towards the end of the 14th century, is best known by his scholia on Hesiod; and Triclinius, who taught grammar in Constantinople at the same period, wrote scholia on Hesiod, Pindar, and the Tragedians. Nothing can exceed the stupidity of these writers and their fellow scholiasts of the Byzantine era. They misunderstand the acute remarks of their Alexandrian predecessors or bury them in verbiage. They are utterly uncritical in their discussion of historical questions; they are continually going wrong in their grammatical expositions; and they are passionately fond of nonsense. Perhaps nowhere, to take one instance, in the whole of literature could wilder etymologies be found in greater numbers than in the scholia on the *Plutus* of Aristophanes. Yet these men thought highly of their work, and Triclinius tells us, in regard to a trivial book which he wrote on metres, that he accomplished the task only through divine inspiration. Notwithstanding this, they have preserved for us within the quantities of rubbish many valuable facts and expositions derived from earlier writers.

Grammar. Ignatius, deacon in the reign of Michael II. (820–829), Gregorius, archbishop of Corinth in the second half of the 12th century, Holobolus, in the reign of Michael VIII., and Joannes Glycas, patriarch of Constantinople in 1316, are the principal writers on grammar. Of these Gregorius is best known, for his work on the Greek dialects, though full of mistakes, has deservedly attracted the attention of scholars.

Lexicons. Of the writers of lexicons Suidas is the best known. He flourished in the 10th century. His work contains not only explanations of words but biographies of men. It is an undigested mass of statements which are often contradictory, but is of great value, for he has incorporated facts and expositions from early writers possessed of accurate knowledge. A full account of Suidas, and a discussion of all the questions connected with him, are given by Bernhardy in the prolegomena to his edition of the *Lexicon*. The *Etymologicum Magnum* is another important work of the Byzantine period, having been compiled in the 11th century. The appellation *magnum* or *μέγα* does not belong to it originally, but was added by Musurus, its first editor, or Calliergis, its first printer. Gaisford in his edition has discussed this and other matters concerning the *Etymologicum*. A much smaller work by Philemon is a *Technological Dictionary*, written in the second half of the 12th century. Among the lexicon-writers is Photius, who was patriarch of Constantinople, and died in an Armenian convent about the year 891. Photius was a man of marked individuality, and his history is mixed up with that of his country. A more detailed account of him will therefore be found in a separate article. Porson prepared an edition of the *Lexicon*, which was published after his death by Dobree. The Leipsic edition contains a review by Blomfield (*Edin. Rev.*, xlii., 1813) of Hermann's edition of Photius, in which the English reader will find a full discussion of the sources and value of the *Lexicon*. Photius also prepared a work generally called *Photii Bibliotheca*, containing extracts and notices of 280 books which he read while acting as ambassador in Syria. The nature of this work awaits more minute investigation than it has yet received; but there can scarcely be a doubt that some of the articles are the productions of a dishonest man, or of a late interpolator, or of both. His *Letters*, recently edited by Valettas, are of great importance for a knowledge of the times.

Music and metre.

Several scholars of the Byzantine period wrote on the music and metres of the ancients. Their works abound in errors, but they preserve fragments of earlier writers which are interesting and valuable. The work of Psellus the younger, called Σύνταγμα εἰς τὰς τέσσαρας μαθηματικὰς ἐπιστήμας, contains large fragments of Aristoxenus (Westphal, *Fragmente der Rhythmiker*, supplement to the first volume of his *Metrik*); and Manuel Bryennius (about the year 1320) wrote three books on harmonics, which contain among other things an exposition of the later Byzantine musical system (see Westphal, *Metrik*, vol. i. p. 319).

Rhetoric.

Of the rhetoricians only a very few deserve mention. Joannes Doxopater, who flourished in the reign of Alexius I., Comnenus (1081–1118), wrote several works of a rhetorical nature, which are to be found in Walz's *Rhetores Græci*. All that can be said of them is that they prove that he was a man of culture and refinement, and did not deserve the neglect and poverty which fell to his lot. A cluster of rhetoricians appeared in the reigns of Michael VIII. and Andronicus II., of whom the principal were Georgius of Cyprus, Nicephorus Chumnus, and Theodorus of Hyrtace. The emperor Manuel II., Palæologus, wrote several works of the nature of essays, and a large number of letters, several of which were addressed to Demetrius Cydones of Thessalonica, the author of a treatise on the *Contempt of Death* which has attracted some attention.

Philosophy.

The study of philosophy was, generally speaking, neglected, but there were some who acquired renown as philosophers. Foremost amongst these was Michael Psellus the younger. He was born about the year 1018, and died shortly after the year 1105, after a chequered career. He was called by the men of his own age "Chief of Philosophers." His works range over the entire field of human learning. He wrote on the sciences, mathematical, physical, medical, on grammar and metres and music, on the doctrines of Plato and Aristotle, on psychology and dialectic; and very recently Sathas has edited a work of his called *A Century of Byzantine History*, which entitles him to a place among historians, a series of his letters which throw much light on the life of the Byzantines, and various discourses, panegyric and funereal. He lost the favour of the court and was supplanted by Joannes Italus, who also succeeded to the title of "Chief of Philosophers." Several of his scholars attained distinction as authors, or rather compilers, of commentaries on the Greek philosophers.

Theology.

The theologians were to a large extent philosophers. The most famous among them was John of Damascus, who lived in the reign of Leo the Isaurian (718–741). He wrote on a great variety of subjects, theological and philosophical. The work by which he is best known is his *Sacra Parallela*, in which he has collected numerous passages from the writings of the fathers on such topics as repentance, faith, &c. The work is valuable as containing fragments of works which are not now extant. Alzog calls Damascenus the last of the Greek theologians. In subsequent times few appear worthy of attention, and it may suffice here to mention Nicephorus Callistus, "the Ecclesiastical Thucydides," who lived in the 14th century. He compiled an *Ecclesiastical History* from Eusebius, Socrates, Sozomenus, and the other earlier ecclesiastical historians, endeavouring at the same time to make his style more elegant than that of his predecessors.

Fiction.

We find almost no attempt at light literature in prose during the Byzantine period. Only one work has come down to us of this nature, *The Loves of Hysmine and Hysminias*, by Eustathius the Macrembolite. Hilberg, the last editor of the work, has tried to show with some success that Eustathius lived some time between 852 and 988. The work is full of imitations, and displays no inventive power.

A very full account is given of most of the writers here mentioned, with lists of their works edited and unedited, in the later volumes of the *Bibliotheca Græca* of Johannes Albertus Fabricius, edited by Harles (Hamburg, in 12 vols., 1790–1809); see also Cave, *Scriptorum Ecclesiasticorum Historia Literaria*; Gibbon, *Decline and Fall of the Roman Empire*; Müller and Donaldson's *History of Greek Literature*, 1858; Fr. R. Nicolai, *Griechische Literaturgeschichte*, vol. iii., 1876. Many of the works of the Byzantine writers are found only in ἀνέκδοτα, especially those of Villoison, Boissonade, Cramer, Bekker, and Sathas, and often these editors investigate the history of the writers. Sathas has thrown much new light on the life of Psellus. (J. D.)

SECTION III.—MODERN GREEK LITERATURE.

Peculiar nature of modern Greek literature.

In narrating the history of modern Greek literature several difficulties of a peculiar nature present themselves which do not emerge in an account of the literature of previous periods. The literature is no longer homogeneous, and we have to answer for ourselves the question whether we are to record the literary efforts made by Greeks or the literary efforts made in Greek. If we adopt the first course, we have to take notice of books written in Italian, French, German, and English, as well as in Greek, for the Greeks like the Jews were, during the three centuries of Turkish domination, a dispersed people. They found refuge far away from their native land; they spoke the languages of strange peoples, and, when they published books, frequently used these languages. Few, however, forgot their native tongue, and there are consequently very few authors who, however copiously they may have written in the languages of the countries in which they settled, did not leave at least one work written in Greek. Even since the kingdom of Greece has been established, many of her most distinguished men have written some of their best works in French, German, or English, in order to obtain a wider audience than they could expect if they had used modern Greek.

Works in the ancient language.

We have to divide even those who used Greek into two classes,—those who used the ancient language and those who used the modern, though many have used both forms. The ancient language was still the literary language at the time of the capture of Constantinople, and the use of it as a vehicle of literature has been handed down in unbroken tradition to the present day. This has been specially the case with ecclesiastical writers. The church service is in ancient Greek. The New Testament is still read in the original language in Greek churches. The learned priests were familiar with the ancient language, and in learned treatises felt bound by a firmly impressed tradition to use only the language which the great fathers of the church had used. Cultivated Greeks in all lands still continued to make verses in imitation of the ancients. A change took place when Greece revived in the 19th century. All the great writers felt that it was pedantic to adopt many of the old forms of inflexion and construction,—that, in one word, the ancient language was not fitted to be the vehicle of modern civilization. They therefore resolved to adapt it, to omit what might fetter the full and free expression of modern thought, but to retain at the same time the body and substance of the language. And hence arose a form of the language which is practically identical with the ancient, but transfused with modern ideas, and fitted for the clear and rapid expression of modern literature. The influence of the ancient language on the modern is manifest in every part of it. And it could not be otherwise. Education is spread over every corner of free Greece. But in education the Greek child does not learn the grammar of the modern language but of the ancient. He often reads ancient books, and every cultivated Greek becomes as familiar with Xenophon and Plutarch as an Englishman is with Shakespeare and Milton.

The modern language.

Before entering on the history of modern Greek literature, it is necessary to trace the modern language through its various stages. Historians of the Greek language acknowledge that alongside of the literary language there existed a conversational, which must have varied in different localities. We have the clearest traces of this language in the New Testament, as noticed under GREEK LANGUAGE, p. [illegible], and some ecclesiastical writers of a later date bear equally unmistakable indications of it. The *Pastor of Hermas* is specially marked by such features, and the form of it given in the *Codex Sinaiticus* is as far advanced towards the modern as we find in several works of the 12th century written in the popular language. Very distinct approximations to the modern forms are also to be found in some of the apocryphal gospels, and in the *Testaments of the Twelve Patriarchs*, but especially in the *Apocryphal Acts* and *Apocalypses* published by Tischendorf. All these writings tend to show that it is impossible to fix on any period when the modern language may be said to be definitely formed. It grew out of the conversational language of earlier times. Till very recently some poems of Theodorus Prodromus (often called Ptochoprodromus) were supposed to be the earliest distinct specimens of the modern language; but recent researches among the libraries have brought to light the fact that between the 10th and 15th centuries various works were produced in the modern form of the language. These researches are not yet concluded, and any results that are attained must be deemed merely provisional. The work which is now regarded as the earliest specimen of the new form is the *Exploits of Basilius Digenis Acritas*, written according to Legrand in the second half of the 10th century. The writer of this work unquestionably knew classical Greek well, and most of the lines would be perfectly intelligible to every scholar. But now and then words and constructions purely modern intervene. Yet there is a wide and marked difference between the language of this poem and that of the two poems of Prodromus, belonging to the 12th century, published by Corais; or the three more recently discovered by E. Miller, and published by him in his *Mélanges*, and subsequently by Legrand. In every line of these the scholar comes upon forms which are quite strange.

Earliest modern Greek works.

The difference will be best appreciated if we quote some lines from each of the writers. We take a passage from the *Digenis*, which contains more than the usual number of modern peculiarities.

Καὶ γὰρ [illegible] εἶδε ταῦτα
[illegible] τοῦ
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Here the accent of [illegible], τα for αὐτά, [illegible] signifying when, 's for εἰς, [illegible] from [illegible] and [illegible] for [illegible], are the usual peculiarities, and none of them need puzzle the scholar. As a contrast we take a few lines from one of the poems of Prodromus published by Miller.

Ὥρμησα τάχατε κἀγὼ τὸ [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

The lines are thus translated by Miller:—"Et moi aussi, j'ai changé de [illegible]." After the fall of Constantinople some of the learned Greeks took an interest in the popular form of the language, and one of them, [illegible], composed a grammar in the first half of the 16th century, which Legrand has published, along with a translation by the same scholar of Plutarch's treatise *On the Education of the Young*, into modern Greek. This grammar proves that the popular form of Greek was by that time fully developed, and it might still be taken as a good exposition of the ordinary spoken language of illiterate Greeks. Of course there were great varieties in this popular form. Almost every small district and every island had inflexions, constructions, and words peculiar to themselves. Kavasilas wrote to Martin Crusius in the end of the 16th century that there were upwards of seventy modern dialects, of which that of the Athenians was the worst. But however many dialects there may have been, there is no reason to suppose that the difference was such as to prevent a Greek residing in one part of Greece from understanding a Greek residing in any other part. Since that time changes have taken place in the popular forms. Turkish words were introduced to a larger extent, but the language has remained substantially the same. There are indeed still a considerable variety of forms in the different districts, and one of the most amusing of modern Greek comedies, Ἡ Βαβυλωνία ἢ ἡ κατὰ τόπους διαφθορὰ τῆς Ἑλληνικῆς γλώσσης, by D. K. Byzantios, is based upon the different dialects spoken by the Greek of Asia Minor and the Peloponnesian, the Chian, Cretan, and Cypriote, the Albanian and Heptanesian. This language is no longer the language of cultivated Greek society, of literature, or of science. When Greece was stirred with new life, no question agitated the patriotic Greeks more intensely than that of the form which the language should take. Some, led by Chrysopoulos, maintained that the popular language was really ancient, that it was a mixture of Æolic and Doric, and that it ought therefore to be retained. Others, with Œconomos as their champion, were for adopting the classical language with a few slight modifications which could claim the sanction of some of the best Byzantine writers. A third party, headed by Corais, were for steering a middle course, and they have ultimately triumphed. Colonel Leake has well described the present language. "This style," he says, "may with tolerable accuracy be defined to consist in Hellenic words, arranged in the syntax of modern Europe, with a grammar partly Hellenic and partly modern. Inversions and transpositions occur with almost the same degree of frequency as in Italian, and the arrangement in general is not much more complex than that of our own language" (*Researches*, p. 54). We extract a specimen of it from the sixth volume or "Epilogos" of the *History of Greece* by Paparrhegopoulos.

Neo-Hellenic.

Ὅτε τῷ 17[illegible] τρεῖς τοῦ [illegible] εἰς τὴν μεγάλην Αἰκατερίναν [illegible] αὐτῆς Κωνσταντῖνον [illegible] ὡς Ῥωμαῖοι ἢ καὶ ἁπλῶς [illegible], ἀλλὰ ὡς Ἕλληνες καὶ ἀπόγονοι τῶν Ἀθηναίων καὶ τῶν [illegible].

In this sentence all the words are ancient. Two of them are contracted, νὰ for ἵνα and 'ς for εἰς, and some have had their meanings modified. The remarks of Paparrhegopoulos relate to a subject which demands a brief notice. The Greeks at the time of the capture of Constantinople were proud of being Ῥωμαῖοι or Romans, and the term included all the Christians who formed the subjects of the Greek empire. Hence the term Romaic was the name given to the popular language. But during all the period of the Turkish domination the Greeks occasionally spoke of themselves as [illegible] and Ἕλληνες, and when the period of revival came, they cast off the old name of [illegible] and [illegible], and spoke only of [illegible] and [illegible]. Accordingly the Greek language is now spoken of as the Hellenic tongue. When it is necessary to distinguish the modern from the ancient, the language of cultivated men is called Neo-Hellenic, [illegible], and the popular form is styled [illegible] (see especially Dr Clyde's *Romaic and Modern Greek*, Edin. 1855).

[illegible]

In narrating the history of this literature, we have at the earliest stage to treat separately those who used the classical language and those who used the vulgar. In both cases we cannot draw a fast line at the date of the fall of Constantinople, for, though that event is of great importance in the history of the Greeks as a people, it does not constitute a turning point in their literary history. It is often imagined that the dispersion of the Greeks in 1453 stood in close connexion with the revival of literature in Western Europe. But the fact is that the Greeks had come into contact with the Westerns long before, and their influence had become [illegible] before the Turks seized the capital of the Greek empire. The crusades had brought Greeks and Latins together. The Latin empire in Constantinople had made the contact still more frequent. Greeks and Latins had entered into keen discussion on the truth of the dogmas in regard to which they differed. Some of the Greeks had become converts to Roman Catholicism, or at least desired the union of the Eastern and Western Churches. In these circumstances they often left their native land to seek preferment in the church in which they could labour with greater sympathy. Many of them also had become connected by marriage or other ties with the Italian nobles who ruled in the Ægean, and circumstances led them to settle in Italy. Of the Greeks who thus found their way to the West before the taking of Constantinople, the most prominent were Leon or Leontios Pilates, Georgios Gemistos Plethon, Manuel and John Chrysoloras, Theodoros Gazis, Georgios Trapezuntios, and Cardinal Bessarion. Hody has given a full account of most of these men in his work *De Græcis illustribus Linguæ Græcæ Literarumque Humaniorum Instauratoribus* (London, 1742). Pilates was a native of Thessalonica and a pupil of Barlaam, a Calabrian monk who taught Petrarch Greek. Pilates himself taught Boccaccio his native language, and expounded Homer in Florence. He died in [illegible]. Gemistos was a native of Lacedæmon. He taught in Constantinople, Athens, and Florence, and had in all places a large number of pupils who eagerly imbibed his Platonic teachings. His works were numerous, but most of them still lie hid in the great libraries of Europe unpublished. Manuel Chrysoloras was one of the pupils of Gemistos, and is famous as the translator of Homer and Plato. Both he and his brother John had many illustrious men as their pupils in Greek. Manuel taught in Milan, Venice, Padua, and Rome. He has the merit of composing the first Greek grammar that appeared in the West (*Erotemata*), published for the first time in Venice (1484). He made his first visit to Italy in 1393 in the capacity of ambassador from the Greek emperor to seek aid against the Turks, and he returned to Italy on the accomplishment of his mission that he might spread the knowledge of Greek literature. He was sent as deputy to the council of Constance, and he died in Italy in 1415. Theodoros Gazis, a native of Thessalonica, fled from his native place in 1430, and became a teacher of Greek in Ferrara, Rome, and Florence. He prepared a Greek grammar in four books (first published in Venice 1495), which continued for a long time to be a text-book in Greece and other countries. He translated many of the classical writers, and wrote on the ancient history of the Turks and on theological subjects. He died in 1478 in Calabria, where he had settled in his old age. Georgios Trapezuntios was born in Crete in 1396. He received the appellation of Trapezuntios because his family had come from Trebizond. A Venetian noble took him to Venice to teach Greek in 1428. He removed to Rome in 1440, where he remained till 1450, at first highly honoured, but subsequently, through the bitterness of his temper, falling into disgrace. After that he led a wandering and miserable life, and died in 1486. He translated many of the Greek writers into Latin and wrote a treatise in which he compared Plato with Aristotle. Cardinal Bessarion was a native of Trebizond. He received his education in Constantinople. In 1425 he went to the Peloponnesus to hear Gemistos expound the philosophy of Plato. In 1439 he removed to Italy, after he had been made archbishop of Nicæa, because the Greeks bitterly resented his attachment to the party which saw no difficulty in a union between the Western and Eastern Churches. He rose to great honour in the West, obtaining the cardinal's hat. He died in Ravenna in 1472. He was passionately attached to the classical literature of his country, and took a profound interest in the education of his fellow-countrymen. He aided in the most liberal manner all the men of ability who came from Greece. He made a large collection of manuscripts. He translated portions of Xenophon, Aristotle, Theophrastus, and other Greek writers, and he wrote on the theological questions of the day.

The Greeks after the fall of Constantinople.

The Greeks who were most prominent in spreading a knowledge of Greek in Europe after the fall of Constantinople are Joannes Argyropoulos, Demetrios Chalcocondyles, Constantine and John Lascaris, and Marcus Musuros. Argyropoulos was a native of Constantinople, and there taught Constantine Lascaris. In the West he taught at various times in Padua (1434), Florence (1456), and Rome (1471), and had amongst his scholars Angelus Politianus and Reuchlin. He translated many of the works of Aristotle. Chalcocondyles was a native of Athens and became teacher of Greek in Florence in 1471; after some time he removed to Milan, where he died in 1511. He edited very many of the Greek authors. Constantine Lascaris, descended from a noble Bithynian family, taught Greek in various Italian cities, and finally settled in Sicily, where he died about 1500. He wrote a large number of works, most of them still unpublished. His best known work is his *Grammar*. He also transcribed manuscripts, and made a large collection of them. His name is well known to modern readers through the romance of Villemain (*Lascaris ou les Grecs du XV^me siècle*). John was probably the younger brother of Constantine. He was principally employed in collecting manuscripts for the great men of the day, wrote several works, and edited several Greek books for the first time. He died at Rome in 1535.

Almost all these men were rather employed about literature than engaged in producing it. They taught Greek; several of them wrote Greek grammars; they transcribed and edited Greek classical writers; and they collected manuscripts. Bessarion laid the foundation of the library of St Mark in Venice. The collections of Constantine Lascaris formed the nucleus of the Escorial library; John Lascaris and his pupil Budæus gathered the first stores for the national library in Paris; and Pope Nicholas V. employed the services of Bessarion, Gazis, and C. Lascaris in establishing the Vatican library. But almost none of these men accomplished much in literature strictly so-called. The question which most deeply interested them was the philosophy of Plato and Aristotle. Somehow or other the championship of Plato was undertaken by those Greeks who eagerly desired the union of the Greek and Latin churches, and the philosophy of Aristotle was upheld by the opposite party. Gennadios, whom Mahomet II. appointed as patriarch of Constantinople after the capture of the city, showed himself a keen partisan of the Stagirite, and hurled his thunderbolts against the Platonists. Gemistos Plethon was the chief defender of the Platonic philosophy, and received unmeasured abuse from George of Trebizond for his heterodox opinions. The works on these subjects were numerous, but beyond these theological questions (for they were theological rather than philosophical) there is not much. Scholarship continued to survive in Greece or among the Greeks for a long time after the

Turks began to rule in Greece, and a considerable list might be adduced, including the names of Apostolios, whose collection of Greek Proverbs is well known to scholars, and his son Arsenius, metropolitan of Monemvasia. Among the few who still used the Greek language for literary purposes Leo Allatius is prominent. His Greek verses show skill and cleverness. Mention also should be made of Constantine Rhodocanakis, honorary physician to Charles II. of England. He wrote verses on the return of Charles to England not without merit (see a very curious life of C. Rhodocanakis published in Athens, 1872).

Early works in modern Greek. Romantic poems.

We now return to the literature in the modern language, and here again we have to go back several centuries before the fall of Constantinople. We have already seen that the earliest production is the *Exploits of Digenis Acritas*, so called because he was the son of a Turk and a Greek, and because he spent a large portion of his time in watching the frontiers. There is reason to believe that his adventures formed the subject of poems in many parts of Greece. Some have called him a Cyprian Hercules, and believe him a kind of mythological character, while others regard him as a genuinely historical personage. The poem published by Legrand describing his adventures is imperfect. Many of the incidents are of a purely romantic nature. From the 12th to the 16th century many poems were composed in the popular language. Our knowledge of these works is still incomplete. Several of them lie hidden in the great libraries of Europe; but much is now doing to increase our knowledge. Many have been already published in the collections of Mavrophrydis, Sathas (ἀνέκδοτα), Wagner (*Carmina Medii Ævi*), and especially Legrand. They all breathe the spirit of chivalry, and are full of romantic adventures and tales of love. M. Gidel has the special merit of drawing attention to these poems in his *Études sur la Littérature Grecque Moderne* (Paris, 1866), and he has gone further into the subject in his *Nouvelles Études sur la Littérature Grecque Moderne* (Paris, 1878). He has proved that the romances which delighted the knights of France and Italy found their way probably through the Genoese and Venetians and some French families into Greece, especially into the islands. The Greek minstrels took them and adapted them for their Greek audiences. He has given an analysis of the various poems and compared them with the Western forms. The most important in modern Greek are "The Old Knight" (12th century), a tale of the Round Table; "The Story of Belthander and Chrysantza" (probably 12th century); "The Loves of Lybistros and Rhodamne" (probably 12th century); "The War of Troy," taken from the *Guerre de Troie* of Benoit de Sainte More, who wrote in the second half of the 12th century (the Greek translation was made some time before the fall of Constantinople); "Flore and Blanchefleur"; and the "History of Imberios and Margarona." There are various other poems belonging to this period of a different character, such as the "Oracles" of Leo the Wise, imitations of *Reineke Fuchs*, and "Physiologus." The history of Alexander the Great was a favourite theme, and there is a Greek version of Apollonius of Tyre. We do not know the authors of any of these poems. But about the time of the fall of Constantinople we meet with the names of some versifiers. Paraspondylus Zoticos described the battle of Varna (1444) in verse, and from the poem we gather that he was present at it. We have three poems written by Georgios Limenitas (1450-1500), one "On the Deeds of the great Commander of the Romans, Belisarius," another "On the Plague in Rhodes," which took place in 1498; and a third, "A Complaint on the Fall of Constantinople." Some have been inclined to think that the last cannot be the work of Georgilas. From an examination of the poems of Georgilas and from other phenomena, Corais, in the prolegomena to the second volume of the Ἄτακτα, came to the conclusion that rhyme was unknown to Greek poems before the fall of Constantinople, and had become established as a feature of them when Georgilas wrote on the Rhodian plague. Gidel has accepted this as giving a clue to the dates of Greek poems. A third versifier was Jacobos Trivolis of Corfu, who lived in the beginning of the 16th century. He wrote the history of Tagiapiera, a Venetian noble, and the history of the king of Scotland and the queen of England, a tale taken from Boccaccio. Almost none of these poems have poetical merit; but they are interesting as specimens of the popular language, and curious as throwing light on the manners and thoughts of the Greeks of those days.

Historical poems

From the earliest times the Greeks were in the habit of putting into verse any remarkable occurrence that stirred their feelings. Crusius tells us that in his time Greeks, especially on the islands, contended with each other in repeating or extemporizing verses, and the custom has remained down to the present day. Accordingly the Greek popular poetry is rich in historical subjects: we have already noticed the poems on the battle of Varna and on the taking of Constantinople. There is also a chronicle of the conquest of the Morea (given by Ellissen in his *Analekten*). There are several lamentations over the fall of Constantinople. And the klephtic ballads relate real adventures. Almost every leader in the war of independence had his song in his honour. Some have thought that the largest portion of the ballad poetry of the Greeks is recent; but Legrand's collection lately published shows that some of them belong to very early times, being edited from a manuscript of the 16th century. There are two or three famous historical poems connected with the islands. Especially noteworthy is one on the exploits of Mercurios Bous by Coronæos.

Early popular poems.

There are three poems belonging to the 16th and 17th centuries which have obtained wide popularity among the Greeks. The first is the *Erotocritos*, the epic poem of modern Greece, of about 11,400 lines. Of its author Vincenzo Cornaro, a Cretan, we know almost nothing, but it is probable that he belonged to a noble Venetian family and lived in the middle or towards the end of the 16th century. The tale is one of two lovers who, after many trials of their fidelity to each other, are at last united and blessed. There is genuine poetry in the work. Many of the scenes are charming, and, as M. Gidel remarks, there is not a single situation which shocks propriety nor a single sentiment which is not modest and of rare purity. The second poem is a drama called *Erophile*, and its theme is the love of Panaretos and Erophile. The author of it was Georgios Chortakis, who was brought up in Rhethymnos, a Cretan town, and lived towards the end of the 16th and beginning of the 17th century. It was thought to be nearly the only drama of this period; but Sathas has brought to light the fact that there was a considerable number of them, and he has already published three, *Zeno*, *Stathes*, and *Gyparis*, in addition to the *Erophile*. Some of them are translations, and all of them are closely connected with Italian dramas of the same period. The *Erophile* has interludes to each act, dealing with an entirely different theme, and most probably written by a different author. The third poem, *The Shepherdess*, is a charming idyll written by Nicolaos Demetrios, a native of Apocorone in Crete, who lived in the beginning of the 17th century.

Early prose works.

There are few prose productions of any importance belonging to the early period of modern Greek literature. Chronicles and other works written by Malaxos, Zygomalas, and Cartanos. Sathas has more recently brought to light a number of chronicles, such as those in the second volume of his *Bibliotheca Græca Medii Ævi*, that relate the history of Cyprus, Leontios Machaira, in the beginning of the 15th century, and Georgios Boustronios, whose narrative extends from 1456 to 1501. His sixth volume contains curious documents (the assizes of Cyprus, Cretan wills, &c.), which afford insight into the forms of modern Greek prevalent among the Cypriotes and Cretans, though a considerable number of them are written in classical Greek. Miklosich and Müller have made a similar collection of documents, *Acta et Diplomata Græca Medii Ævi*. Even in the 18th century we find the classical language used much more frequently than the modern. Meletios, the man whose name stands most prominent in this period, wrote his *Ecclesiastical History from the time of Christ to the year* 1700 in ancient Greek, and his werk had to be translated into modern Greek to give it currency among the masses. Another ecclesiastical history by Sergios Makraios, given in the collection of Sathas (from 1750 to 1800), is written in the same language, and we find some writers like Caisarios Dapoute and Meletios using sometimes the ancient and sometimes the modern form. We have almost no attempts at elegant literature in the modern Greek prose of this period. But it is possible that manuscripts containing such works may be hid among private family documents. One has recently been edited by Innocente Damaria (Turin, 1872), *The Loves of Erogeios and Erasmia*, by Holophilos, which was most probably written between the 12th and 15th centuries, but which might have been written by any one of the Scriptores Erotici, as the language discloses modern forms only in one or two sentences.

Literature of the 18th century.

In the 18th century a revival of enthusiasm for education and literature took place among the Greeks. Schools were established in every important Greek city, school books and translations from Continental languages poured forth from the presses of Venice, Trieste, Vienna, and other places where the Greeks had influence. The leaders in this movement were Eugenios Bulgaris, Nikephoros Theotokis, and Adamantios Corais. The first two, both natives of Corfu, were devout adherents of the Greek Orthodox Church, warm partisans of Russia, and both became archbishops in the Russo-Greek Church. They were true but narrow patriots. They wrote much in defence of Greek orthodoxy as against Latin heresy. Bulgaris also wrote on philosophy and Theotokis on physics, and the latter prepared or translated educational treatises on physics, mathematics, and geography. Far before these stands Adamantios Corais, who was above everything a Greek of widest aim and of the greatest culture. He was born in Smyrna in April 1748. He studied nearly every branch of learning, medicine, theology, and literature, in the universities of Italy and France, and then devoted his life to the resuscitation of his country from ignorance and servitude. He edited a very great number of the classical writers, with admirable critical notes, and generally with prolegomena, which tried to awaken the interest of his countrymen in their past glories, and strove to rouse them to emulate their ancestors. He also devoted his attention to the modern language, especially in his Ἄτακτα, discussed the writings which had appeared in it, prepared a provisional dictionary of it, and determined the mode in which the popular dialect might become the basis of a literary language.

Modern era

From the time of Corais we may date a new era in the history of the literature. Henceforth the works become exceedingly numerous, and efforts are made in every direction of literary activity. Perhaps no nation now produces so much literature in proportion to its numbers. The Greeks seem restless in their desire to give expression to their thoughts. They have indeed great difficulties to contend with in the way of publishing. The number of readers is necessarily small owing to the smallness of the nation. To take an instance, one of their most important periodicals, the Ἀθήναιον, containing articles on archæology and literary history, which should be known to all scholars, had not more than 150 subscribers in 1876, as we are informed in the preface; 600 copies were published, of which 100 were sent by the university of Athens to the various libraries in Europe and America, 150 were distributed free, and only 150 were subscribed and paid for. The number of subscribers had not increased in August 1879. In these circumstances many rich Greeks have come nobly forward and published books at their own expense; and much credit is due to the Zosimades, the Ralli, and the other Greeks who have served their country in this way. Very frequently scholars produce their best works for periodicals or even newspapers; and some most valuable treatises have been published as supplements to Greek periodicals. Translations of many of the best French novels have also been given away with these periodicals, and occasionally some of our most esteemed English writers have been thus made known to the Greeks; for instance, a translation of the *Bride of Lammermoor* was published by the editors of the *Pandora*. These circumstances, while impeding the production of Greek books, also tend to prevent foreigners from knowing exactly what the Greeks have done. Another circumstance that marks this period deserves notice. Almost every literary man of eminence makes efforts in every literary direction. Theologians, scholars, physicians, are all found in the list of poets. The same persons write school-books, histories, dramas, lyrics, and novels. It would be impossible to give even a notion of this endless activity. All that can be done is to point out a few of the principal writers.

Poetry.

In the early part of this period two poets claim our notice, Rhegas of Velestino in Thessaly, and Christopoulos. Rhegas was the poet of liberty, and his great war song, Δεῦτε παῖδες τῶν Ἑλλήνων, is well known to English readers through Byron's translation. He wrote many songs or hymns calculated to rouse his fellow-countrymen, but acting rashly he was seized and shot at Belgrade in 1798 at the age of forty-four. Christopoulos was born in Macedonia in 1770, and died in 1847. He devoted himself to songs of love and wine, and many of his anacreontics are melodious, graceful, and charming. Somewhat later than Christopoulos comes Jacobos Rizos Neroulos, who was born in Constantinople in 1778, and died in 1850. Neroulos wrote lyrics, tragedies, and comedies with considerable success, but his best known book is a work published at Geneva in French in 1826—*Cours de la littérature Grecque moderne*—and admirably translated into modern Greek by Miss Olympia Abbot of Thessalonica. It is an interesting account of modern Greek literature up to the time at which the lectures were delivered, and is written in a bright and forcible style. It is perhaps rather too favourable to the phanariots, to whom Neroulos himself belonged, but it is an honest defence; and it has to be remembered, on the other hand, that he lashed the vices of the phanariots with great boldness in his comedies. From these writers we pass to the era of the independence of Greece. During this last period three writers have appeared who have established for themselves a permanent place in the history of mankind as men of true genius, Panagiotis Sontsos, Alexander Sontsos, and Alexander Rizos Rangabé. Panagiotis and Alexander Sontsos were brothers, and belonged to the phanariots. They were born in Constantinople in the first quarter of this century, and were educated first in Chios and then in the universities of Italy and France. They threw all their energies into the war for independence, and sang of its glories. But they conceived a determined dislike to Capodistrias. They were still more bitter against Otho, and, adopting extreme opinions and always discontented, they fell out of sympathy with their fellow-countrymen. Panagiotis received high posts of

Sontsos

honour at the end of the war of independence, and Alexander was offered great literary distinctions; but the unmitigated abuse and contempt which they both, but especially Alexander, heaped on all men in authority rendered absence from their country a necessity. Alexander died in Smyrna in a hospital in 1863, and Panagiotis died at Athens in utter obscurity in 1868. Both tried various forms of poetry, but as nearly all critics have remarked, Panagiotis was always lyrical and Alexander continually returned to satire, whatever his subject might be. Both had a rich command of musical language, were highly ideal in their conceptions, were strongly patriotic, and possessed an ardent love of liberty. Of the two the muse of Panagiotis strove more after the sublime, but was less steady, less uniformly excellent than that of Alexander. Both were deficient in giving unity to their poems, or in forming a sustained and original plot. The plays of Panagiotis remind one of such works as Bailey's *Festus*, where there is a profusion of poetical conceptions but no coherent whole. Many passages in the works of both brothers bear a strong resemblance to lines which are to be found in the writings of poets whom they admired, especially Lamartine, Béranger, and Byron. The spirit of Byron pervades both. The principal works of Panagiotis are Ὁδοιπόρος (The Traveller), a drama in five acts, for which Byron's *Manfred* stood as model; *Μεσσίας ἢ τὰ πάθη Ἰησοῦ Χριστοῦ* (The Messiah), also a drama in five acts; and three other plays *Vlachavas*, *Caraiscakis*, and *The Unknown*, in all of which there is an utter want of character and plot, and a rich store of poetry; a novel, *Leandros*, and many lyrics, especially Ἡ Κιθάρα, first published in 1835. He tried in his later days to strike out a new style in modern Greek, but his effort was unsuccessful. Alexander's principal works are—*Πανόραμα τῆς* Ἑλλάδος, a collection of poems for the most part bitterly satirical, recently republished by Legrand at the end of his grammar; Ὁ *Περιπλανώμενος* (The Wanderer), a poem which was suggested by and contains many direct imitations of Byron's *Childe Harold*; and several comedies, *The Prodigal*, *The Premier*, *The Untamed Poet*, and *The Constitutional School*, and numerous odes and lyrical pieces. He also wrote one comico-tragic novel, Ἐξόριστος *τοῦ* 1831, or *The Banished One of* 1831.

Rangabé.

The other great poet that regenerated Greece has produced is Alexander Rizos Rangabé. He was born in Constantinople early in the century, and belonged like the Soutzos to a phanariot family. He thus describes his own career:—"A pupil of Vardalachos and Gennadios, he completed his studies at the military school and at the university of Munich. In his own country he was at first an artillery officer, then a councillor in the ministry of public instruction and also in that of the interior, professor of archaeology in the university of Athens, minister for foreign affairs, deputy, and later on representative of his country in different foreign countries." His works are of wide range. He has written a grammar of modern Greek, contributed to a dictionary and a cyclopaedia, composed a history of ancient Greece, and edited many school books. He has written an able work on ancient art, and an exceedingly valuable and scholarly work on inscriptions, *Antiquités Helléniques*. He has contributed much to the *Pandora*, the *Archaeological Journal*, and the [illegible]. He has recorded the results of his travels, and discussed mathematical problems. He has also composed several novels. And he has written a history of the literature of modern Greece, [illegible], graceful, sparkling, and full of true and sometimes trenchant criticism. It is on his poems, however, that his claims to [illegible] specially rest. In these he shows fine poetic feeling, a rare command of exquisite and harmonious language, and a singular beauty and purity of thought and sentiment. His poetical works consist of a large collection of hymns, odes, and songs; long narrative poems; ballads; four tragedies and three comedies; translations of the *Antigone* of Sophocles, and of three plays of Aristophanes.

Other poets.

Besides these three poets there is a great number of writers who have composed poetry of considerable merit, but we can only mention the names of a few,—Valaoritis, Zalacostas, Salomos, Vlachos, Cokkinakis, Carasoutsas, Tantalides, Zampelios, Orphanides, Cleon and E. Rangabé, Euphrosyne Samartsidis, and Antoniadis. Elias Tantalides, who for a long time was blind and who died a few years ago, published an interesting collection of songs, including nursery rhymes and school songs, with music (Athens, 1876). The production of poetry was much stimulated by an annual poetical contest. A sum of money was set aside for prizes, poems were sent in, judges were named, and when all was ready, a speech was delivered in the university by the convener of the judges, assigning their reasons for their decision and giving criticisms of the poems. The envelope of the successful candidate was then opened, and he received the laurel wreath with a thousand drachmas. From what is stated in the *Athenaion* of Athens for May, June, July, and August 1878, where the exposition of the contest of 1877 is given, it would seem that probably that of 1877 was to be the last. Amongst the poets of recent days special mention should be made of Chrestos A. Parmenides, who while in Manchester did much to make the works of his fellow countrymen known to Englishmen, and the best works in recent English literature to Greece. Among other things he translated Roscoe's *Life of Lorenzo de' Medici*, Byron's *Sardanapalus*, Villemain's *Lascaris*, and poems of Goldsmith, Bryant, Burns, Goethe, and Victor Hugo. He also wrote original poems of great merit, and a novel called *Ἐλγαία*. Two writers have distinguished themselves by poetic compositions in ancient Greek, Leukias and Philippos-Joannes.

Drama

The drama is a form of poetry to which the Greeks feel peculiarly prone. Rangabé gives a list of ninety writers of dramas in his *History of Modern Greek Literature*, and the list he says is incomplete. Out of these writers we may select for notice Demetrios N. Bernardakis, whose *Μαρία Δεξαπατρῆ*, "Maria, the daughter of Dexapater," with its prolegomena, has deservedly attracted much attention and been analysed by Gidel.

History

In prose there is no department of literature which is not well represented. In history the Greeks are particularly strong. Perrhaebos has described with great vigour the exploits of Suli. Tricoupis's *History of the Revolution* is a masterly work. Philemon has given the Russian side of the revolutionary movements with great earnestness; and nearly every man who took a part in the movement has handed down his recollections, or, as in the case of Colocotrones, who was illiterate, has dictated them to some one who could put them into shape. The Greeks have been particularly active in investigating the history of the Byzantine empire, of the Venetian domination, and of special localities. The history of Paparrigopoulos is especially valuable in regard to the later periods, and its style is singularly clear and flowing. Along with him should be mentioned Sakellion, Sakellarios, Sathas, Byzantios, Mustoxydes, Dragoumis, [illegible], and [illegible].

Theology

In theology, Oeconomos stands forth as the first of preachers, occupying the place which Miniatis held in [illegible] in the 17th century. Contogones is well known by his *History of Patristic Literature down to the Fourth Century*, and [illegible] by his edition of *Clemens Romanus*.

Philosophy

Brailas stands first among Greek philosophers for profoundness and originality. Along with him may be mentioned Vamvas and [illegible]. Greeks have also distinguished themselves in medicine, but very frequently they write their scientific books in French. They have also produced many treatises on law, political economy, and on mathematics and the physical sciences. Little has been accomplished in the way of original novel-writing. We have seen that Panagiotis and Alexander Soutsos and Rangabé wrote novels, and others have done so likewise, but with moderate success. One recent work, Ἡ Πάπισσα Ἰωάννα, by Rhoides, has gained considerable popularity, and is written in an attractive and vigorous style. Another novelist, Stephanos Xenos, is known to English readers by his work on the Ionian Islands called *East and West*. He is the author of a novel called the *Devil in Turkey*, and he wrote in Greek an interesting account of the Exhibition in London in 1851. Several ladies have distinguished themselves in the field of Greek literature. Especially deserving of mention is Dora d'Istria, whose work on the *Women of the West*, contributed to the *Pandora* and forming a pendant to her *Women of the East*, written in French, shows remarkable powers of research, exposition, and criticism. The Greeks, as might have been expected, have produced good editions of the classical writers. They have also done much to elucidate the archæology of their country, though most of their works on this subject are written in foreign languages. Among these works especially deserving mention are *Ancient Athens* of Pittakis, in French; the *Gravestones of the Ancient Greeks*, by Pervanoglous, in German; the *Hellenic Antiquities*, by Rangabé, in French; the *Sepulchral Inscriptions of Attica*, by Coumanoudis, in modern Greek; and *Dodona and its Ruins*, by Carapanos, in French. The works of Lambros on numismatics are of great value. The Greeks have also contributed much to a knowledge of the ancient Greek language. Asopios has gained a great name in this direction, and the contributions of Constantinos Contos are very valuable. They have also done much to collect materials for a knowledge of existing dialects. Investigations have been made into the dialects of the Tzaconians by Œconomos and Neo-Locrian by Chalkiopoulos, and lists of peculiar words and forms to be found in Cythera, Chios, Crete, Cyprus, Locris, and other places, have appeared in *Pandora* and other journals. Castorchis has written much and well on Latin literature. The Greeks have a very large number of newspapers and journals, if we consider the number of the population; but, as might be expected, their existence is precarious, and many are short lived. Translations abound in modern Greek, especially from the French, but the Greeks have also translated classical English and German works, and novels of all kinds. The translations include those of Muller and Donaldson's *History of Greek Literature* by Valettas, and Shakespeare's *Romeo and Juliet*, *Hamlet*, and *Macbeth* by Bikelas.

Law, &c.

Fiction.

Female authors.

Archæology.

Philology.

Translations.

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GREEK CHURCH, The, or more properly the Eastern Church, is both the source and background of the Western. Christianity arose in the East, and Greek was the language of the Scriptures and early services of the church, but when Latin Christianity established itself in Europe and Africa, and when the old Roman empire fell in two, and the eastern half became separate in government, interests, and ideas from the western, the term Greek or Eastern Church acquired gradually a fixed meaning. It denoted the church which included the patriarchates of Antioch, Alexandria, Jerusalem, and Constantinople, and their dependencies. The ecclesiastical division of the early church, at least within the empire, was based upon the civil. Constantine introduced a new partition of the empire into dioceses, and the church adopted a similar division. The bishop of the chief city in each diocese naturally rose to a pre-eminence, and was commonly called *exarch*—a title borrowed from the civil jurisdiction. In process of time the common title *patriarch* was restricted to the most eminent of these exarchs, and councils decided who were worthy of the dignity. The council of Nicæa recognized three patriarchs—the bishops of Rome, Alexandria, and Antioch. To these were afterwards added the bishops of Constantinople and Jerusalem. When the empire was divided, there was one patriarch in the West, the bishop of Rome, while in the East there were at first two, then four, and latterly five. This geographical fact has had a great deal to do in determining the character of the Eastern Church. It is not a despotic monarchy governed from one centre and by a monarch in whom plenitude of power resides. It is an oligarchy of patriarchs. It is based, of course, on the great body of bishops; but episcopal rule, through the various grades of metropolitan, primate, exarch, attains to sovereignty only in the five patriarchal thrones. Each patriarch is, within his diocese, what the Gallican theory makes the pope in the universal church. He is supreme, and not amenable to any of his brother patriarchs, but is within the jurisdiction of an œcumenical synod. This makes the Greek Church quite distinct in government and traditions of polity from the Western. It has ever been the policy of Rome to efface national distinctions, but under the shadow of the Eastern Church national churches have grown and flourished. Revolts against Rome have always implied a repudiation of the ruling principles of Ultramontanism; but the schismatic churches of the East have always reproduced the ecclesiastical polity of the church which they have deserted.

The Greek Church, like the Roman, soon spread out far beyond the imperial dioceses which at first fixed its boundaries, but, unlike the Roman, it did not keep for Christianity a[illegible] it had once laid hold of. What Rome Christianized, with the exception of Africa, remained Christian. The old empire was overrun by the barbarians, but the conquered empire imposed its law and its religion upon its conquerors, and pagan and heretic became in the end Catholic Christians. In the East it was otherwise. The empire maintained itself long and died hard; but its decline and fall meant not merely the overthrow of the supremacy of the emperors of the East, it meant also the destruction of civilization and the submergence of Christianity. In the West, German and Saxon, and Goth and Lombard, became Christian law-abiding peoples. In the East Arab and Kurd, the Seljuk and Ottoman Turk, remained what they were before they swarmed over the Eastern empire, and could never be taught either law or gospel. It is true that the Eastern Church more than made up for her losses by her missionary conquests, but she never conquered her conquerors, and the historian is too apt to speak of her past glories and forget her present strength. The same reason also makes it difficult to describe, with any accuracy, the extent of the Greek Church. She has shifted her position so often that to describe her extent at any one period must be misleading. The church never at any one period occupied all the territories she has possessed.

The patriarchate of Constantinople included the imperial dioceses of Pontus, Asia, Thrace, and Eastern Illyricum—*i.e.*, speaking roughly, the greater part of Asia Minor, European Turkey, and Greece, with a small portion of Austria. The imperial diocese of Pontus was governed by the exarch of Cæsarea, who ruled over thirteen metropolitans with more than 100 suffragans; now there are nine metropolitans (Kaisarieh, Nisi, Angouri, Niksar, Amasia, Isinid, Kadikiov, Broussa, Iznik), and one archbishopric (Trebizond), but the suffragans seem to have disappeared. Asia was governed by the exarch of Ephesus, who ruled over twelve metropolitans with more than 350 suffragan bishops. Of these there remain Ephesus, with its suffragans Aidene and Chisme, Smyrna, Artaki, Marmora, Allah Shehr, Rhodes, Samos, Khio, Cos, Paronaxia, Santorina, Andro, Milô, Lero, Scarpanto, Sephanto, Imbro, Lemno, Metelini, Molivo, Myra, and Konieh. In Asia Minor the church maintains but a small remnant of her former greatness; in Europe it is otherwise. The old outlines, however, are effaced wherever the Christian races have emancipated themselves from the Turkish rule, and the national churches of Greece, Servia, and Roumania have reorganized themselves on a new basis. Where the Turkish rule still prevails the church retains her old organization, but greatly impaired. The national churches of Russia, Georgia, and Armenia are offshoots from the patriarchate of Constantinople, but quite independent of its jurisdiction.

The patriarchate of Antioch has undergone most changes in extent of jurisdiction, arising from the transfer of sees to Jerusalem, from the progress of the schismatic churches of the East, and from the conquests of the Mahometans. At the height of his power the patriarch of Antioch ruled over 12 metropolitans and 250 suffragan bishops. In the time of the first crusade 153 still survived; now there are scarcely 20. Most of those that remain are called either metropolitan or archiepiscopal sees, but they have few or no suffragans. In Syria there are still Antioch, Aleppo, Laodicea, and Arcadia; in Phœnicia, Tyre and Sidon, Beyrout, Tripolis, Emesa, and Heliopolis; in Cilicia, Adana; in Syria, Epiphania; in Isauria, Seleucia; in Cyprus, Famagosta, with Piscopa, Baffo, Neapolis, Limasol, and Nicosia as suffragan sees. Cyprus has been independent of Antioch, however, since the council of Ephesus. Antioch also had jurisdiction beyond the bounds of the empire over Chaldæa and India, and the missionaries of Antioch seem to have preached Christianity in the borders of China. The Chaldæan Church now, however, is almost entirely Nestorian. The Thomas Christians of India do not belong to the Orthodox Greek Church. In Syria the Jacobites are more numerous than the Orthodox; while the Maronites of Lebanon have become subject to Rome.

In the earlier period of the church, ecclesiastical followed civil divisions so closely that Jerusalem, in spite of the sacred associations connected with it, was merely an ordinary bishopric dependent on the metropolitan of Cæsarea. Ambitious prelates had from time to time endeavoured to advance the pretensions of their see, but it was not until the council of Chalcedon, in 451, that Jerusalem was made a patriarchate with jurisdiction over Palestine. From this time on to the inroad of the Saracens, the patriarchate of Jerusalem was highly prosperous. It ruled over three metropolitans with eighty suffragans. The modern patriarch has seven suffragans, all of whom enjoy the titles of metropolitan or archbishop,—Cæsarea, Scythopolis (Bethshan), Petra, Ptolemais, Sinai, Nablous, Sebastia. The patriarchs, however, are non-resident (they live in Constantinople), and the primate of Palestine is the metropolitan of Cæsarea.

The patriarch of Alexandria in ancient times possessed much more power than the others, and the church ruled by him was much more centralized. He had no metropolitans. His hundred suffragans were ordinary bishops. This perhaps in part accounts for the decay of the Orthodox church in Egypt; at present there is no bishop but the patriarch. The Christians in Egypt are for the most part Monophysites. The church of Nubia has been blotted out. The church of Æthiopia or Abyssinia is Monophysite, and acknowledges the Jacobite patriarch of Cairo.

HISTORY.—*Controversies and Schisms.*—To describe the controversies of the Greek Church is to write the history of the church of the first five centuries; in a short sketch like this all that can be done is to mention those causes of division which led (1) to the formation of the schismatic churches of the East, and (2) to the open rupture with Latin Christianity.

The great dogmatic work of the Greek Church was the definition of that portion of the creed of Christendom which concerns *theology proper*,—the doctrines of the essential nature of the Godhead, and the doctrine of the Godhead in relation with manhood in the incarnation, while it fell to the Latin Church to define *anthropology*, or the doctrine of man's nature and needs. The controversies which concern us are all about the person of Christ, the Theanthropos, for they alone are represented in the schismatic churches of the East. These controversies are most easily described, at least for our purpose, by reference to the œcumenical councils of the ancient and undivided church.

Rise of Sects.—All the churches of the East, schismatic as well as orthodox, accept unreservedly the decrees of the first two councils. The schismatic churches protest against the additions made to the creeds of Nicæa and Constantinople by succeeding councils. The Nicæo-Constantinopolitan creed declared that Christ was *consubstantial* (ὁμοούσιος) with the Father, and that He *had become man* (ἐνανθρωπήσας). Disputes arose when theologians tried to explain the latter phrase. These differences took two separate and extreme types, the one of which forcibly separated the two natures so as to deny anything like a real union, while the other insisted upon a mixture of the two, or an absorption of the human in the divine. The former was the creed of Chaldæa and the latter the creed of Egypt; Chaldæa was the home of Nestorianism, Egypt the land of Monophysitism. The Nestorians accept the decisions of the first two councils, and reject the decrees of all the rest as unwarranted alterations of the creed of Nicæa. The Monophysites accept the first three councils, but reject the decree of Chalcedon and all that come after it.

The council of Ephesus, the third œcumenical, had insisted upon applying the term Theotokos to the Virgin Mary, and this was repeated in the symbol of Chalcedon, which says that Christ was born of the Virgin Mary, the Theotokos, "according to the manhood." The same symbol also declares that Christ is "to be acknowledged in two natures, . . . indivisibly and inseparably." Hence the Nestorians, who insisted upon the duality of the natures to such a degree as to lose sight of the unity of the person, and who rejected the term Theotokos, repudiated the decrees both of Ephesus and of Chalcedon, and upon the promulgation of the decrees of Chalcedon formally separated from the church. Nestorianism had sprung from an exaggeration of the theology of the school of Antioch, and the schism weakened that patriarchate and its dependencies. It took root in Chaldæa, and became very powerful. No small part of the literature and science of the Mahometan Arabs came from Nestorian teachers, and Nestorian Christianity spread widely. "It was successfully preached to the Bactrians, the Huns, the Persians, the Indians, the Persarmenians, the Medes, the Elamites. The barbaric churches from the Gulf of Persia to the Caspian Sea were almost infinite. . . . The Malabar coast and the Isles of the Ocean, Zocotra and Ceylon, were peopled with an increasing number of Christians. The missionaries of Balkh and Samarcand pursued without fear the footsteps of the roving Tartar, and insinuated themselves into the valleys of the Imaus and the banks of the Selinga." Their principal bishop took the title of patriarch of Babylon. His seat was later removed to Baghdad and then to Mosul; it is now at Juhmerik in Kurdistan. In the 11th century he ruled over twenty-five metropolitans, and his jurisdiction extended from the Tigris to China, from Lake Baikal to South India. Persecutions weakened the church, Timur almost extirpated it. In the 16th century a schism occurred; many of the Nestorians yielded obedience to Rome. The Roman Nestorians are usually called Chaldæans, though all lay claim to the title. At present the patriarch rules over two metropolitans and sixteen suffragan bishops. The Nestorians dwell principally in Kurdistan, though many are found in Mesopotamia and in India. In the latter country they are numerous on the Malabar coast, and are called Thomas Christians.

The council of Chalcedon, the fourth œcumenical, declared that Christ is to be acknowledged "in two natures—unconfusedly, unchangeably," and therefore decided against the opinions of all who either believed that the divinity is the sole nature of Christ, or who, rejecting this, taught only one composite nature of Christ (one nature and one person, instead of two natures and one person). The advocates of the one nature theory were called Monophysites, and they gave rise to numerous sects, and to at least three separate national churches—the Jacobites of Syria, the Copts of Egypt, and the Abyssinian Church.

The term "Jacobite" (from Jacobus Baradæus, a Syrian theologian) is properly confined to the Syrian Monophysites, but is sometimes used to denote all the various divisions of this heresy. The Jacobites therefore accept the first three councils and reject those that follow. The Armenian Church does the same, and it is common to class the Armenians with the Jacobites, while some theologians have made them more heretical than the Jacobites of Syria and Egypt (Neale, *Holy Eastern Church*, *Patriarchate of Alexandria*, pp. 8–10). This, however, seems a wrong opinion, and the Armenians ought to be reckoned as Orthodox (see ARMENIAN CHURCH). Apart, however, from theological criticism, the Jacobites are arranged under three patriarchates—Antioch, Alexandria, and Armenia. Antioch and Alexandria have intercommunion, but Armenia, in spite of times of reconciliation, stands apart. Under the patriarch of Alexandria is the metran or metropolitan of Abyssinia, and under the patriarch of Antioch the maphrian or primate of the East. The Jacobites or Copts of Egypt greatly outnumber the members of the Orthodox Greek Church there. The patriarch assumes jurisdiction over Egypt, Jerusalem, Nubia, Abyssinia, and the Pentapolis. He now resides in Cairo, and is chosen by lot in a council of all the bishops from a number of monks recommended by four convents to whom belongs this privilege. He has for suffragans the bishops of Menouf, Sherkeyeh, Behnese, Fayoum, Miniyeh, Senabau, Manfalout, Siout, Abuteg, Aschumin, Esne, Kauss and Nekada, and Khartoum. He has besides jurisdiction over twenty-six monasteries, and rules nominally over the Church of Abyssinia.

The Syrian Jacobites also form a patriarchate—the patriarchate of Antioch. While Antioch belonged to the empire the persecution of the state drove the Jacobite patriarch from the city. He settled at Amida, now called Caramit, which is still the ecclesiastical centre. The second dignitary is the maphrian (fruitbearer) of the East, who was originally a missionary bishop to the regions east of the Tigris. He is now settled at Mosul. The Syrian Jacobites could at one time boast 20 metropolitans and 103 bishops: now there are only 5 metropolitans (Caramit, Mosul, Mardin, Aleppo, and Jerusalem) without suffragans.

The decisions of Chalcedon, which were the occasion of the formation of all these sects outside, did not put an end to Christological controversy inside the Orthodox Greek Church. The most prominent question which emerged in attempting to define further the person of Christ was whether the will belonged to the nature or the person, or, as it came to be stated, whether Christ had two wills or only one. The church in the sixth œcumenical council at Constantinople declared that Christ had two wills. The Monotheletes refused to submit, and the result was the formation of another schismatic church—the Maronite Church of the Lebanon range. The Maronites, however, in the 12th century were reconciled to Rome, and cannot now be said to belong to the Greek Church.

Conflict with Rome.—The relation of the Greek Church to the Roman may be described as one of growing estrangement from the 5th to the 11th century, and a series of abortive attempts at reconciliation since the latter date. The estrangement and final rupture may be traced to the overweening pretensions of the Roman bishops and to Western innovation in the doctrine of the Holy Spirit, accompanied by an alteration of creed. In the early church three bishops stood forth prominently, principally from the political eminence of the cities in which they ruled—the bishops of Rome, Alexandria, and Antioch. The transfer of the seat of empire from Rome to Constantinople gave the bishops of Rome a possible rival in the patriarch of Constantinople, but the absence of an overawing court and meddling statesmen did more than recoup the loss to the head of the Roman Church. The theological calmness of the West, amid the violent theological disputes which troubled the Eastern patriarchates, and the statesmanlike wisdom of Rome's greater bishops, combined to give a unique position to the pope, which councils in vain strove to shake, and which in time of difficulty the Eastern patriarchs were fain to acknowledge and make use of, however they might protest against it and the conclusions deduced from it. But this pre-eminence, or rather the Roman idea of what was involved in it, was never acknowledged in the East; to press it upon the Eastern patriarchs was to prepare the way for separation, to insist upon it in times of irritation was to cause a schism. The theological genius of the East was different from that of the West. The Greek theology had its roots in Greek philosophy, while a great deal of Western theology was based on Roman law. The Greek fathers [illegible] the Scriptures, the Latin theologians [illegible] the Roman [illegible] (Stanley, *Eastern Church*). This gave rise to [illegible], and at last led to two widely separate ways of [illegible] one important doctrine, the procession of the Holy Spirit from the Father or from the Father and the Son. Political jealousies and interests intensified the disputes, and at last, after many preliminary [illegible], the final break came in 1054, when Leo IX. [illegible] Michael Cerularius and the whole of the Eastern Church with [illegible]. There had been [illegible] before, but they had not resulted in permanent schism. "It was not the first time that anathemas had been exchanged between Adrian I. and Photius, between Photius and Nicholas I. The sixth council had formally condemned Honorius I. [illegible]. There had been [illegible] in the 6th century between Gregory I. and John the Faster, and not many years before this the name of [illegible] had been [illegible] from every one of the diptychs of the Eastern Church." (Stanley, *Eastern Church*, p. 173.) Now, however, the separation was final, and the ostensible cause of its [illegible] was the introduction by the Latins of two words *filioque* into the creed. It is this addition which was and which still remains the permanent cause of separation. Ffoulkes has pointed out in his second volume (ch. 1-3) that there was a resumption of intercourse more than once between Rome and Constantinople after 1054, and that the overbearing character of the Norman crusaders, and finally the horrors of the sack of Constantinople in the fourth crusade, were the real causes of the permanent estrangement. It is undeniable, however, that the *filioque* question has always come up to bar the way in any subsequent attempt at intercommunion. The theological question involved is a very small one, but it brings out clearly the opposing characteristics of Eastern and Western theology, and so has acquired an importance far beyond its own worth. The question is really one about the relations subsisting between the persons of the Trinity and their hypostatical properties. The Western Church affirms that the Holy Spirit "proceeds from" the Father and from the Son. It believes that the Spirit of the Father must be the Spirit of the Son also. Such a theory seems alone able to satisfy the practical instincts of the West, which did not concern itself with the metaphysical aspect of the Trinity, but with Godhead in its relation to redeemed humanity. The Eastern Church affirms that the Holy Spirit proceeds from the Father only. The Eastern theologian thinks that the Western double procession degrades the Deity and destroys the perfection of the Trinity. The double procession, in his eyes, means two active principles (*αἰτίαι*) in the Deity, and it means also that there is a confusion between the hypostatical properties; a property possessed by the Father and distinctive of the First Person is attributed also to the Second. This is the theological, and there is conjoined with it an historical and moral dispute. The Greeks allege that the addition of the words *filioque* was made, not only without authority, and therefore unwarrantably, but also for the purpose of forcing a rupture between East and West in the interests of the barbarian empire of the West.

Attempts at reconciliation were made from time to time afterwards, but were always wrecked on the two points of papal supremacy, when it meant the right to impose Western terms upon the East, and of the addition to the creed. First there was the negotiation between Pope Gregory IX. and the Greek patriarch Germanus. The Latin conditions were practically recognition of papal jurisdiction, the use of unleavened bread enforced on the Greeks, and the Greeks to be permitted to omit *filioque* on condition that they burnt all books written against the Western doctrine. The Greek patriarch refused these terms. Then came negotiations under Innocent IV. and Clement IV., in which the popes proposed the same conditions as Gregory IX., with additions. These proposals were rejected by the Greeks, who regarded them as attempts to enforce new terms on their church.

The negotiations at the council of Lyons (1274) were, strictly speaking, between the pope and the Greek emperor, and were more political than ecclesiastical. Michael Palaeologus ruled in Constantinople when Baldwin II., the last of the Latin emperors, was an exile in Europe. He desired the pope to acknowledge his title to the empire of the East, and in return promised submission to the papal supremacy, and the union of the Greek with the Latin Church on the pope's own terms. The arrangement lasted only during the lifetime of the emperor. The only other attempt at union which requires to be mentioned is that made at the council of Florence. It was really suggested by the political weakness of the Byzantine empire and the dread of the approach of the Turks. John Palaeologus the emperor, Joseph the patriarch of Constantinople, and several Greek bishops came to Italy and appeared at the council of Florence, the papal council, the rival of the council of Basel. As on former occasions the Greeks were at first deceived by false representations; they were betrayed into a recognition of papal supremacy, and tricked into signing what could afterwards be represented as a submission to Western doctrine. The natural consequences followed,—a repudiation of what had been done; and the Greek bishops on their way home took care to make emphatic their ritualistic differences from Rome. Soon after came the fall of Constantinople, and with this event an end to the political reasons for the submission of the Greek clergy. Rome's schemes for a union which meant an unconditional submission on the part of the Greeks did not cease, however, but they were no longer attempted on a grand scale. Jesuit missionaries after the Reformation stirred up schisms in some parts of the Eastern Church, and in Austria and Poland many of the Greeks were compelled to submit themselves to the see of Rome. The result of these schemes has been what is called the *Unia*, or the United Greeks. These various unions have commonly arisen from dissensions among the Greeks themselves when a portion of the dissentients have made submission to Rome. Rome commonly promised to allow them to enjoy their own liturgies and rites of worship, but usually broke her promises. This was done so systematically that the college of the Propaganda prints what profess to be the old liturgies of the Eastern churches, which are really so interpolated as to bring them surreptitiously into harmony with the Western rites. This is done so universally that it is impossible to trust to any professedly Eastern creed or service-book printed at the office of the Propaganda in Rome.

Differentiation of National Churches included in the Orthodox Greek Church.—Mr Finlay, in his *History of Greece*, has shown that there has been always a very close relation between the church and national life. Christianity from the first connected itself with the social organization of the people, and therefore in every province assumed the language and the usages of the locality. In this way it was able to command at once individual attachment and universal power. This feeling died down to some extent when Constantine made use of the church to consolidate his empire. But it revived under the persecution of the Arian emperors. The struggle against Arianism was not merely a struggle for orthodoxy. Athanasius was really at the head of a national Greek party resisting the domination of a Latin-speaking court. From this time onwards Greek patriotism and Greek orthodoxy have been almost convertible terms, and this led naturally to revolts against Greek supremacy in the days of Justinian and other emperors. Dean Stanley is probably correct when he describes the heretical churches of the East as the ancient national churches of Egypt, Syria, and Armenia in revolt against supposed innovations in the earlier faith imposed on them by Greek supremacy. In the East, as in Scotland, the history of the church is the key to the history of the nation, and in the freedom of the church the Greek saw the freedom and supremacy of his race. For this very reason Orthodox Eastern Christians of alien race felt compelled to resist Greek domination by means of independent ecclesiastical organization, and the structure of the church rather favoured than interfered with the coexistence of separate national churches professing the same faith. Another circumstance favoured the creation of separate national churches. While the Greek empire lasted the Greek emperors had a right of investiture on the election of a new patriarch, and this right was retained by the Turkish sultans after the conquest of Constantinople. The Russian people, for example, could not contemplate with calmness as the head of their church a bishop appointed by the hereditary enemy of their country. In this way the jealousies of race and the necessities of nations have produced various national churches which are independent or autocephalous, and yet are one in doctrine with the Orthodox Greek Church. The most important of these are the churches of Russia, Georgia, Servia, Roumania, Greece, and Montenegro. The churches of Russia and Georgia have been united.

Russian Church.

The Church of Russia dates from 992, when Prince Vladimir and his people accepted Christianity. The metropolitan, who was subject to the patriarch of Constantinople, resided at Kieff on the Dnieper. During the Tartar invasion the metropolis was destroyed, and Vladimir became the ecclesiastical capital. In 1320 the metropolitans fixed their seat at Moscow. In 1582 Jeremiah, patriarch of Constantinople, raised Job, 46th metropolitan, to the patriarchal dignity, and the act was afterwards confirmed by a general council of the East. In this way the Russian Church became autocephalous, and its patriarch had immense power. In 1700 Peter the Great forbade the election of a new patriarch, and in 1721 he established the Holy Governing Synod to supply the place of the patriarch. This body now governs the Russian Church, and consists of five or six bishops, one or two other ecclesiastics of dignity, and several laymen, all appointed by the emperor. The Church of Georgia, which has existed from a very early period, and was dependent first on the patriarch of Antioch and then on the patriarch of Constantinople, has since 1801 been incorporated in the Russian Church. Its head, the archbishop of Tiflis, is a member of the Holy Governing Synod, with the title of exarch, and having under him four suffragans. Russia is divided for ecclesiastical purposes into eparchies of three classes, each of which is ruled over by a bishop. There are three eparchies of the first class, ruled by the metropolitans of Kieff, Novogorod and St Petersburg, and Moscow. The steady increase of the Russian Church makes it difficult to detail with exactness the number of bishops belonging to the three classes; but, according to the report presented to the Holy Governing Synod in 1876, there are, in addition to the three eparchies of the first class, twenty-one of the second, thirty-three of the third, and six vicariates. These sixty-three bishops possess diocesan authority; and there are besides, excluding the exarchate of Georgia, fifty-six bishops ruling over monasteries.

Servian.

The Church of Servia has undergone great changes. In mediæval times, when Servia was a strong kingdom, the head of the church invariably claimed the title and authority of patriarch. In 1810, when Kara George achieved the independence of the kingdom, the archbishop of Carlowitz in Hungary was recognized as the head of the church, but in 1830 the national church was reconstituted and declared to be autocephalous. In 1838 the seat of government was removed to Belgrade, and the metropolitan of Belgrade is now the head of the Servian Church, though his right is still disputed by the archbishop of Carlowitz. He has under him as suffragans the bishops of Shabatz, Csatsak, and Uschize, the last of whom resides at Karanowatz. Election to the episcopate is subject to the veto of the prince and of the patriarch of Constantinople. The extension of Servia under the provisions of the treaty of Berlin will probably cause some ecclesiastical changes.

Roumanian.

Before the union of the two provinces of Moldavia and Wallachia, the Orthodox Greek Church was ruled by two metropolitans—the one at Jassy and the other at Bucharest. Since the independence of the united provinces there has been a long-continued conflict, which had for its design, not merely to throw off the supremacy of the patriarch of Constantinople, but to curb the influence of the higher clergy, and to assert the pre-eminence of the Slavonic over the Greek element. The result has been that the state, aided by the lower clergy and the people, has thrown off the supremacy of Constantinople, united the church under one metropolitan of Roumania, who has under him the metropolitan of Moldavia and six bishops, confiscated the property of most of the convents, which were centres of Greek influence, published liturgies either in the Slavonic or in the Roumanian language, and asserted the supremacy of the state.

Hellenic.

The constitution of the Church of Modern Greece is the result of the peculiar position of the patriarch of Constantinople. The war of liberation was sympathized in, not merely by the inhabitants of Greece, but by all the Greek-speaking Christians in the East. But the patriarch was in the hands of the Turks; he had been appointed by the sultan, and he was compelled by the Turkish authorities to ban the movement for freedom. When the Greeks achieved independence they refused to be subject ecclesiastically to a patriarch who was nominated by the sultan (June 9, 1828); and, to add to their difficulties, there were in the country twenty-two bishops who had been consecrated by the patriarch, twelve bishops who had been consecrated irregularly during the war, and about twenty bishops who had been deprived of their sees during the troubles—*i.e.*, fifty-three bishops claimed to be provided for. In these circumstances the Government and people resolved that there should be ten diocesan bishops and forty additional provisional sees. They also resolved that the church should be governed after the fashion of the Russian Church by a synod; and they decreed that the king of Greece was to be head of the church. All these ideas were carried out with some modifications, and gradually. The patriarch of Constantinople in 1850 acknowledged the independence of the church, which gradually grew to be more independent of the state. The provisional sees were not all merged in the ten proposed dioceses. Greece at present is divided into four exarchies,—(1) the Continent and Eubœa—divided into eight sees, of four archbishops and four bishops; (2) the Peloponnesus—divided into twelve sees, of six archbishops and six bishops; (3) the islands of the Ægean Sea—governed by one archbishop and three bishops; and (4) the Ionian Islands—governed by five archbishops. The Greek Church in Greece includes a good many monasteries; but the number has been diminished since the war of liberation, and a great many of those that remain have been made use of for the purposes of education. Many of these convents are dependent on the celebrated ancient monasteries of Athos, Sinai, and Jerusalem. The Greek Church has done and is doing a great deal for the cause of education in Greece.

Montenegrin.

The bitter enmity which subsists between the people of the Black Mountain and the Turks made them from the beginning repudiate the authority of the patriarch of Constantinople, and the church is nominally independent. It is however very closely allied to the Russian Church. Up to the year 1852 the spiritual and the civil authority were vested in one individual, and the prince-bishops were always chosen from the family of Petrovitsch, but in that year the prince-bishop Danilo married and demitted his episcopal functions. Since then there has been a bishop of Montenegro who has metropolitan functions. He has no suffragan bishops, but rules over three arch-priests and a large number of inferior clergy. He is consecrated by the Holy Governing Synod of the Russian Church.

Bulgarian.

The Church of Bulgaria demanded independence about fifteen years ago, and has practically enjoyed it since 1858, although it has not yet obtained recognition. It is governed by an exarch who, while recognizing the supremacy of the patriarch of Constantinople, refuses to allow him to interfere in any way in the internal government of the church. It is still under excommunication by the patriarch. The new rights which Bulgaria has acquired under the treaty of Berlin will probably lead to a rearrangement of the church.

DOCTRINES AND CREEDS.—The Greek Church has no creeds in the modern Western use of the word, no *normative* summaries of what must be believed. It has preserved the older idea that a creed is an adoring confession of the church engaged in worship; and, when occasion called for more, the belief of the church was expressed more by way of public testimony than in symbolical books. Still the doctrines of the church can be gathered from these confessions of faith. The Greek creeds may be roughly placed in two classes,—the œcumenical creeds of the early undivided church, and later testimonies defining the position of the Orthodox Church of the East with regard to the belief of the Roman Catholic and of Protestant Churches. These testimonies were called forth mainly by the protest of Greek theologians against Jesuitism on the one hand and against the reforming tendencies of Cyril Lucaris on the other. The Orthodox Greek Church adopts the doctrinal decisions of the seven œcumenical councils, together with the canons of the Concilium Quinisextum or second Trullan council; and they further hold that all these definitions and canons are simply explanations and enforcements of the Niceno-Constantinopolitan creed and the decrees of the first council of Nicæa. The first four councils settled the orthodox faith on the doctrines of the Trinity and of the Incarnation; the fifth supplemented the decisions of the first four. The sixth declared against Monothelitism, the seventh sanctioned the worship (δουλεία not λατρεία) of images, the council held in the Trullus (a saloon in the palace at Constantinople) supplemented by canons of discipline the doctrinal decrees of the fifth and sixth councils.

The Reformation of the 16th century was not without effect on the Greek Church. Some of the Reformers, notably Melanchthon, attempted to effect a union of Christendom by means of the Greeks, cherishing the same hopes as the modern Old Catholic divines and their English sympathizers. Melanchthon himself sent a Greek translation of the Augsburg Confession to Joasaph patriarch of Constantinople, and some years afterwards Jacob Andreæ and Martin Crusius began a correspondence with Jeremiah, patriarch of Constantinople, in which they urged an official expression of his opinions about Lutheran doctrine. The result was that Jeremiah answered in his *Censura Orientalis Ecclesiæ* condemning the distinctive principles of Lutheranism.

The reformatory movement of Cyril Lucaris brought the Greek Church face to face with Reformation theology. Cyril was a learned Cretan, who, having travelled extensively in Europe, and having become acquainted with and devoted to the Reformed faith, was afterwards elected patriarch of Alexandria in 1602 and patriarch of Constantinople in 1621. He conceived the plan of reforming the Eastern Church by bringing its doctrines into harmony with those of Calvinism, and by sending able young Greek theologians to Switzerland, Holland, and England to study Protestant theology. His scheme of reform was opposed chiefly by the intrigues of the Jesuits. He was five times deposed, and five times reinstated. In the end he was murdered by the Turks at the instigation of the Jesuits. The church anathematized his doctrines, and in its later testimonies repudiated his confession on the one hand and Jesuit ideas on the other. The most important of these testimonies are (1) the Orthodox confession or catechism of Peter Mogilas, confirmed by the Eastern patriarchs and by the synod of Jerusalem (1643), and (2) the decree of the synod of Jerusalem or the confession of Dositheus (1672). Besides these, the catechisms of the Russian Church should be consulted, especially the catechism of Philaret, which since 1839 has been used in all the churches and schools in Russia. Founding on these doctrinal sources the teaching of the Orthodox Greek Church is:—[1]

Christianity is a Divine revelation communicated to mankind through Christ; its saving truths are to be learned from the Bible *and tradition*, the former having been written, *and the latter maintained uncorrupted* through the influence of the Holy Spirit; *the interpretation of the Bible belongs to the Church, which is taught by the Holy Spirit*, but every believer may read the Scriptures.

According to the Christian revelation, God is a Trinity, that is, the Divine Essence exists in Three Persons, perfectly equal in nature and dignity, the Father, the Son, and the Holy Ghost; THE HOLY GHOST PROCEEDS FROM THE FATHER ONLY. Besides the Triune God there is no other object of divine worship, *but homage (ὑπερδουλία) may be paid to the Virgin Mary, and reverence (δουλία) to the saints and to their pictures and relics.*

Man is born with a corrupt bias which was not his at creation; the first man, when created, possessed IMMORTALITY, PERFECT WISDOM, AND A WILL REGULATED BY REASON. Through the first sin Adam and his posterity lost IMMORTALITY, AND HIS WILL RECEIVED A BIAS TOWARDS EVIL. In this natural state man, who even before he actually sins is a sinner before God by original or inherited sin, commits manifold actual transgressions; *but he is not absolutely without power of will towards good, and is not always doing evil.*

Christ, the Son of God, became man in two natures, which internally and inseparably united make One Person, and, according to the eternal purpose of God, has obtained for man reconciliation with God, and eternal life, inasmuch as He by His vicarious death has made satisfaction to God for the world's sins, and this satisfaction was PERFECTLY COMMENSURATE WITH THE SINS OF THE WORLD. Man is made partaker of reconciliation in spiritual regeneration, which he attains to, being led and kept by the Holy Ghost. This divine help is offered *to all men without distinction, and may be rejected.* In order to attain to salvation, man is justified, and when so justified CAN DO NO MORE THAN THE COMMANDS OF GOD. He may fall from a state of grace through mortal sin.

Regeneration is offered by the word of God and in the sacraments, *which under visible signs communicate God's invisible grace to Christians when administered and received aright.* There are *seven mysteries or sacraments.* Baptism *entirely destroys* original sin. In the Eucharist the true body and blood of Christ are *substantially present, and the elements are changed into the substance of Christ, whose body and blood are corporeally partaken of by communicants.* All Christians should receive the bread and the wine. *The Eucharist is also an expiatory sacrifice.* The new birth when lost may be restored through repentance, which is not merely (1) sorrow for sin, but also (2) *confession of each individual sin to the priest, and (3) the discharge of penances imposed by the priest for the removal of the temporal punishments which may have been imposed by God and the church. Penance is accompanied by the judicial absolution of the priest uttered in God's name.*

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[1] This summary has been taken, with some changes, from Winer. Small capitals show differences from Roman Catholic, italics differences from Protestant doctrine.

The Church of Christ is the fellowship of ALL THOSE WHO ACCEPT AND PROFESS ALL THE ARTICLES OF FAITH TRANSMITTED BY THE APOSTLES AND APPROVED BY GENERAL SYNODS. *Without this visible Church there is no salvation.* It is under the abiding influence of the Holy Ghost, and *therefore cannot err in matters of faith.* Specially appointed persons are necessary in the service of the Church, and they form a *threefold order, distinct jure divino from other Christians, of Bishops, Priests, and Deacons.* THE FOUR PATRIARCHS, OF EQUAL DIGNITY, HAVE THE HIGHEST RANK AMONG THE BISHOPS, AND THE BISHOPS UNITED IN A *General Council represent the Church and infallibly decide*, under the guidance of the Holy Ghost, all matters of faith and ecclesiastical life. All ministers of Christ must be regularly called and appointed to their office, and are consecrated by *the sacrament of orders. Bishops* must be unmarried, and PRIESTS AND DEACONS MUST NOT CONTRACT A SECOND MARRIAGE. To all priests in common belongs, besides the preaching of the word, the administration of the SIX SACRAMENTS, BAPTISM, CONFIRMATION, PENANCE, EUCHARIST, MATRIMONY, UNCTION OF THE SICK. The *bishops* alone can administer the sacrament of orders.

Ecclesiastical ceremonies are part of the divine service; most of them have apostolic origin; and those connected with the sacrament must not be omitted by priests under pain of mortal sin.

LITURGY AND WORSHIP.—The ancient liturgies of the Eastern Church were very numerous, and have been frequently classified. Neale makes three divisions—the liturgy of Jerusalem or of St James, that of Alexandria or of St Mark, and that of Edessa or of St Thaddæus; and Daniel substantially agrees with him. The same passion for uniformity which suppressed the Gallican and Mozarabic liturgies in the West led to the almost exclusive use of the liturgy of St James in the East. It is used in two forms, a shorter revised by Chrysostom, and a longer called the liturgy of St Basil. This liturgy and the service generally are either in Old Greek or in Old Slavonic—and frequent disputes have arisen in particular districts about the language to be employed. Both sacred languages differ from the language of the people, but it cannot be said that in the Eastern Church worship is conducted in an unknown tongue,—"the actual difference," says Neale, "may be about that between Chaucer's English and our own."

MONASTIC LIFE.—Monastic life was introduced into Christianity in the East, and has always remained a prominent feature in Greek Christianity. The monks usually follow the rule of St Basil, but some monasteries, notably that of Sinai, obey the rule of St Anthony. The monks are of three classes:—κοινοβιακοί, who live together in a monastery ruled over by a ἡγούμενος or ἀρχιμανδρίτης; ἀναχωρηταί, who live either in a cloister apart from the other monks or among the laity; and ἀσκηταί, who are hermits. The nuns, virgins or widows, all follow the rule of St Basil. There are three great convents—at Jerusalem, Sinai, and Mount Athos; each has a great number of daughter monasteries throughout the East. Many monasteries are presided over by bishops, and many monks are in priests' and deacons' orders. Monks alone are eligible for election to bishoprics and the higher offices in the Eastern Church.

Number of Adherents.—These can only be given approximately:—

Orthodox Greek Church in Turkey	10,000,000
,, ,, Roumania	4,529,000
,, ,, Servia	1,345,000
,, ,, Montenegro	136,000
,, ,, Greece	1,310,000
,, ,, Austria	3,000,000
,, ,, Russia (including Poland, Siberia, and the Caucasus)	58,000,000
	78,314,000

To these may be added:—

Russian Dissenters	1,051,000
Armenians	3,000,000
Nestorians (including the Thomas Christians of India)	360,000
Syrian Jacobites	90,000
Copts	121,000
Abyssinians	1,200,000
	5,822,000
United Greeks (chiefly in Austria and Poland)	4,670,000

See the common books on Church History, as those of Neander, Gieseler, Robertson, &c. Special mention may be made of Schroeckh's *Christliche Kirchengeschichte*, and the various collections of councils, *e.g.*, Mansi, or, for English readers, Hefele's *History of the Councils*, translated in Clark's series. For the controversies which gave rise to the schismatic churches, consult F. C. Baur, *Die Christliche Lehre von der Dreieinigkeit*; Dorner, *History of the Doctrine of the Person of Christ*, translated in Clark's series; J. H. Newman, *The Arians of the Fourth Century*; Swainson, *The Apostles' and Nicene Creeds*. For the *Filioque* controversy Walch, *Historia Controversiae de Processione Spiritus Sancti*, and the works of Swete and Langen, may be referred to, also Schaff's *History of the Creeds of Christendom*. The following are devoted specially to the history and condition of the Eastern Church.—M. Le Quien, *Oriens Christianus*; Asseman, *Bibliotheca Orientalis*; Stanley's *Eastern Church*; and, above all, J. M. Neale, *The Holy Eastern Church* (*General Introduction*, 2 vols.; *Patriarchate of Alexandria*, 2 vols.; and, published posthumously in 1873, *Patriarchate of Antioch*, 1 vol.). For liturgy, see Daniel, *Codex Liturgicus Eccl. Univ. in Epitomen redactus*, 4 vols., 1847–56, and the shorter works of Neale and Littledale; Renaudot, *Collectio Liturgiarum Orient.*; Leo Allatius, *De libris et rebus Eccles. Graecorum Dissertationes*. For hymnology, see Daniel, *Thesaurus Hymnologicus*, 4 vols., and Neale's translations of *Eastern Hymns*; and for creeds, the collections of Kimmel, Gass, and Schaff. (T. M. L.)

GREEK EMPIRE. See GREECE, p. 114 *sqq.*

GREEK FIRE is properly the name applied to the inflammable and destructive compounds used in warfare in the Middle Ages, and particularly by the Byzantine Greeks at the sieges of Constantinople. It was the precursor of gunpowder, and of such modern compositions as dynamite and nitroglycerin, and was frequently accessory to gunpowder for many years after its invention. But combustible mineral substances were employed in war much earlier than the Middle Ages. Greek fire has borne the names wildfire, maritime fire, wet fire, fire-rain; called by the French *feu grégeois*, by the Germans *griechisches Feuer*, it was "the oil of cruel fire" of the Chinese, the *oleum incendiarum* of the Romans, and the πῦρ ὑγρόν, liquid fire, of the Greeks. Procopius designates it "Medea's oil." Cinnamus (12th century) describes it as πῦρ Μήδικον, Median fire, the black clays of Media and Persia supplying the principal constituent. Used chiefly at sieges and in naval engagements, it was poured from cauldrons and ladles on the besiegers and their engines, or vomited through long copper tubes from the mouths of hideous figures set in the prows of ships. Sometimes flax was twisted and saturated with the liquid, then fired, and projected on arrows, lances, and javelins. At sea it was often flung in pots and phials. The heavy ballista and other military engines were pressed into the service in early times for scattering this destructive compound in large quantities, often in barrels. Owing to the viscid nature of Greek fire it adhered to whatever it touched. It is described as producing a thick smoke, a loud explosion, and a fierce flame, and as being quickened by the element of water. Sea-water is specially mentioned as intensifying its inflammability; and whenever it fell among ignitible materials terrible havoc was occasioned. The sight and sound of the engine discharging the torrent of fire carried dismay into many a warrior's breast. The devastating consequences pictured by early writers are probably overdrawn, but there can be no doubt that they were formidable. Liquid fire has been used in warfare from very remote times, as may be seen in the Assyrian bas-reliefs in the British Museum. Greek fire, properly so called, is said to have been employed for the first time against the Saracens in the siege of Constantinople, 673–679, the inventor being a Syrian named Callinicus. The art of compounding Greek fire was concealed at Constantinople with the most jealous care; indeed it was to Greek fire, while the secret of its manufacture was kept, that the city owed in great measure its safety. In 1755 two Frenchmen, Gaubert and Dupré, are reported to have rediscovered the art so carefully concealed by the Byzantine Greeks; but they were prohibited from making it known. Various projects for the use of this or similar preparations have been advocated in recent times. The ingredients and relative proportions of the composition are not exactly known, the secret having been very successfully preserved. The Syrian historian Michael applies the name naphtha to the "newly invented" Greek fire; and this probably was the destructive agent of the Assyrians, Persians, and other Eastern nations, springs of naphtha abounding in their territories. According to the author of *L'Esprit des Croisades*, Greek fire was compounded of the gum of the pine and other resinous trees reduced to powder, with the addition of brimstone, naphtha, and other bitumens. Fanciful substances were included, such as the water of a particular fountain in the East, duck's grease, &c. Friar Bacon mentions two of the ingredients, saltpetre and sulphur, but conceals the rest. Giambattista Porta states that Greek fire is made by boiling together willow charcoal, salt, ardent aqua vitæ, sulphur, pitch, frankincense, threads of soft Ethiopian wool, and camphor. In a Spanish MS. of the 13th century in the Bodleian library a different receipt is given; and others will be found in the *Liber ignium a Marco Græco perscriptus*, &c., Sloane MS. (Brit. Mus.) 323; in the Sloane MS. 7, *Modus faciendi ignem græcum*, &c. From all that has been said it appears that naphtha—otherwise petroleum, rock oil, or Rangoon tar—and sulphur, and sometimes nitre, were the principal constituents; and the use of these, or two of them, in varying quantities, with the charcoal mentioned by Porta, no doubt gave birth to gunpowder. An invention by Niepce comprised benzol and potassium, in the proportion of [illegible] to 1, placed in a glass vessel; and Disney's is believed to have included a solution of phosphorus in sulphide of carbon or chloride of sulphur. But of all the spontaneously combustible liquids, Bunsen's kakodyl, As₂(CH₃)₄, is probably the most deadly, while it is far in advance of the old Greek fire as a destroyer of life. A combustible used at the siege of Charleston, U.S., in 1863 consisted of (1) saltpetre, sulphur, and lampblack, pressed into small tubes, and (2) coal tar naphtha, placed in shells or pumped through hose. The best military authorities appear now to agree that Greek fire is unsuitable for purposes of war, and comparatively little use has been made of it in recent times.

[illegible] *Forma de præparatione ignis Græci*, [illegible] MS. 164; Beckmann, *Gesch. der Erfindungen*; [illegible] *Esprit des Croisades*, Amsterdam, 17[illegible]; Gibbon; Grose, *Mil. Antiq.*; Hoefer, *Hist. de la Chimie*; Joinville, *Memoirs*, 1807; [illegible] *Hist.* [illegible]; [illegible] *Magazine*, [illegible]; Napoleon III., *Études sur . . . . l'Artillerie*; [illegible] 1859; [illegible] *Journ.*, xiv.; [illegible] *Weapons*, [illegible]; and the writings of the Byzantine historians.

HORACE GREELEY

HORACE GREELEY, an eminent American journalist and author, was born at Amherst, N. H., Feb. 3, 1811. His father, Zaccheus Greeley, and his mother, Mary Woodburn, were of Scotch-Irish descent. Upon a farm of fifty acres, stony and sterile, Zaccheus Greeley was barely able to earn a living. The lad Horace, although a feeble child physically, took an active part in helping carry on the poorly paid work of the farm. Before he was two years old he gave evidence of remarkable precocity, for he had learned his letters before he could talk plainly. With an insatiable fondness for reading he had devoured every book and paper he could borrow from neighbors and friends, within several miles of his father's dwelling. When about six years of age he had read the Bible through. Possessed of a retentive memory, he did not forget what he read and his stores of knowledge were the wonder of all the people who knew him. They justly regarded him as the prodigy of the neighborhood. He was especially noted for his accurate spelling. No one in the "spelling school" was ever able to spell little Horace down. He snatched every moment from labor to gratify his desire for learning. As soon as he was up in the morning his hand was upon the book which had been placed the night before within easy reach. While resting for a few moments after plying the ax at the wood pile, he would find an opportunity to read the book which he had stowed away conveniently in his pocket. Sent out on an errand, he would literally read as he walked or ran, the nimble foot taking care he did not trip, while the nimble brain was busy taking in what the eager eyes were so carefully scanning. At three years of age he was attending the district school at Londonderry, the home of his maternal grandfather, and although he was not able to derive as much advantage from the common schools as many boys of his age and time, he always recognized their inestimable value in the education of the coming American citizens, and pleaded for their preservation and development.

When Horace was about ten years of age Zaccheus Greeley removed to Westhaven, Vermont, being forced through bad management, and endorsing for friends, to leave his native state a bankrupt. Here Horace worked for three or four years helping his father in clearing up wild land and in performing the hard tasks incident to such a laborious life.

Before he was eleven years old Horace had greatly desired to enter the village printing office as an apprentice, but had been rejected on account of his youth. In the spring of 1826, however, the position he had so long coveted was given him, and he became an apprentice to the publisher of *The Northern Spectator*, a weekly newspaper, issued at Poultney, Vermont. In one week he had learned to set type with far more skill and dexterity than many an apprentice who had been in practice for a month or more. His compensation was only $40 a year, almost the entire amount of which he sent his father, spending next to nothing on himself. The editing of the paper was soon thrown upon him, as he became thoroughly interested in every question of a social, political or industrial nature. In the village debating society he was one of the foremost speakers, bringing to the subjects under discussion the most careful preparation.

In June, 1830, *The Northern Spectator* was discontinued, and young Greeley went to work for a few weeks on the farm which his father was clearing in the dense forests of western Pennsylvania, about thirty miles from the city of Erie. He soon obtained employment in various printing offices in the vicinity, at very low wages for very hard work, giving nearly all he earned to his father. At length he made up his mind to seek his fortune in New York, and traveling on foot and by canal boat, with a scanty stock of clothing in a bundle on his back, and with $10 in his pocket, he reached his destination August 17, 1831. His rustic appearance and threadbare, shabby apparel prejudiced people against him, so that it was very difficult to obtain employment as a journeyman printer. Many believed him to be a runaway apprentice and turned their backs upon him. By strictest economy, living on but little more than bread and water during these trying days, he had spent only $5 of his small but precious hoard. When despair was just about taking hold of him, he found a job, which was so difficult and so [illegible] that other printers had abandoned it. This was the setting up of a [illegible] New Testament, [illegible] with [illegible] of notes in [illegible]. He earned barely enough to pay his board bill at a cheap boarding house but persevered to the end of his task. Better paid employment came afterward in different printing offices until January 1, 1833 when he entered into partnership with a fellow workman, Francis V. Story, and [illegible] on a [illegible] capital of [illegible] the printing of *The Morning Post*, the first daily penny paper ever printed.

The enterprise failed at the end of three weeks, not from any lack of [illegible] strength on the part of the editor, for it [illegible] Mr. Greeley, but from other causes. [illegible] Dr. H. D. Shepard, its projector, [illegible] the penny paper [illegible] Horace Greeley and his partner [illegible] The good [illegible], however, was [illegible] Story [illegible] *The* [illegible] *New* [illegible] which [illegible] a week. They also [illegible] Mr. Jonas Winchester, took his place [illegible]

About this time [illegible] known as a [illegible] New York. [illegible] Mr. [illegible] Greeley's [illegible] to provide [illegible] in prospective bills of [illegible] Mr. Greeley [illegible] was the [illegible] with its [illegible] and [illegible] with that [illegible], Mr. Greeley married Miss Mary Y. [illegible] Miss [illegible] was a [illegible] Mr. Greeley had met at the Graham house [illegible] in New York. On his wedding [illegible] of Washington, and was [illegible] of Congress then in session. [illegible] *The New Yorker* [illegible] writing [illegible] *The Daily Whig*. On March 3, 18[illegible], the Whig [illegible] of the State of New York, started *The Jeffersonian* [illegible] Mr. Greeley [illegible] William H. Seward, and other [illegible] the Whig party, [illegible] editorial charge of the paper in [illegible] with *The New Yorker*. Mr. Greeley spent two days [illegible] for his year's services [illegible]. *The Jeffersonian* was a neat [illegible] paper of eight pages, con[illegible] the best speeches of the day, some for, and some against [illegible] principles. It was believed by the Whigs to have [illegible] the elections of the next year. The labors of Mr. Greeley [illegible] were very great and exhausting. On the [illegible] of May, 18[illegible], during the famous campaign of William Henry Harrison [illegible] Mr. Greeley issued the first number of *The Log Cabin*, a weekly campaign paper, in the interest of Harrison. Its success was unprecedented. Forty-eight thousand [illegible] were sold, and the weekly circulation rose [illegible].

[illegible] did not prove a pecuniary advantage as the [illegible] paper was low and the facilities for handling it were [illegible]. It was a brilliant political success, and gave Mr. Greeley a great reputation as an able writer and a zealous [illegible] April, 1841, Mr. Greeley announced that [illegible] he would publish the first number of a new [illegible] politics, literature and general intelligence, [illegible] *The Tribune*. When the paper appeared, Mr. Greeley [illegible]. But his credit was good, and his editorial [illegible]. From a friend, Mr. James Coggeshall, he [illegible] and thus laid the foundation of the noblest [illegible]. *The Tribune* began with 600 subscribers [illegible] by the exertions of a few of Mr. Greeley's personal and political friends. Five thousand copies of the first number were printed, and Mr. Greeley said, "We found some difficulty in giving them away." The expenses of the first week were [illegible]. A rival newspaper resorted to unfair means to [illegible] the infant paper, but the measures taken [illegible] increase its circulation. By the end of the fourth week its circulation reached 6,000, and by the seventh [illegible], which was all that could be printed with the press used.

Mr. Thomas McElrath, a man of superior business qualifications, was [illegible] by Mr. Greeley as an equal partner upon the payment of [illegible] common fund. Mr. McElrath undertook the [illegible] of the business of publication, and Mr. Greeley assumed the [illegible] care of the editorial department. To the paper Mr. Greeley [illegible] the best powers of his mind and body. With it he was [illegible] as, perhaps, no other man has been [illegible] newspaper [illegible]. In his *Recollections of a Busy Life*, he says: "[illegible] is a vapor; popularity an accident; [illegible], the only earthly certainty is oblivion; no [illegible] what a day may bring forth, while those who [illegible] and yet I cherish the hope that the [illegible] established will live and flourish long after I shall have [illegible] forgotten dust, being guided by a [illegible] to discern the right, [illegible] readiness to embrace and defend [illegible] and that the stone which covers my [illegible] the still intelligible inscription, [illegible] of *The New York Tribune*.'"

[illegible] *The Log Cabin* and *The New Yorker* were merged [illegible] Mr. Greeley [illegible] *The Weekly Tribune*, the first number of which [illegible] on September 20. It rapidly grew into [illegible] favor. In almost every [illegible] of the Union the paper found [illegible]. The name of its editor was a household word in thousands of homes. It was with a feeling very closely akin to that of [illegible] that Mr. Greeley was regarded by the readers of the *Tribune*. He was undoubtedly for many years the foremost man [illegible] the opinions of the rural classes.

[illegible] of *The Weekly Tribune* sometimes reached 1[illegible]000 [illegible] of great political excitement over 2[illegible]000. Its influence was far greater proportionately than the *Daily Tribune*, whose [illegible] from [illegible] to [illegible]. The semi-weekly [illegible] ranged from [illegible] to [illegible].

Mr. Greeley was always deeply interested in every movement which seemed to be of benefit to the toiling [illegible]. He set out in his journalistic career to give to all questions which affect the public good a fair hearing.

He was ever ready to welcome new ideas. He was ever the champion of the [illegible] poor. When Charles Fourier, the French socialist reformer, had made known his principles Mr. Greeley presented them for discussion in the *Tribune* by Albert Brisbane. And when the North American Phalanx was organized in part upon these principles in 1843 near Red Bank, New Jersey, Mr. Greeley became president of the society. He was always careful to discriminate the good from the bad in socialistic teachings.

He would not be a party for a moment to any assault upon the divine institution of the family, nor did he fail to attack every position which was not consistent with the highest social purity. His broad heart was fired with an earnest desire that increasing good might come to the working man and his toils through the principle of association. He thoroughly believed in co-operation as a panacea for a multitude of social evils, and dwelt unceasingly upon the dignity of labor. He was quick to perceive the wrongs in existing institutions, but was not a shallow disturber of social order. With an abiding faith in the growth and development of human society, he cheerfully and hopefully watched the unfoldings of Divine Providence in the affairs of men.

In 1848 the famous Fox sisters attracted attention, and on the invitation of his wife, they spent some time at his house. Events have proved the wisdom of his attitude toward their peculiar "manifestations." While it was one of observation and inquiry, it was also one of profound distrust of the genuine character of most of the phenomena.

In 1848, Mr. Greeley was elected to fill a vacancy in the House of Representatives in the United States Congress. He served as a member of that body from December 1, 1848, to March 4, 1849, and his career is one that may be regarded with unmingled admiration. He had two objects in view, during these three turbulent and exciting months: 1st, to do his duty as a representative of the people; 2d, to let the people know exactly and fully what the House of Representatives was, by what methods their business was kept from being done, and under what pretexts public money was plundered. He accomplished these objects by being constantly in his seat, on the floor of the House and by writing daily letters to the *Tribune*, composed in the quiet of his own room, and not at his desk in the House. He introduced the "Land Reform" bill, by which it was provided that any citizen or alien who had declared his intention of becoming a citizen might file a claim to 160 acres of public land and purchase the same within seven years at $1.25 per acre, or, by declaring his intention to reside upon it, become the owner of a portion of it at the end of five years.

He also set forth in the *Tribune* the famous Congressional Mileage exposé, which, considered merely as a piece of editorship was the best hit ever made by a New York paper. It brought the rage of Congress upon him but put a check on the wastes of the mileage system. He made use of his vigorous English against the chaplaincy of Congress in the following words, more forcible, however, than true. "The chaplaincy remains a thing of grimace and mummery, nicely calculated to help some flockless and complaisant shepherd to a few hundred dollars, and impose on devout simpletons an exalted notion of the piety of Congress."

Mr. Greeley never favored woman suffrage, because the majority of women did not demand it. "Yet if, after all," he says, "the question recurs, 'But suppose the women should generally prefer a complete political equality with men, what would you say to the demand?' The answer must be, 'I accede to it.' However unwise or mistaken the demand, it is but the assertion of a natural right, and as such must be conceded." On the platform Horace Greeley discussed questions of agriculture; but *Reforms*, in all the great lines of progress, furnished the main subjects for public speeches. He was, however, no orator. Devoid of gesticulations and glow, for the sake of effect, he held the unflagging attention of an audience through the respect that was everywhere entertained for his character, his opinions and the mind whence they emanated. The object of his public life was a single one. It was the *Emancipation of Labor* from ignorance, vice, servitude, insecurity and poverty. This was his main theme, whether he spoke from the platform or wrote for the *Tribune*, whether the subject were slavery, protection, human life, character, or education. The one-time companion of the landless, the hireling, the uneducated became their constant champion.

In 1851 Horace Greeley visited Europe principally for the purpose of attending the World's Fair in London, and afterward served as one of the jurors in the Crystal Palace. He made a hurried visit to the more accessible parts of the continent, and wrote for the *Tribune* the most interesting letters concerning the facts and events which came under his notice. In 1855 he again visited Europe, spending six weeks in Paris, where he was arrested and imprisoned two days for having injured a statue at the World's Fair in 1853. In 1859 he visited the Pacific coast, and was tendered a public reception, both at Sacramento and San Francisco. With the political defeat of Gen. Scott, and the annihilation of the Whig party in 1852, the *Tribune* ceased to be a party paper, and Mr. Greeley ceased to be a party man.

On the 16th of May, 1860, Mr. Greeley attended the National Republican Convention, which met at Chicago, for the purpose of nominating candidates for the presidency and vice presidency. Mr. Greeley was not sent as a delegate by the Republican party of New York, because he opposed Mr. Seward, but went as a delegate at large from Oregon. The general expectation was that Mr. Seward would receive the nomination for president, and Mr. Greeley was chiefly instrumental in frustrating these hopes of Mr. Seward [illegible]

[illegible]

GREEN BAY, a city of the United States, capital of Brown county, Wisconsin, is situated at the head of Green Bay, an inlet on the west shore of Lake Michigan. The bay is 100 miles long, from 15 to 35 miles wide, and of considerable depth. The city stands near the mouth of Fox River, with a small stream known as the East River on the other side, its situation affording it a secure harbour. It is 232 miles N. of Chicago, 114 N. of Milwaukee, and 120 N. E. of Madison, the capital of the State. By the completion of a canal connecting the Fox and Wisconsin rivers at Portage City, Green Bay has become the terminus of the inland water-system which unites the great lakes with the Mississippi and the Gulf of St. Lawrence with the Gulf of Mexico. The nearness of Green Bay to the forests of the State makes it a centre of the lumber trade, and it exports annually large quantities of planks, boards, shingles, staves, and headings. It has several other manufactories, an iron furnace, a foundry, machine shops, tanneries, planing-mills, and breweries. The fishing interests, especially in white fish and lake trout, are important. Three lines of railway and the lake steamers minister to its commerce. Though the French formed settlements on the bay as early as 1745, the site of the present city was not laid out until 1830 and 1835, when the villages of Navarino and Astor were founded. In 1839 these were incorporated under the name of Green Bay, and in 1854 a city charter was granted. It was in 1868 erected a bishop's see by Pius IX., and a handsome cathedral church in the Romanesque style has been erected since. The growth of the place has been rapid even for an American city. The population in 1860 numbered 2275, and 4666 in 1870, exclusive of Fort Howard across the river, with its population of 2462, which commercially may well be regarded as part of the city. In 1875 the State census gave 8037 to Green Bay and 3610 to Fort Howard.

GREENE, Maurice, an English composer, was born in London towards the close of the 17th century (about 1696, it is generally stated). He was the son of a clergyman in the city of London, and soon became a chorister of St Paul's Cathedral, where he studied under Charles King, and subsequently under Richard Brind, organist of the cathedral from 1707 to 1718, whom, on his death in the last-named year, he succeeded. Nine years later he became organist and composer to the chapel royal, on the death of Dr Croft. In 1730 he was elected to the chair of music in the university of Cambridge, and had the degree of doctor of music conferred on him. Dr Greene was a voluminous composer of church music, and his collection of *Forty Select Anthems* is a standard work of its kind. He also wrote a *Te Deum*, several oratorios, a masque, *The Judgment of Hercules*, and a pastoral opera, *Phœbe* (1748). He is also among the writers of glees and catches, a form of music peculiar to English composers (see GLEE); and a collection of *Catches and Canons for Three and Four Voices* is amongst his compositions. In addition to this he wrote many occasional pieces for the king's birthday, having been appointed master of the king's band in 1735. But it is as a composer of church music that Greene will be chiefly remembered. It is here that his contrapuntal skill and his sound musical scholarship are chiefly shown. The influence of Handel is, however, discernible in his compositions. With that great master Greene was originally on intimate terms, but his equal friendship for Buononcini, Handel's rival, estranged the German master's feelings from him, and all personal intercourse between them ceased. Greene, in conjunction with Festing and others, originated that excellent institution, the Society of Musicians, for the support of poor artists and their families. He died September 1, 1755.

GREENE, Nathanael (1742–1786), an American general, son of a Quaker who followed the joint occupation of a farmer and smith, was born at Potowhommet, Warwick county, Rhode Island, May 27, 1742. From his early years he was employed in assisting his father, but he succeeded, notwithstanding this, in acquiring a large amount of general information, and made a special study of mathematics, history, and law. At Coventry, where he removed to take charge of a forge of his own, he was the first to establish a public school; and in 1770 he was chosen a member of the legislature of Rhode Island. Sympathizing strongly with the revolutionists he in 1774 joined the "Kentish Guards," and on this account was expelled from the Society of Friends. In 1775 he was appointed to the command of the contingent of 1000 men raised by Rhode Island, and after joining Washington before Boston he was named brigadier-general. In 1776 he obtained the rank of major-general and accompanied Washington to New Jersey, where he took part in the battles of Trenton and Princeton. At the urgent request of Washington he in 1778 accepted the office of quartermaster-general, on the understanding, however, that he should retain the right to command in the field, a right of which he took advantage at the battle of Monmouth, 28th June of the same year, and at the battle of Springfield, 23d June 1780. In August following he resigned his office, and on the 2d of December he superseded Gates in the command of the Southern army. In this position he was soon successful in restoring the demoralized and helpless troops to a condition of thorough vigour and efficiency; and though not always technically victorious in the combats in which he engaged, he arranged his operations in such a masterly manner that the enemy gained little advantage from any victories they obtained, and were never able to baffle him in what was essential to his plans. At the beginning of the campaign he despatched General Morgan to attack the enemy at Cowpens, with a result that was brilliantly successful. Then followed a series of clever retreats to avoid engaging a superior force, until he deemed himself strong enough to attack the enemy at Guilford Court House; and although he here suffered defeat, the British army a few days afterwards retreated towards Wilmington. After following a short distance in pursuit he changed his line of march, and advancing into South Carolina attacked Lord Rawdon at Camden, and again suffered a defeat. But this reverse also failed to impede his energy, and after capturing a number of forts he again engaged Lord Rawdon at the battle of Eutaw Springs, which, though a drawn combat, resulted in the British abandoning South Carolina. For his services in the campaign he was presented with two pieces of captured ordnance, a British standard, and a gold medal. Georgia and North and South Carolina also made him valuable grants of land. He died from sunstroke at his estate of Mulberry Grove, Savannah, June 19, 1786. His *Life and Letters*, 3 vols., edited by G. W. Greene, were published in 1867–71.

GREENE, Robert (1560–1592), dramatist and miscellaneous writer, was born at Norwich about the year 1560. As an eastern counties man (to one of whose plays, *Friar Bacon*, the Norfolk and Suffolk borderland owes a lasting poetic commemoration) he naturally received his education at Cambridge, where he took his B.A. from St John's College in 1578, proceeding M.A. in 1583 from Clare Hall, where it is possible that he had expectations of a fellowship. In 1588 he was incorporated at Oxford, so that on some of his title-pages he styles himself "utriusque Academiæ in Artibus Magister," and Nash humorously refers to him as "utriusque Academiæ Robertus Greene." Between the years 1578 and 1583 he had travelled abroad, according to his own account very extensively, visiting France, Germany, Poland, and Denmark, and learning at first hand to "hate the pride of Italie" and to know the taste of that poet's fruit, "Spanish mirabolanes." Whether on his return he took holy orders, the evidence on the subject is insufficient to determine; according to the title-page of a pamphlet published by him in 1585 he was then a "student in phisicke." Already, however, after taking his M.A. degree, he had according to his own account begun his London life, and engaged in pursuits more congenial to his tastes. He became "an author of playes and a penner of love-pamphlets, so that I soone grew famous in that qualitie, that who for that trade growne so ordinary about London as Robin Greene?" He rapidly sank into the worst debaucheries of the town, though not without being inspired by a passing impulse towards a better life, and derided in consequence by his associates as a "Puritane and Presizian." His marriage, which soon after this took place, failed to steady him; if Francesco, in Greene's pamphlet *Never too late*, is intended for the author himself, it had been a runaway match; but the fiction and the autobiographical sketch in the *Repentance* agree in their account of the unfaithfulness which followed on the part of the husband. He lived with his wife for a while; "but forasmuch as she would persuade me from my wilfull wicked-nes, after I had a child by her, I cast her off, having spent up the marriage-money which I obtained by her. Then left I her at six or seven, who went into Lincolnshire, and I to London," where his reputation as a playwright and writer of pamphlets "of love and vaine fantasyes" continued to increase, and where his life was a feverish alternation of labour and debauchery. He tells us how in the end he was friendless "except it were in a fewe alehouses," where he was respected on account of the score he had run up. When the end came he was a dependant on the charity of the poor and the pitying love of the unfortunate. Henri Murger has drawn no picture more sickening and more pitiful than the story of Greene's death, as told by his Puritan adversary, Gabriel Harvey—a veracious though not an unprejudiced narrator. (Greene had stung his vanity by an allusion to his paternal origin in the prose-tract of *A Quip for an Upstart Courtier*.) After a banquet where the chief guest had been the dramatist Nash,—an old associate and perhaps a college friend of Greene's, any great intimacy with whom, however, he seems to have been anxious to disclaim,—Greene had fallen sick "of a surfeit of pickle herringe and Rennish wine." At the house of a poor shoemaker near Dowgate, deserted by all except his compassionate hosts and two women,—one of them the mother of his illegitimate son, Fortunatus Greene,—he died, September 2, 1592. Shortly before his death, he wrote under a bond for ten pounds which he had given to the good shoemaker, the following words addressed to his long forsaken wife:—"Doll, I charge thee, by the loue of our youth and by my soules rest, that thou wilte see this man paide; for if hee and his wife had not succoured me, I had died in the streetes.—ROBERT GREENE."

Shortly after Greene's death the dramatist Henry Chettle published a pamphlet from the hand of the unhappy man, entitled *Greene's Groat's-worth of Wit bought with a Million of Repentance*. This ill-starred production may almost be said to have done more to excite the resentment of posterity against Greene's name than all the errors for which he so unctuously professed his (doubtless sincere) repentance. For in it he chose to point the fact of his own conversion by exhorting three of his *quondam* acquaintance to go and do likewise. Of these three Marlowe was one—to whom and to whose creation of "that Atheist Tamberlaine" (perhaps to both author and hero under the name of the latter) he had repeatedly alluded or referred in previous pamphlets. The second was Peele, the third probably Nash. But the passage addressed to Peele contained a transparent allusion to a fourth dramatist, who was an actor likewise, and of whom Greene accordingly thought himself entitled to speak with insolent arrogance as of "an upstart crow beautified with our feathers, that with his *Tygres heart wrapt in a player's hyde* supposes hee is as well able to bombast out a blanke verse as the best of you; and being an absolute Iohannes fac totum, is in his owne conceyt the onely Shake-scene in a countrey." The phrase italicized parodies a passage occurring in *The True Tragedie of Richard, Duke of Yorke*, &c., and retained in Part III. of *Henry VI.* If Greene (as many eminent critics have thought) had a hand in *The True Tragedie*, he must here have intended a charge of plagiarism against Shakespeare. But it seems more probable that, while (as Mr R. Simpson suggested) the upstart crow beautified with the feathers of the three dramatists is a sneering description of the actor who declaimed their verse, the *animus* of the whole attack (as Mr Halliwell-Phillipps explains it) is revealed in its concluding phrase. The "shake-scene," *i.e.*, the *actor*, had ventured to intrude upon the domain of the regular staff of playwrights—their monopoly was in danger!

Altogether not less than thirty-five prose-tracts are ascribed to Greene's prolific pen. To these, which are by no means all of a personal or even controversial character, he owed in his lifetime a great part of his celebrity. Nearly all of them are interspersed with verses; in their themes they range from the "misticall" wonders of the heavens to the familiar but "pernitious sleights" of the sharpers of London. But the most widely attractive of his prose publications were no doubt those to which he more especially refers under the designation of "love-pamphlets," and which, as he tells us, brought upon him the outcry of Puritan censors. In these popular productions he appears very distinctly as a follower of the fashionable euphuistic style, indeed two of them are by their titles announced as a kind of sequel to the mother romance. But though Greene's style shows the same balanced oscillation to and fro, and his diction the same elaborate ornateness, as those of Lyly, he contrives to interest by the matter as well as to attract attention by the manner of his narratives. It is known that on his *Pandosto, the Triumph of Time* (1588) Shakespeare founded his *A Winter's Tale*; in fact, the novel contains the entire plot of the comedy, though some of the subordinate characters in the latter (including the immortal Autolycus) were added by Shakespeare.

In Greene's *Never too late*, announced in its author's unctuous variety of the euphuistic manner as a "Powder of Experience: sent to all youthfull gentlemen" for their benefit, the hero of the Palmer's story is in all probability intended for Greene himself; and this episodical narrative has a vivacity and truthfulness of manner which savour of an 18th century novel rather than of an Elizabethan tale concerning the days of "Palmerin, King of Great Britaine." The experiences of the Roberto of *Greene's Groat's-worth of Wit* are even more palpably the experiences of the author himself, though they are possibly overdrawn—for a born rhetorician exaggerates everything, even his own sins. Much that might be enlarged upon in Greene's manner as a writer of prose fiction shows how already in the Elizabethan age there was a possibility of the English novel anticipating what proved the slow course of its actual development.

For us, however, Greene's name lives chiefly if not solely as that of a dramatist. Only four plays remain to us of which he was indisputably the sole author. The earliest of these seems to be *The History of Orlando Furioso, one of the Twelve Peeres of France*—which has (on unsatisfactory evidence) been dated as before 1586, and is known to have been acted on February 21, 1592. It is a free dramatic adaptation of Ariosto (who in one passage is textually quoted), and contains a large variety of characters and a superabundance of action. Fairly lucid in arrangement and fluent in style, it lacks in the treatment of its main situation—the madness of Orlando—the tragic power to which in truth its author was a stranger. Greene's *Orlando* has been described as "a stepping stone to *Lear* and *Hamlet*," but its priority to Kyd's *Spanish Tragedy* (to which the author of this observation likewise refers) is not proved. Very few dramatists between Sophocles and Shakespeare have succeeded in subordinating the grotesque effect of madness to the tragic; and Greene (the close of whose play is tameness itself) is not among the number.

Of the *Comicall Historie of Alphonsus, King of Aragon*, Henslowe's *Diary* contains no trace. But it can hardly have been first acted long after the production of Marlowe's *Tamburlaine*, which had been brought on the stage at least three years before. For this play—which is oddly enough called "comical," though it contains not a single comic character, and is scarcely unintentionally humorous in the effect of some of its passages—was manifestly written in emulation of Marlowe's tragedy. While Greene cannot have thought himself capable of surpassing Marlowe as a tragic poet, he very probably wished to outdo him in "business," and to equal him in the rant which, since there has been an English theatre, has been sure to bring down at least part of the house. *Alphonsus* is accordingly not less sensational than *Tamburlaine*, and supplied its share of quotations to ancient Pistol. It is a history proper,—a dramatised chronicle or narrative of warlike events,—and a very effective one of its kind. Its fame could never equal that of Marlowe's tragedy; but its composition showed that Greene could seek to rival the most popular drama of the day, without falling very far short of his model.

In the *Honourable History of Friar Bacon and Friar Bungay* (not known to have been acted before February 1592, but very possibly written by 1588) Greene once more attempted to emulate Marlowe; but on this occasion, while producing something very different from the play with which he placed his own in competition, he succeeded in producing a masterpiece of his own. Marlowe's *Doctor Faustus*, which there is every reason to believe suggested the composition of Greene's comedy, is a work which, even in the form in which it has come down to us, reveals the mighty tragic genius of its author; and it was fortunate for Greene's fame that he resolved on an altogether distinct treatment of a cognate theme. Interweaving with the popular tale of Friar Bacon and his wondrous doings a charming idyl (so far as we know, of his own invention), the story of Prince Edward (I.)'s love for the Fair Maid of Fressingfield, he produced a comedy brimful of amusing action and genial fun, and at the same time containing a dramatic love-story of unsurpassed freshness and brightness. *Friar Bacon* remains a dramatic picture of English life with which *The Merry Wives* alone can vie; and not even the ultra-classicism in the similes of its diction can destroy the naturalness which constitutes its perennial charm.

In *The Scottish Historie of James IV.* (not printed till 1598, acted by 1592) Greene seems to have reached the climax of his dramatic powers. The "historical" character of this play is pure pretence, so that one wonders how a Tudor dramatist could have dared to invent a fictitious name and unreal experiences (of a painful kind) for King Henry VII.'s daughter. Its theme is the illicit passion of King James for the chaste lady Ida, to obtain whose hand he endeavours, at the suggestion of a villain called Ateukin, to make away with his own wife. She escapes in doublet and hose, attended by her faithful dwarf; but on her father's making war upon her husband to avenge her wrongs, she effects a reconciliation between them. Not only is this well-constructed story effectively worked out, but the characters are vigorously drawn, and in Ateukin there is a touch of Iago. The fooling by Slipper, the clown of the piece, is unexceptionable; and lest even so the play should hang heavy on the audience, its action is carried off by a "pleasant comedie"—i.e., a prelude and some dances between the acts—"presented by Oboram, King of Fayeries"—the Oberon of *A Midsummer Night's Dream* (probably later in date than Greene's play).

It is hard to have to abandon the belief that *George-a-Greene the Pinner of Wakefield* (printed 1599), a delightful picture of English life fully worthy of the author of *Friar Bungay*, has been rightly attributed to him. Of the comedy of *Fair Em*, which resembles *Friar Bacon* in more than one point, it is most improbable that Greene was the author. The disputed question as to his supposed share in the plays on which the Second and Third Parts of *Henry VI.* are founded has been already referred to. He was certainly joint author with Thomas Lodge of the curious drama called *A Looking Glass for London and England* (printed 1594)—a dramatic apologue addressing to the living generation of English-men the warning of Nineveh's corruption and prophesied doom. The lesson was frequently repeated in the streets of London by the "Ninivitical motions" of the puppets; but there are both fire and wealth of language in Greene and Lodge's oratory. The comic element is not absent, being supplied in abundance by Adam, the clown of the piece, who belongs to the family of Slipper and of Friar Bacon's servant, Miles.

Greene's dramatic genius has nothing in it of the intensity of Marlowe's tragic muse; nor perhaps are there any passages in his poetry equalling certain of Peele's when at his best. On the other hand, of none of Shakespeare's predecessors or contemporaries can it be said, as of Greene, that his dramatic poetry is occasionally animated with the breezy freshness which no artifice can simulate, but which nothing but obtuseness can mistake. He can construct neatly and with facility, though of course belonging to a period of our dramatic literature when the art of construction was still in its infancy. He has created no character of commanding power—unless Ateukin be excepted; but his personages are living men and women, and marked out from one another with a vigorous but far from rude hand. His comic humour is undeniable, and he unites a spirit of true farcical fun with a capacity for light and graceful dialogue. His diction is overloaded with classical ornament; but even this he frequently employs with pleasing aptness. His versification is easy and fluent; and its cadence is at times singularly sweet. He creates his best effects, like a true artist, by the simplest means; and he is indisputably one of the most gifted and one of the most pleasing among our early dramatic authors.

The best account of Greene and his writings (including a list of all his prose tracts) is that by the late Mr Dyce, prefixed to his edition of *The Dramatic and Poetical Works of Robert Greene*, 1 vol., 1861; the 2 vol. edition was published in 1831. It contains copious extracts from *Pandosto*, and from other prose-writings by Greene. *Greene's Groatsworth of Wit* is printed in part i. of Dr Ingleby's *Shakspeare Allusion-Books* (*New Shakspere Society's Publications*, 1874). Dr Ingleby's general introduction, and a supplement by the late Mr Richard Simpson, as well as the observations in Mr Simpson's *School of Shakspere*, will be of great value to readers of Greene. W. Bernhardi's *Robert Greene's Leben und Schriften* (Leipsic, 1874) is an essay full of useful research; and Prof. J. M. Brown of Christchurch, New Zealand, has contributed a spirited, but at the same time judicious, criticism of Greene to the *New Zealand Magazine* for April 1877. A Russian monograph on him by N. I. Storozhenko (Moscow, 1878) is described as perhaps the fullest hitherto published. *Friar Bacon and Friar Bungay* has been edited, together with Marlowe's *Doctor Faustus*, for the Oxford Clarendon Press (1878). (A. W. W.)

GREENFINCH (German *Grünfink*) or GREEN LINNET, as it is very often called, a common European bird, the *Fringilla chloris* of Linnæus, ranked by many systematists with one section of Hawfinches, *Coccothraustes*, but apparently more nearly allied to the other section *Hesperiphona* (*cf.* FINCH, vol. ix. p. 192), and perhaps justifiably deemed the type of a distinct genus, to which the name *Chloris* or *Ligurinus* has been applied. The cock, in his plumage of green and gold, is one of the most finely coloured of our common birds, but he is rather heavily built, and his song is hardly commended. The hen is much less brightly tinted. Throughout Britain, as a rule, this species is one of the most plentiful birds, and is found at all seasons of the year. It pervades almost the whole of Europe, and in Asia reaches the river Ob. It visits Palestine, but is unknown in Egypt. It is, however, abundant in Mauritania, whence specimens are so brightly coloured that they have been deemed to form a distinct species, the *Ligurinus aurantiiventris* of Dr Cabanis, but that view is now generally abandoned. In the north-east of Asia and its adjacent islands occur two allied species—the *Fringilla sinica* of Linnæus, and the *F. kawarahiba* of Temminck. No species of Greenfinch is found in America. (A. N.)

GREENHEART, one of the most valuable of timbers, is the produce of *Nectandra Rodiæi*, nat. ord. *Lauraceæ*, a tree which grows to a height of 70 feet, native of Guiana, where, inland, it exists in great abundance. The Indian name of the tree is Sipiri or Bibiru, and from its bark and fruits is obtained the febrifuge principle Bibirine (see BIBIRINE). Greenheart wood is of a dark green colour, sap wood and heart wood being so much alike that they can with difficulty be distinguished from each other. The heart wood is one of the most durable of all timbers, and its value is greatly enhanced by the fact that it is proof against the ravages of many marine borers which rapidly destroy piles and other submarine structures of most other kinds of wood available for such purposes. In the Kelvingrove Museum, Glasgow, there are two pieces of planking from a wreck submerged during eighteen years on the west coast of Scotland. The one specimen—greenheart—is merely slightly pitted on the surface, the body of the wood being perfectly sound and untouched; while the other—teak—is almost entirely eaten away. Greenheart, tested either by transverse or by tensile strain, is one of the strongest of all woods, and it is also exceedingly dense, its specific gravity being about 1150. It is one of the few woods included in the first class of Lloyd's Register for shipbuilding purposes, and it is extensively used for keelsons, beams, engine-bearers, and planking, &c., as well as in the general engineering arts, but its excessive weight unfits it for many purposes for which its other properties would render it eminently suitable.

GREENLAND, or GRONLAND, is the name applied to a large continental island, the greater portion of which lies within the Arctic Circle, and all of which is arctic in character (see vol. i., Plate X.). It is entirely unconnected with any portion of Europe or America, though in the extreme north only separated from the latter by the narrow strait which lies between it and the outlying portion of America known as Grinnell Land. From Europe it is divided by the North and Greenland Seas,—the Faroe Isles, Jan Mayen Island, Iceland, and part of Shetland being the only lands between it and Norway. Denmark Strait is the sea between it and Iceland, and it is more than probable that Spitzbergen is the only great group of islands lying to the east of its northern portion. On the west, Davis Strait and Baffin's Bay separate it from the opposite shore. The latter sea narrows to the north into the gulf generally known as Smith Sound, though, in reality, Kane Sea, Kennedy Channel, Hall Basin, and Robeson Channel are the names which have been successively applied in the progress of exploration to the northern continuations of the sound so named more than two hundred years ago by William Baffin. The exact northern termination of Greenland is not known, the country never having been doubled on the north; but we know enough from the explorations of Markham, Beaumont, and other officers of Nares's expedition, to lead to the conclusion that the ice-encumbered Polar Ocean washes around the headlands of the broken country which forms its supposed limits in about 83° N. lat.

From Cape Farewell, or [illegible], an island lying about 18 miles from Frederiksdal, the most southern Danish post on the west, to Cape Britannia is about 1550 miles; and the greatest breadth of Greenland is about 77° 30′ N. lat. measuring from the one coast to the other. The length is fully 3100 miles along; but so little is the country known with accuracy, and so broken is it by fjords and coast-lying islands, that any accurate estimate of its area is impossible. Then Dr Rink, who has been connected with the government in various capacities for upwards of thirty years, estimates its area at 512,000 square miles. This estimate allows 192,000 square miles for what has been called the outskirts—or what is uncovered by ice—with their fjords, and 320,000 for the interior believed to be almost entirely covered by a glacier.

On the east coast, Cape Bismarck, in 76° 47′ N. lat., marks the limit of exploration: though as early as 1670 Lambert is said to have sighted land several degrees further north. From Cape Bismarck south to Cape Farewell (59° 35′ N. lat.) the coast is very imperfectly known, whole stretches being entirely uncharted, even in the rudest fashion. This arises from the Spitzbergen ice-stream continually pouring down that shore, rendering it possible to approach within sight of it only on rare occasions, and to land still more rarely. Yet, from the explorations of Hall and Lindenow in early times, and those in this century by Scoresby,[1] Graah,[2] the German expedition,[3] and Mourier (1879), we know its general features. These are—high beetling cliffs, great glaciers creeping down to the sea, and deep inlets, like Scoresby Sound and Franz Josef Fjord, penetrating the land for distances which cannot as yet be definitely stated. A number of islands also are dotted over the chart here; but there are few "ice fjords," the slope of the inland ice being evidently chiefly towards the west coast. The west coast is of much the same character,—only, on this side, the fjords with which it is intersected have been nearly all followed to their heads. Many of them stretch several miles into the interior, and the greater number are ended by glacier prolongations of the "inland ice," which discharge icebergs; these are known as "ice fjords." The Greenland fjords, like those of Norway, British Columbia, and other countries with a western exposure, bear every mark of having been at one time the beds of glaciers, when the climate and physical geography of the country were different from what they are at present. The country cannot be said to be mountainous, yet heights of from 3000 to 4000 feet are common, and the aspect which the coast presents is that of high cliffs,—black when steep, white where the snow can lie; snow for eight or nine months in the year on even the lower lands; icebergs and broken floe ice floating off the coast; an "ice foot" attached to the shore early in the spring; and glaciers peeping down through the valleys between the cliffs and fjelds. There are one or two still higher points, such as Petermann's Peak—near the shores of Franz Josef Fjord on the east coast (11,000 feet), Payer's Peak, Sukkertoppen, and the familiar Sanderson's Hope. With the exception of Disco, there are no large islands; but the bays, fjords, straits, and peninsulas of this extremely broken coast are so numerous that it is needless mentioning them by name.

The Interior Topography.—The Danes divide Greenland into two physical divisions—the "outskirts" and the "inland ice." The first comprises the coast-lying land, the latter the interior. If we ascend any considerable eminence on the west coast, and look eastward, we do not find mountains and valleys as in most other countries, but only one huge, seemingly endless, expanse of glacier ice gradually rising towards the east, until the view is bounded by a white horizon. If we cross the coast-lying land, which varies in breadth from a few miles to twenty, or in a few cases much more, we come to this "inland ice," generally in the form of a glacier offshoot of it which has crept down into a fjord, or is making its way to the sea in one of the many valleys lying between two high cliffs, noisy with mollemokes or with the weird scream of cor- [illegible], which at various sheltered places have colonies in these "fuglefjelde." In the former case the glacier usually presents a steep wall facing the sea, from which great fragments of ice are continually breaking off, or the icebergs being detached by the force of the sea; then it is "Sermiksoak"—the "great ice wall"—of the Eskimo. In the latter case it presents a slope on which the explorer

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[1] *Journal of a Voyage to the Northern Whale Fishery* (1823).

[2] *Narrative of an Expedition to the East Coast of Greenland*, trans. by G. Gordon Macdougall (1837).

[3] *Die zweite deutsche Nordpolarfahrt* (1873-74).

[illegible], and extend into the interior over the inland ice, of which it is a projecting arm. A little way eastward, the covering is found to be hard glacier ice, rising by a gentle slope, covered in the winter and beginning with a thick coating of snow, which partially melts during the summer, forming considerable lakelets on the surface of the ice, or rushing over it in the shape of streams that thunder down the deep crevasses which divide it here and there as in ordinary glaciers. No sign of living thing is seen on it save patches here and there of a low order of plants associated with or allied to the "red snow" (*Ancylonema Nordenskiöldii*,[1] *Protococcus* [illegible], *P. nivalis*, and *Sphærella* [illegible]), no moraines of any description, showing that the ice could not have impinged on land in its travels, and no sign of the ice having come in contact with any other physical influence save that of the atmosphere, unless the presence here and there in hollows of the minute powder-like mineral "kryokonite" is to be considered an exception. The few explorers who have ever attempted to penetrate this terrible waste all give the same account.[2] Travel eastward, and nothing but ice—rough, crevasse-torn, white, earthless, moraineless, lifeless—is seen, until, in the far distance, the view is bounded by a dim, misty horizon of ice, which, at a distance of about 30 miles inland, rises to a height of 2000 feet above the sea. North is ice; south is ice; and behind are seen the "outskirts," or ice-bare islands. The only exception to this general statement is to be found in the fact that here and there the ice has licked in and surrounded, but not yet covered, bits of high land near the coast, which stand out black amid the surrounding icy whiteness. Such an island in the ice is known to the Greenlanders as a "nunatak." A noted one has long been known to exist some 50 miles east of the westward edge of the inland ice north of Frederikshaab. It was long supposed to be merely the east coast mountains, the country being narrow at this point; but the explorations of Lieut. Jensen, R.D.N., in July and August 1878, prove it to be a peak 5000 feet high,—about 3000 feet above the surrounding ice,—entirely isolated. On the other side of this mountain ridge the great ice field was observed stretching without interruption as far as the eye could see, the plateau apparently rising higher and higher to the east,[3] which may account for the fact that the German explorers did not notice the inland ice in their explorations of Franz Josef Fjord. The high peak only proves that, though in the course of ages the winter snow, unmelted by the summer heats, has got compressed into the glacier sheet which has covered the interior, and is partially discharging its surplus in the form of icebergs on the coast, it has not yet accumulated to such depths as to overwhelm these elevated places. It may, however, do so in time; for, though it is clear that at one time the climate of Greenland was very different from what it is now, it is equally evident that at no very distant date the ice overlapped much of the now uncovered outskirts. The so-called "glaciers" which reach the sea are long or short, broad or narrow, according to the character of the valley through which they creep seaward. Thus a coast "glacier," so called, may be 40 miles broad, like the Great Glacier of Humboldt, or only a few yards, like most of the others in Greenland. When the glacier reaches the sea it ploughs along the bottom, until, by the force of the water, its end is buoyed up and finally broken off in the shape of an iceberg, which is carried by the winds and currents out to sea to be in time again melted and absorbed into the ocean whence it originally sprang. If, on the contrary, the sea is shallow, the glacier will protrude for a considerable distance, as in the case of the Isblink, a little north of the fishing station of Avigait (62° 32′ N. lat.), which is a low sandy beach projecting about 8 miles in front of the inland ice, and forming a breakwater against the force of the waves. From under the Arctic glacier pours, as in the Alpine ones, a muddy stream, which silts up some of the fjords, and forms deposits identical with the laminated glacial clays of Britain. Such, in brief, is the inland ice of Greenland, which has been known since the days of Fabricius,[4] but has only been recently generally recognized, and even yet is imperfectly understood in its all important bearings on the study of ancient glacial remains.

Geology.—So far as made out, the structure of explored Greenland is as follows:—

(1.) *Laurentian gneiss* forms the greatest mass of the exposed rocks of the country bare of ice. They are found on both sides of Smith Sound, rising to heights of 2000 feet, and underlie the Miocene and Cretaceous rocks of Disco Island, Noursoak Peninsula, and the Oolites of Pendulum Island in East Greenland. It is possible that some of these rocks are also of Huronian age, but it is doubtful whether the rocks so designated by the geologists of the "Alert" and "Discovery" expedition are really the rocks so known in Canada, or are a continuous portion of the fundamental or oldest gneiss of the north-west of Scotland and the Western Isles.

(2.) *Silurian.*—Upper Silurian, having a strong relation to the Wenlock group of Britain, but with an American facies, and Lower Silurian, with a succession much the same as in British North America, are found on the shores of Smith Sound, but not as yet so far south as the Danish possessions.

(3.) *Devonian* rocks are believed to occur in Igaliko and Tunnudiorbik Fjords, in S.W. Greenland, but as they are unfossiliferous sandstone, rapidly disintegrating, this cannot be known. It is, however, likely that this formation occurs in Greenland, for in Dana Bay, Capt. Feilden found a species of *Spirifera*, and *Productus mesolobus* or *costatus*, though it is possible that these fossils represent the "Ursa stage" (Heer) of the Lower Carboniferous. But a few Devonian forms have also been recorded from the Parry Archipelago, which tends to confirm belief in the existence of a sporadic Devonian formation in Greenland.

(4.) *Carboniferous.*—In erratic blocks of sandstone, found on the Disco shore of the Waigatt, have been detected a *Sigillaria* and a species of either *Pecopteris* or *Gleichenia*, perhaps of this age; and probably much of the extreme northern coast of Grinnell Land, and therefore, in all likelihood, the opposite Greenland shore, contains a clearly developed Carboniferous Limestone fauna, identical with that so widely distributed over the North American continent, and referable also to British and Spitzbergen species. Of the Coal Measures above these, if they occur, we know nothing at present. Capt. Feilden notes as suggestive that, though the explorers have not met with this formation on the northern shores of Greenland, yet it was observed that a continuation of the direction of the known strike of the limestones of Feilden peninsula, carried over the polar area, passes through the neighbourhood of Spitzbergen, where the formation occurs, and contains certain species identical with those of the Grinnell Land rocks of this horizon. The facies of the fossils is, according to Mr Etheridge, North American and Canadian, though many of the species are British. The corals are few in number, but the *Molluscoida* (*Polyzoa*) are more numerous in species and individuals. No Secondary rocks have been discovered in the extreme northern parts of West Greenland, but they are present on the east and west coasts in more southerly latitudes than Smith Sound.

(5.) *Jurassic.*—These do not occur on the west coast, but on the east coast the German expedition discovered marls and sandstones on Kuhn Island, resembling those of the Russian Jurassics, characterized by the presence of the genus *Aucella*, an ammonite (*Perisphinctes Payeri*), *A. striolaris*, *Belemnites Panderianus*, *B. volgensis*, *B. absolutus*, and a *Cyprina* near to *C. syssolæ*. On the south coast of the same island are coarse-grained, brownish micaceous, and light-coloured calcareous sandstone and marls, containing fossils, which render it probable that they are of the same age as the coal-bearing Jurassics of Brora, Skye, and Mull (Scotland), and the Middle Dogger of Yorkshire. There is also coal on Kuhn Island.

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[1] Berggren, *Öfv. Kongl. Vet. Akad. Förh.*, 1871, p. 293.

[2] Full accounts of these explorations are given by Brown in *Arctic Papers of the R. G. S.* (1875), and in "Das Innere von Grönland" (*Petermann's Mittheilungen*, 1871), as well as in "Physics of Arctic Ice" (*Quarterly Journal of the Geol. Soc.*, 1870).

[3] [illegible], *Deutsche Geog. Blätter*, 1878; *Dansk* [illegible] 1879, &c.

[4] *Fauna Grœnlandica* (1780), p. 1; Nordenskjöld, *Redogörelse för en Expedition till Grönland*, 1870 (1871), also translated in *Geol. Mag.* (1872), and Nordenskjöld's *Arctic Voyages* (1879); Rink, "Om Grønlands Indland" (No. 9, *Fra Videnskabens Verden*, 1875), *Danish Grønland geographisk og statistisk beskrevet* (1857), Helland, [illegible] *Nordgrønland*, [illegible], and the various works and memoirs cited by Brown in *Arctic Papers of R. G. S.* (1875).

(6.) *Cretaceous.*—Beds of this age, consisting of sandstones and coal, are found on the northern coast of Disco Island, and the southern side of the Noursoak Peninsula, the beds in the former locality, "the Kome strata" of Nordenskiöld, being the oldest. They reach 1000 feet in thickness, occupying undulating hollows in the underlying gneiss, and dip towards the Noursoak Peninsula at 20°, when the overlying Atanekerdluk strata come in. Both these series contain numerous plant remains, evergreen oaks, magnolias, aralias, &c., and seams of lignite coal, which is burnt; but in neither occur the marine beds of the United States. Still, the presence of dicotyledonous leaves, such as *Magnolia alternans*, in the Atanakerdluk strata, proves their close alliance with the Dakota series of the United States. The underlying Kome beds are not present in the American series. They are characterized by the cycads *Zamites arcticus*, and *Glossozamites Hoheneggeri*, which also occur in the Urgonian strata of Wernsdorf.

(7.) *Miocene.*—This formation, one of the most widely spread in polar lands, though the most local in Greenland, is also the best known feature in its geology. It is limited to Disco Island, and perhaps to a small part of the Noursoak Peninsula, and the neighbouring country, and consists of numerous thin beds of sandstone, shale, and coal,—the sideritic shale containing immense quantities of leaves, stems, fruit, &c., as well as some insects, and the small pieces of retinite. The study of these plant and insect remains shows that forests containing a vegetation very similar to that of California and the southern United States, in some instances even the species of trees being all but identical, flourished in 70° N. lat. during geological periods comparatively recent. These beds, as well as the Cretaceous series, from which they are as yet only imperfectly distinguished, are associated with sheets of basalt, which penetrate them in great dykes, and in some places, owing to the wearing away of the softer sedimentary rocks, stand out in long walls running across the beds. These Miocene strata have not been found further north on the Greenland shore than the region mentioned, but in Lady Franklin Bay, on the Grinnell Land side of Smith Sound, they again appear, so that the chances are they will be found on the opposite coast, though doubtless the great denudation Greenland has undergone and is undergoing has destroyed many of the softer beds of fossiliferous rocks. On the east coast, more particularly in Hochstetter Foreland, the Miocene beds again appear, and we may add that there are traces of them even on the west coast, between Sonntag Bay and Foulke Fjord, at the entrance to Smith Sound. It thus appears that since early Tertiary times there has been a great change in the climate of Greenland.

(8.) *Post-Tertiary Beds.*—These consist of raised sea-beaches found along the whole coast of Greenland, containing *Mollusca* and other organic remains, identical with those living in the neighbouring sea. These terraces are very marked on the shores of Smith Sound, and are believed to be proof of the gradual elevation of the land in that quarter, [illegible] being known to be going on all round the [illegible]. Within the Danish possessions, however, the [illegible] within the memory [illegible] longer habitable, and other localities which, when the Danes first came to the country a century and a half ago, [illegible].

[illegible] there are numerous [illegible] which [illegible] found [illegible] Few of these are of [illegible] importance. *Graphite* is found in great abundance, particularly on an island [illegible] the [illegible] of it has proved unprofitable [illegible] at present [illegible] European and American [illegible] on the shore of Arsuk Fjord in 61° [illegible] N. lat. [illegible] with [illegible] tin, [illegible] of [illegible] have been found [illegible]

[illegible]

Miocene beds, is found in the districts about Disco Bay and Umenak Fjord, but it is only mined to the extent of 40 or 50 tons per annum, for use in the houses of the Danish officers, unless when an exploring ship refills with it. The coal of Kuhn island is Jurassic.[1]

Climate.—The southern part has a climate much the same as the northern shores of Norway and Iceland; further north the temperature decreases with the increase of latitude, while the severity of the winter season is intensified by the country being shrouded for several months in the year in darkness,—in the far north seldom even relieved by the rare displays of the aurora, though the starlight and moonlight are brilliant beyond what the inhabitants of lower latitudes are accustomed to. Again, during the summer there is an equally long continuance of the sun above the horizon. Spring and autumn are disagreeable, rain, sleet, and snow being frequent, while, the sea not being frozen over, travelling becomes difficult. In North Greenland sledging along the ice-covered coast is pleasant during the winter, but in the south the sea is not continuously congealed; hence no dogs are kept, and the winter exercise of the sometimes scurvied residents is confined to within a few yards of the houses, when the great depth of snow will admit even of this. The climate is very uncertain—the weather changing suddenly from bright sunshine, with swarms of mosquitoes enjoying their brief holiday, to dense fog, driving in clouds around the headlands and even heavy falls of snow accompanied by icy cold winds. At Julianehaab the mean annual temperature is about 33° Fahr., and at Upernivik, 13°. In January, at Van Rensselaer Harbour, Kane experienced as low a temperature as −[illegible] Fahr. At Sabine Island, on the east coast, the temperature is much the same at the same periods as on the opposite west coast, except in the month of December. Again, at Upernivik the mean temperature of the three summer months is 35°; at Julianehaab it is 48°; and for the three winter months respectively −7° and 20°. The winter at Julianehaab is not much colder than that of Norway and Sweden in the same latitude, but its mean temperature for the whole year is like that of Norway 600 miles farther north. In other words, its winter is not severe but its summer is cold, and, so far as the summer goes, the same generalization may be made regarding all Greenland. In the most northern settlements a temperature of 52° is oppressive, but until the thermometer falls to −25° no one complains of extreme cold. At Upernivik (72° 48′ N. lat.) the highest temperature that has been noted is 59°. At Julianehaab 68° has once been recorded, perhaps the highest known Greenland heat. Often in January and February a peculiar warm wind or "föhn" begins to blow, raising the temperature to 42°. On the other hand, at Upernivik, in July a day was observed with a mean temperature below 32°, and a single observation in the same month has shown 27½° Fahr. The prevailing winds, the "föhn,"[2] which blows from points between true E.S.E. and true E.N.E., excepted, follow the direction of the coast, "blowing from the south with snow and rain, and from the north clearing the sky, or in summer frequently accompanied by mist." Mirage, parhelia, paraselenæ, anthelia, and auroral displays are common. There is less snow in the north than in the south. At Julianehaab it once snowed in June continuously for thirty-six hours, and in 61° N. lat. not a single drop of rain fell from September 27, 1862, to May 20, 1863, on which day the snow had attained a depth between the houses of from 8 to 20 feet.[3] The temperature of the soil at Godthaab, 4 feet under the ground, only varied between the extremes of [illegible] in March and [illegible] Fahr. in September (Rink).

Animals and Plants.—The fauna and flora are essentially European, [illegible] America. This fact [illegible] Davis Strait and Baffin's Bay [illegible] old [illegible] Greenland having been connected with Europe at a comparatively recent geological period. Possibly the islands between Norway and Greenland [illegible] over which the Lapland plants and [illegible]. With one or two exceptions [illegible] the plants and animals of the east coast [illegible] those of the west, though the [illegible] of European animals and plants on the

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[1] [illegible] Heer, *Flora Fossilis Arctica*, vol. i. p. 5, and Brown, *Trans. Geol. Soc. Glasgow*, vol. v. p. 43; [illegible] *Mag.*, [illegible] 1877, [illegible] and [illegible], *Quart. Journ. Geol. Soc.*, [illegible] Kalkmann [illegible], vol. [illegible] p. [illegible] [illegible] 1874, p. 17, and 187[illegible] p. [illegible] [illegible] *Meddelelser om Grønland*, [illegible] Steenstrup (1877), &c.

[2] [illegible] *Mag.*, 1877, p. 225; Nares, *Voy.*, p. 316.

[3] [illegible] ed. (1877), [illegible] the [illegible] Copenhagen [illegible] pp. [illegible] *Zeit.*, 1872, [illegible]

[illegible] [illegible] [illegible] [illegible] of America [illegible]. [illegible] [illegible] from the Old [illegible] [illegible] [illegible] [illegible], the [illegible] [illegible], [illegible] [illegible], the [illegible] [illegible] white bear, [illegible], [illegible] species of seals, [illegible] [illegible] the [illegible], the [illegible], the right whale, [illegible] species of [illegible], the [illegible] whale, [illegible], the [illegible] whale, [illegible], porpoise, [illegible] [illegible], [illegible] [illegible] and the sword fish. [illegible] [illegible] [illegible] [illegible] are not found as far north as [illegible] [illegible]. [illegible] the [illegible] of South [illegible] [illegible] [illegible] the same latitude, but do not [illegible] [illegible] [illegible] [illegible] are that they have [illegible] [illegible] the [illegible] of the country, and are kept from [illegible] [illegible] [illegible]. The [illegible], goat, sheep, and [illegible] [illegible], and [illegible] as far north as [illegible], [illegible] [illegible]. Goats, sheep, and oxen live [illegible] the [illegible] [illegible] in the extreme south; in the north there are none. A few pigs are kept at Ivigtut. The right whale [illegible] [illegible] of the coast of Greenland, the whalers [illegible] [illegible] to the fishing grounds further north and west. The [illegible] at Holsteinsborg still occasionally harpoon one or two, but the industry is a mere shadow of what it once was. The [illegible], one of the fin-whales, is now and then killed, but the narwhal and white whale form the staple "fishery" of the Greenlanders. Of seals it has been calculated that there are annually captured 51,000 of the floe rat (*Phoca hispida*), between [illegible] and [illegible] of the kastigak (*P. vitulina*), 23,000 saddlebacks (*P. groenlandica*), [illegible] of the ugsuk or thong-seal (*P. barbata*, the great or "grown" seal of the English sealers), and 3000 of the bladdernose (*Cystophora cristata*). About 200 walruses, 600 white whales, 100 narwhals, a few porpoises, on an average one right-whale in the season from December to March, when it goes as near the coast as the ice will permit in the south, and two or three humpbacks (*Megaptera longimana*), are killed. The other whales are rare, and are captured only under peculiar circumstances. The average catch of the Greenlanders thus amounts to 89,000 seals, 700 white whales and narwhals, and 2 or 3 large whales. Of these seals it may be stated that 38,000 have been caught with harpoons and bladders, 38,000 killed by fire-arms, and 13,000 caught in nets. The polar bear is almost extinct,—about 50 being annually killed in the north, or in the south when they have floated from the east coast on the Spitzbergen heavy ice which doubles Cape Farewell and [illegible] on the coast south of 62° N. lat., or occasionally in the intervening space where a wandering bear has been carried south on a broken-up floe. The reindeer, once killed in enormous quantities, is sharing the fate of the bear. Between 1845 and 1849 about 25,000 were shot annually, and 16,000 skins were exported. In 1872 there were not more than 1000 killed, and only 6 skins exported. It is now rarely seen in Mid Greenland. The number of foxes trapped averages 1500 per annum; in 1874 5000 were caught, chiefly between 60° and 61° N. lat. About 1000 white hares are killed. The true bird denizens of Greenland cannot be given at higher than 63, while 62 others are reported as stragglers. Of the denizens 5 belong to the Old World, 11 to the New World, 45 are common to both worlds, and 2 are doubtful.[1] Only the raven, ptarmigan, hawk, owl, and a [illegible] sea-birds are resident all the year round; the rest are migratory. The ptarmigan is killed for food to the extent of about 12,000 per annum, while the number of eider ducks destroyed is so enormous that the export of eider down has fallen within the last twenty years from 5000 to 2000 ℔. Rink estimates the number killed annually at 20,000, and that of auks and smaller sea-fowl at 50,000. The eggs taken yearly, chiefly those of eider ducks, has been estimated at 50,000. Of the 79 or 80 fishes recorded from Greenland very few are peculiar to it; of these the shark ([illegible] [illegible]) is caught for the sake of the oil obtained from its liver, to the extent of from 16,000 to 20,000 per annum. The cod is a migratory fish, and is caught on the banks to the extent of [illegible] per annum, chiefly by the natives. A few salmon trout (*Salmo [illegible]*) are caught in the little lakes and streams, while the large and small halibut, the red fish (*Sebastes*), and the lumpsuck (*Cyclopterus lumpus*) form a considerable portion of the food of the natives. The capelin (*Mallotus villosus*) is caught in enormous quantities (over 1½ million ℔ are dried annually), while a few smaller fish and mussels complete the tribute which the natives take from the sea laving their barren shores. There are no reptiles or amphibians in Greenland, and the lists of invertebrata contain little of general interest.[2]

The vegetation in the height of summer is, in favourable situations, profuse in individual plants, but scanty in species. The plants are of the [illegible] type, and identical with or allied to those found in Lapland or on the summits of the highest British hills. Forest there is none in all the country. In the north, where the glacier-covered or ice-shaven rocks do not protrude, the ground is covered with a carpet of mosses, creeping dwarf willows, crowberries, bilberries, and similar plants, while the flowers most common are the andromeda, the yellow poppy, pedicularis, pyrola, the Alpine rose (rhododendron), saxifrages (12 species), drabas, dryas, &c.; but in South Greenland there is something in the shape of birch,—the dwarf birches even rising a few feet in very sheltered places,—and the vegetation is less arctic and more abundant. Altogether, 361 flowering plants, ferns, horse-tails, quillworts, and club mosses have been described, while the lists of cryptogamic plants, though very imperfect, show a profuse vegetation of the lower orders.[3] No crops, in the strict acceptation of the term, are cultivated in Greenland, but at Godthaab attempts have been made to grow turnips, radishes, lettuce, and chervil in little gardens made with earth brought from the site of old Eskimo houses. Potatoes never grow larger than small marbles, while pease only produce seeds barely recognizable. At Nanortalik strawberries have been produced in a forcing frame, carrots matured tolerably well, and turnips have been grown weighing half a pound. Rhubarb grew vigorously, but could not be raised from seed, while cabbage leaves, under the most favourable circumstances, were poor and flavourless. In the north, radishes represent the highest triumph which horticulture has achieved. Flowers, owing to the long sunlight, grow very well indoors, but require great care, otherwise they soon die.

Government.—Excluding the extreme nortnern parts of Greenland, and the north-east coast,—which may be claimed by the English, American, and Germans "by right of discovery,"—the trade of Greenland is a strict monopoly of the Danish crown, dating from 1774, and is at present administered in Copenhagen by a Government board,—the "Kongelige Grönlandske Handel,"—and in the country by various officials in Government pay. In order to meet the double purposes of government and trade, the west coast, up to nearly 74° N. lat., is divided into two inspectorates,—the southern extending to 67° 40′ N. lat., the northern comprising the rest of the country,—their respective seats of government being at Godthaab and Godhavn. These inspectorates are ruled by two superior officials or governors responsible to the director of the board in Copenhagen. Each of the "inspectorates" is divided into "districts," each district having, in addition to the capital or "coloni" (a hamlet containing three or four Danish dwellings, a storehouse, blubber-boiling house, in a few cases a Lutheran "missionair" or clergyman, a teacher, and a physician), several outlying posts and Eskimo hunting stations, each presided over by an "udligger," who is responsible to the "colonibestyrer" or superintendent of the district. These trading settlements, which dot the coast for a distance of 1000 miles, are about 60 in number, and collect the products from 176 inhabited places. From these Eskimo hunting and fishing stations blubber is the chief article received, in parcels weighing from 50 to 100 ℔, and forwarded in casks to the "coloni," where it is boiled into oil, and prepared for being despatched to Copenhagen by means of the Government sailing ships, which arrive and leave between May and November. For the rest of the year all navigation is stopped, though the winter months form the busy seal-killing season. The principle which the Government acts upon is to give the natives low prices for their produce, but to sell them European articles of necessity at prime cost, and other stores, such as bread, at prices which will scarcely pay for the purchase and freight, while no merchandize is charged, on an average, more than 20 per cent. over the cost price in Denmark. In addition, the Greenland people are allowed to order goods from private dealers, on paying freight for them at the rate of 2½d. per 10 lb, or 1s. 6d. per cubic foot. The prices to be paid for European articles are fixed every year, the prices current in Danish and Eskimo being printed and distributed by the Government. According to a calculation, founded on the average of the last few years, about 22 per cent. of the value in the European market is paid for the products in Greenland. Out of the payment five-sixths are given to the sellers, and one-sixth devoted to the Greenlander's public fund, spent in "public works," in charity, and on other unforeseen contingencies. The object of the monopoly is solely for the good of the Greenlanders,—to prevent spirits being sold to them, and the vice, disease, and misery, which usually attend the collision between civilization of the trader's type and barbarism, being introduced into the primitive arctic community. The inspectors are, in addition to being trade superintendents, magistrates, but serious crime is practically unknown; while the cases of theft which have occurred within a decade are so few that they are held in recollection as historical events. The "vices of civilization" are few, and its diseases unknown. The Danish officials are mostly men of considerable intelligence, and all of good character, though their pay is small. The inspector receives £328 and a residence; the average salaries of the 11 "colonibestyrere" are £250, of the 18 clerks—"assistants" or "volunteers"—£106, besides residence, fuel, and attendance. In addition there are about 182 "udliggers," seamen, mechanics, &c., each receiving an average of £25 a year, besides, in the case of the outpost traders, a percentage on their trade. Though the officials are all-powerful, yet, owing to the exertions of Dr Rink, local councils or "parsissaet" were organized in 1857 in every district. To these parish parliaments delegates are sent from every station,—shrewd men, wise in council, and well acquainted with the wants of the Greenlanders. These "parsissoks"—elected at the rate of about one representative to 120 voters—wear a cap with a badge (a bear rampant), and aid the European members of the council in distributing the surplus profit apportioned to each district, and generally in advising as to the welfare of that part of Greenland under their partial control. In 1873 there were deposited, in a savings bank established in Greenland, £200 as contributions for the support of illegitimate children; £199, 10s., sums gained by inheritance or by other unforeseen circumstances; £791, savings from wages, chiefly those of the Europeans; and £121, savings of the Eskimo, or half-bloods. But thrift is the least prominent feature in the Eskimo character. The "municipal council" has the disposal of 20 per cent. of the annual profits made on produce purchased within the confines of each district. It holds two sessions every year, and the discussions are entirely in the Eskimo language. In addition to their functions as guardians of the poor, the parish M.P.'s have to investigate crimes and punish misdemeanours, settle litigations and divide inheritances. They can impose fines for small offences not worth sending before the inspector, and, in cases of high misdemeanour, have the power of inflicting corporal punishment. During the [illegible] or twelve years the following cases were submitted to trial:—one single case of having in passion [illegible] the death of a person, and another of openly threatening; five or six instances of grosser theft or cheating, and as many of concealment of birth and crimes relating to [illegible]; every year a few petty thefts, and instances of making use of the tools of others without permission, or of like disorders, and several trifling litigations.

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[1] Newton, *Manual and Instructions* (1875), p. 94.

[2] See *Manual and Instructions for the Arctic Expedition of* 1875, and the papers there by Brown, Newton, Lutken, Reinhardt, Schiodte, Morch, and others, abstracted with corrections in the appendix to Rink, [illegible] (1877), numerous memoirs and papers in the Danish scientific journals and transactions, Jeffreys's and Carpenter's report of the "Valorous" expedition (*Proc. Roy. Soc.*, vol. xxv.), the appendix to Nares's *Voyage to the Polar Sea* (1877-78), and the references in these works and in appendix to [illegible] *Voyages*, 1879.

[3] See the appendix to Rink, *loc. cit.*, the references to papers there given, those printed in the *Manual* already referred to, and the memoirs of Berggren, Fries, and Agardh in the *Transactions* of the Upsala and Swedish Academies, 1861-74. A flora of Greenland is in preparation by Prof. Lange.

[illegible] of the [illegible] part of the [illegible] Danish [illegible] and the east coast [illegible] world [illegible]. Neither [illegible] any other nation trade on the coast, the English "Greenland" seal and whale fishery being a misnomer, for the "fisheries" are pursued on the west coast of Davis Strait and Baffin's Bay, and in the sea between Jan Mayen and Spitzbergen, and occasionally within sight of the east coast of Greenland. Taking the Greenland trade as confined to the west coast, we find, according to the calculations of Rink, that the earnings of the 1877 families of Eskimo under the Danish crown are on an average £15,016 per annum,—giving each family an average annual income of £8 from the produce of the hunt sold to the royal officials. These payments are made in paper notes used as a currency in Greenland. During the twenty years 1853–72, excluding cryolite, the average annual exports consisted of 1185 tuns of oil, 35,439 seal-skins, 1436 fox-skins, 41 bear-skins, 811 waterproof jackets, 1003 waterproof trousers, 3533 lb raw eider down, 6900 lb feathers, 2300 lb whalebone, 550 lb narwhal ivory, 87 lb walrus ivory, 1517 reindeer hides. During the period 1870–74 the mean annual value of the products received from Greenland was £45,000; that of the cargoes sent thither, £23,844; and the mean expenditure on the ships and crews, £8897. Not including the royalty paid by the company which exports the cryolite (from 1853 to 1874 equal to £58,924), the average profit of the Greenland trade was, for the 21¼ years between 1853 and 1874, about £6000 yearly. The capital sunk in the "royal trade" is calculated at £64,426; and, taking the whole amount of net revenues from the present trade during the period between 1790 to 1875, the interest on the capital as well as the income from the cryolite royalty being subtracted, the present "direktör" of the Kongelige Gronlandske Handel considers that £160,000 has been earned.

Trading Districts and Census.—A Danish "coloni" in Greenland is not at the best of times a cheerful place, though, in the long days of summer, some of those in the fiords of South Greenland are comparatively pleasant. The houses are almost invariably built of wood, pitched over, and built more for warmth than for appearance. In addition to the three or four Danish houses—the usual number at the chief settlement—there are from 20 or 30 to 300 or 400 Eskimo at the place. They usually live in huts built of turf and stone, each entered by a short tunnel, which in most respects are an improvement over the primitive dwellings of the race elsewhere (see ESKIMO). In South Greenland there are seven trading districts; in North Greenland five. From Cape Farewell northward these are as follows. *Julianehaab* had in 1870 2670 inhabitants and 8 trading stations. Of the inhabitants, 1036 belonged in 1872 to the Moravian mission settlements, which do not extend much farther north, the other clergy being members of the Danish Church, between whom and the "Herrnhutians" something of the *odium theologicum* exists. In this district also are the remains of the old Norse settlements of [illegible] Erik, his contemporaries, and his successors. *Frederikshaab* has six trading stations, which collect about 68 tuns of oil and 1000 seal-skins annually. The population in 1870 was 801; at Ivigtut, in this district, are the cryolite mines. *Godthaab* has 999 people, 6 stations, and a trade return of 74 tuns of oil and 1000 seal-skins annually. It is the most southern station for eider down, and formerly also for reindeer skins. Codfish were also once caught here in great abundance, but this business is now almost abandoned. Godthaab "colony" is the chief settlement in Greenland. "Besides the usual trade officers, one or two Danish missionaries who manage the seminary, and two or three Moravian missionaries (at Ny Herrnhut), the royal inspector of South Greenland, and the physician for the southern part of it reside at this place. In addition to the seminary, Godthaab has a church, of rather imposing appearance for Greenland, but too large for the [illegible], and built of bricks, a material very little suited to the [illegible]. The houses of the natives, [illegible] with sloping roofs of [illegible], look very pretty, but at Ny Herrnhut they offer a sad appearance. The latter station had [illegible] for the missionaries [illegible] it is called." At Lichtenfels is another Moravian settlement, but the community has within the last thirty years decreased to one half, and, owing [illegible] to the [illegible] perhaps the [illegible]. In this district are also found Norse ruins, [illegible] *Sukkertoppen* is one of the [illegible] It [illegible] about 82 tuns of oil and [illegible] a few reindeer, [illegible] It has six trading posts and 700 people. *Holsteinsborg* has [illegible] about 80 tuns of oil and [illegible] seal-skins, [illegible] and eider down. There are also [illegible]. In 67° 40' N. lat., Nagsugtok or North Strom fjord forms the boundary between South and North Greenland, the settlements which follow are therefore in the latter inspectorate. *Egedesminde* is in a state of decline, the present production being about 74 tuns of oil and [illegible] seal-skins collected annually by six stations. In 1870 the population was 1008, the greater number [illegible] at the chief settlement [illegible]. *Christianshaab* has four trading posts, which collect from the inhabitants 110 tuns of oil and 1700 seal-skins. Christianshaab is one of the pleasantest [illegible] torts in North Greenland, the valley on the opposite side of the harbour from the "colony" swarming with mosquitoes and [illegible], and [illegible] with [illegible] flowers. [illegible] is the chief port, and is mainly supplied from the seals killed among the crevices [illegible] pushed out by the great Jakobshavn glacier. Many of the large glacial bergs which they are [illegible] carried by the wind out into Baffin's Bay. [illegible] tons of oil and 950 seal-skins from 121 people. Godhavn, on Disco Island, was at one time a seat of the whale trade, in 1788 no less than 20 whales having been caught there; but this industry has now entirely ceased, the last whale caught by the Government officials being in 1851. Its chief interest [illegible] is the fact that Godhavn (or Lievely) is the seat of the Government of North Greenland, and the place at which exploring and whaling vessels often call. Its trade is insignificant, the district returning on an average only about 30 tons of oil and 400 seal-skins, this settlement has for many years been a steady loss to the Government. There are in the district 245 people, who are perhaps the most industrious and self-reliant of all the Greenlanders. *[illegible]* has five stations, returning 116 tons of oil and [illegible] seal-skins, collected by 447 people. *Umanak* is one of the most profitable districts,—the "colony" with its six outposts returning to the "royal trade" about 180 tons of oil and 8300 seal-skins, collected from 728 people. *Upernivik* is the most northern district, its limits being those of the natives belonging to the Danish settlements. It is very profitable,—its average return being 148 tons of oil and 6500 seal-skins, besides eider down and bear-skins, with formerly a considerable quantity of reindeer-skins. In 1870 there were 702 people in the district, the chief of the outposts being Proven ("the experiment"), and Tasiusak (73° 24′ N. lat.), the most northern Danish trading post, and the most northern permanent abode of civilized men or women, for the trader has a Danish wife with him. "To a European female," writes the director of the Royal Greenland Board of Trade, "this indeed seems to be one of the most melancholy places of residence that can be found." In the service of the Danish mission there were in 1870 63 appointed teachers, besides several other teachers classed as seal hunters or fishers. In the service of the royal trade were 12 outpost traders, 15 head men and "boatswains," 14 carpenters and smiths, 19 coopers, 15 cooks, 54 sailors and labourers, besides 10 pensioners and 35 midwives; 5 officers were enumerated as natives, but 3 of them are more properly Europeans. In the same year the Europeans numbered 207, of whom 95 were engaged in the trade, 5 were Danish and 11 Moravian missionaries, and 38 lived at the cryolite mine; the rest were women and children.[1] Altogether there were in 1870 9825 people in Danish Greenland (including 9408 natives), and in 1875 9800. The details of the latter census are not published, but they do not in any material manner alter those just given. The inhabitants of the east coast are not believed to exceed 300 if so many, and yearly this number is being lessened by immigration to the Danish settlements on the west coast. The natives of the shores of Smith Sound, north of Melville Bay, number about 200, and it is satisfactory to learn that of late these ἔσχατοι ἀνδρῶν are not decreasing.[2] Their most northern settlement is Etah. From the information of the Eskimo, Hans Hendrik, it appears that Dr Kane was in error in asserting that the Smith Sound natives knew nothing of those to the south of the glaciers of Melville Bay.

History.—Greenland was first landed on about the year 986 by Erik Rauthi or Red Erik, a banished Icelandic jarl, though some time previously the country had been sighted by Ulf Kraku, another Icelander. Erik and his house early settled at Brattelid,—the present Eskimo station of Igaliko,—situated on an isthmus between two fjords, believed to be the Erik's and Einar's Fjords of the old sagas, where to this day can be traced the walls of about seventeen dwellings, one of which bears evidence of having been Erik's house. Other settlers followed, and among these was Bjarni, son of Herjulf, one of Erik's companions, whose home was probably at Herjulf's Ness, opposite the Moravian settlement of Frederiksdal, where have been found tombs containing wooden coffins, with skeletons wrapped in coarse hairy cloth, and both pagan and Christian tombstones with runic inscriptions. This Bjarni, in his wanderings, discovered the continent of America (Vinland), and, among those who were attracted hither was Leif, who went ashore near where the town of Taunton now stands. After this there is said to have been a considerable trade between Norway and America, and between both countries and the Greenland colonists. The latter even penetrated to 73° N. lat. as early as the year 1235, and left a small runic stone recording the event.[3] Christianity was introduced, and Arnold appointed the first bishop, in 1126; and Greenland, like Iceland, had a republican organization up to the year 1261, when Hakon Hakonsen, king of Norway, induced the Greenlanders to swear allegiance to him. Henceforth they were Norwegian subjects, and their country one of the queen's domains. From that day may be dated the beginning of their decay and final disappearance as colonists, though the black death, foreign enemies, and the attacks of the Eskimo, who about this period burst upon the colonies from the north, had something to do with it. These settlements were called respectively the Ester Bygd or Building and the Wester Bygd, both being now known to be on the west coast, though for long the view was persistently held that the first was on the east coast, and numerous expeditions have been sent in search of these "lost colonies" and their imaginary survivors. The last bishop appointed to Greenland died in 1540, but long before that date those appointed had never reached their sees. The country had also been visited by a hostile fleet (believed to be English), and about the end of the 15th century it would appear that all colonization had ceased. When in 1585 John Davis visited it there was no sign of any people save the Eskimo, among whose traditions are one or two relating to the old Norsemen. For more than 200 years Greenland seems to have been neglected almost forgotten. It was visited by whalers, chiefly Dutch, but nothing in the form of permanent settlements was established until the year 1721, when the first missionary, Hans Egede, landed. Amid many hardships and discouragements he persevered;[4] and at the present day the remnant of the native race is civilized and Christianized, instead of wild and pagan, as they were when he arrived among them. The colonists of the 18th century were, many of them, convicts and other offenders; and the trade was a monopoly in the hands of private individuals. In 1733-34 there was a dreadful epidemic of small-pox which destroyed an immense number of the people. In 1774 the trade ceased to be profitable as a private monopoly, and to prevent it being abandoned the Government took it over. In 1807-14, owing to the war, communication was cut off with Denmark; but since that date the country has been prospering in a languid fashion, though, if the Government ceased its fostering care, the Eskimo, and with them what trade is carried on, must become extin

Of late years, the northern part of the country has been explored by Inglefield (1852), Kane (1853-55), Hayes (1860-61), Hall (1871-73), and to some extent by Nares (1875-76), whose discovery of the probable northern termination of the country in about 83° N. lat. had been already presaged theoretically.[5] The east coast has been explored by Scoresby (1822), Clavering (1823), Graah (1829-30), the German expedition (1869-70), and Mourier (1879), while the interior has been penetrated for a short way by the Danes, Americans, English, and Swedes whose names have been noted above, and by others.[6] In like manner, the scientific history of the country has been investigated by a host of savants from the days of Fabricius to our own, whose names are too numerous to recount, though, in the works above quoted, these are given either directly or indirectly. For further information see the articles Eskimo and Polar Regions. (R. B.)

GREENLEAF, Simon (1783-1853), American jurist, was born at Newburyport, Massachusetts, December 5, 1783. After studying law in Massachusetts and Maine, he began in 1806 to practise at Standish in the latter State, proceeding finally to Portland in 1818. There, after two years, he became reporter of the supreme court of Maine, and during his twelve years of office published nine volumes of *Reports*. Resigning in 1832, Greenleaf became in 1833 Royale professor, and in 1846 Dane professor of law in Harvard University, where he received the degree of doctor of laws. He retired in 1848 from his active duties, becoming emeritus professor, and after being for some years president of the Massachusetts Bible Society died at Cambridge, Mass., October 6, 1853.

Greenleaf's principal work is a *Treatise on the Law of Evidence*, 1842-53. He published also *A Full Collection of Cases Overruled, Denied, Doubted, or Limited in their Application, taken from American and English Reports*, in 1840, expanded afterwards to 3 volumes; and an *Examination of the Testimony of the Four Evangelists by the Rules of Evidence administered in the Courts of Justice, with an Account of the Trial of Jesus*, 1846. This was republished in England in 1847.

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[1] *Danish Greenland* (1877), p. 355, corrected by recent Government returns and private correspondence.

[2] Feilden, Appendix to Nares, *loc. cit.*, vol. ii. p. 197; *Narrative of "Polaris" N. Polar Expedition*, p. 477, &c.

[3] This stone, not much bigger than a hone, was until recently in the Copenhagen Museum of Northern Antiquities. It was stolen, however, and the precious monument is now only represented by a model.

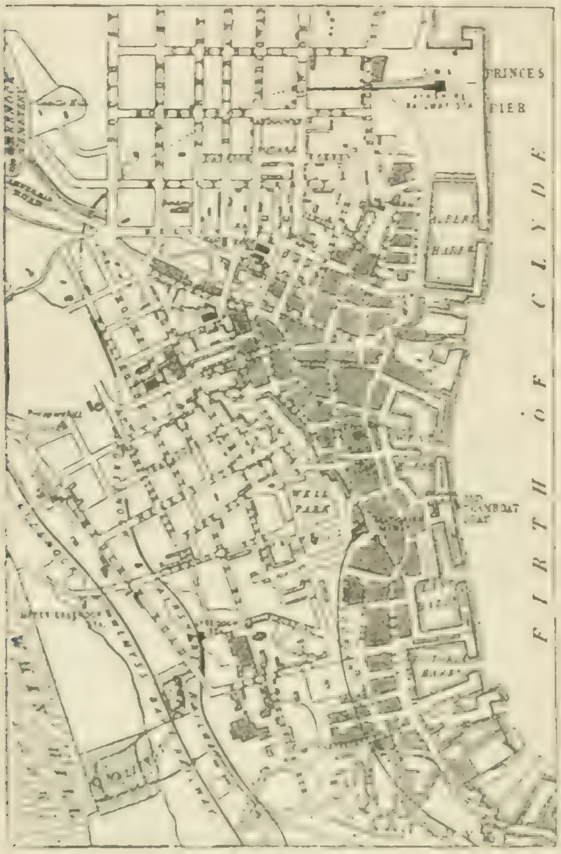
[4] Fenger, *Bidrag til Hans Egedes og den grönlandske Missions Historie*, 1721-1760 (1879).

[5] Brown, *Arctic Papers of R. G. S.* (1875), p. 70.

[6] "The Physical Structure of Greenland" (*Arctic Papers of R. G. S.*, pp. 1-73; see also for history the works catalogued in Chavannes, Karpf, and Le Monniers, *Die Literatur über die Polar-Regionen der Erde* (1878).

GREENOCK, a seaport town of Renfrewshire, Scotland, on the south bank of the Firth of Clyde, 32 miles below Glasgow, in 55° 57′ 2″ N. lat. and 4° 45′ 30″ W. long. In front of the town there is a fine and extensive bay, formerly known by the name of the Bay of St Lawrence, from a religious house that anciently stood there. Behind the town the land rises into a picturesque ridge of hills, about 800 feet high, between which and the bay Greenock stretches for upwards of two miles and a half along the shore.

Greenock is an irregularly built town. The western part is occupied by spacious streets and numerous fine villas, but the central and busier part is composed of narrow and rather mean and overcrowded streets and lanes. The board of police are taking measures, however, to have some of these opened up and occupied with an improved class of buildings. The view from the heights behind the town is exceedingly striking and picturesque, and notwithstanding the steep slope towards the south, the town is steadily progressing in that direction, as well as along the shore, where premises for shipbuilding and various public works, and also dwelling-houses, are extending the town both east and west. Amongst noticeable structures may be mentioned the custom-house, a handsome Doric edifice, and the Watt Monument, a building erected to the memory of the celebrated James Watt, whom with just pride the town claims as a native. The latter contains an exquisite statue of the philosopher by Chantrey, and accommodates a public library founded in 1783, having now upwards of 15,000 volumes. Associated with it are a museum and lecture hall, built at the expense of the late Mr James M'Lean, and opened in 1876. The town also contains several elegant churches, a spacious academy, and various other educational and charitable institutions, the chief of the latter being the public hospital and infirmary, and the Wood mariners' asylum, an institution founded by Sir Gabriel Wood for the benefit of decayed seamen belonging to Clyde ports. The corporation is about to erect a suite of municipal buildings fronting the principal street of the town, on which it is proposed to expend not less than £80,000. Greenock possesses two public parks; and in 1866 a magnificent esplanade, a mile and a quarter in length, skirting the shore, was laid off at an expense of £20,000, and is now a favourite promenade and recreation ground. A new carriage drive is being constructed, at a cost of about £10,000, across the heights to the south-west of the town.



Plan of Greenock.

The water supply is derived from two enormous reservoirs in the high lands behind the town called Loch Thom and Loch Gryfe. The Loch Thom works were completed in 1828, and the Gryfe works were added in 1872. The Loch Thom works are so constructed that they not only supply water to the town, but provide also in their course power to drive the machinery of a number of mills of great size, the water descending from mill to mill till it reaches the level of ordinary supply. Street tramways were introduced in 1873, and connect the town with Gourock. The gas-works of the town, which were originally situated in a populous district, have recently been removed to a small island, Inchgreen, on which a commodious establishment has been erected. The principal industries are shipbuilding and sugar refining. Many of the steamers of the Cunard Company, the Peninsular and Oriental Company, and the Allan Line have been built at Greenock, and the excellence of the iron sailing ships of Greenock yards has become almost proverbial. There are eighteen large sugar refineries in the town, some of which turn out 1000 tons of refined sugar per week. Greenock is connected *via* Paisley with Glasgow by two competing lines of railway, by one of which there is also direct communication with Ayrshire and the south-west. All the important Clyde passenger steamers call at or sail from Greenock; indeed for passenger traffic by steamer it is a more important town than Glasgow, as the greater portion of the travelling public, to save time and avoid the unsavoury odour of the upper reaches of the river, make the journey between Glasgow and Greenock by rail. A large amount of passenger and goods traffic is also carried on between Greenock and Belfast, Londonderry, Dublin, Liverpool, &c.

In the earlier part of the 17th century Greenock was an obscure fishing village, consisting of one row of thatched cottages; and in 1716 there were only six decked boats in the place. In 1741 the population of Greenock was 4100, a century later it was [illegible]; in [illegible]; in 1861, [illegible]; in [illegible], and in the middle of 1879 it was estimated at [illegible]. [illegible] In 1635 the town or village of Greenock was erected [illegible] granted in favour of John Schaw and Helen Houston, his spouse, and [illegible] by the [illegible] for the purpose. In 1741 and 1751 charters were granted by Sir John Schaw, [illegible] were empowered to elect a town council [illegible] of the town [illegible] the [illegible] the [illegible] then [illegible] right [illegible] of a [illegible].

The first harbour of [illegible] was made by John [illegible]. Till [illegible] was [illegible] accommodation.

The harbour constructed under this agreement was not finished till 1710, by which year Greenock was established as a custom-house port. In 1751 an Act of Parliament was obtained whereby a duty of 2d Scots was imposed on every Scots pint of ale or beer "brewed, brought in, tapped, or sold" within the town "for cleaning, deepening, building, and repairing" the harbours and ports. But till the year 1772 the harbour was merely leased to the town by the superior; but in that year and in 1773 the magistrates and town council obtained a conveyance of it from John Shaw Stewart the superior of the Greenock estate. From that date down to the present time the [illegible] made to the harbour by parliamentary authority have been very extensive. The dock and quay accommodation now amounts to [illegible] acres. In addition there is in [illegible] dock, to be named the "James Watt Dock," which is [illegible] to afford accommodation to vessels of the largest tonnage, and to keep them water-borne in all states of the tide. The total area of this dock, with warehouses and sheds, is [illegible]. The harbour trustees who now have the management of the docks consist of the town council and nine elective members chosen by the local shipowners and harbour ratepayers.

The commercial prosperity of Greenock received its first great impetus from the Treaty of Union in 1707. The earliest trade seems to have been in herrings, a trade which, however, has long been extinct. Trading in tobacco was also carried on at a very early period. It was first brought from the colonies, and then exported to the Continent. The Greenland whale fishing commenced as far back as 1752, but it never rose to be of any importance, and is now discontinued. The American war greatly interrupted the progress of Greenock, as the principal trade of the port was then with that country; but after the peace in 1783 it speedily revived, and within the seven following years the shipping trade was trebled in amount. At present the principal intercourse is with the East and West Indies, Australia, and the United States and Canada. Newfoundland and South America have also employed a considerable quantity of shipping. The gradual increase of trade is shown by the following table of the number and tonnage of vessels that entered and cleared from and to foreign ports in various years since 1784:—

	Inwards.				Outwards.			
	British.		Foreign.		British.		Foreign.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1784	[illegible]	[illegible]	4	530	63	7,297	3	520
1804	165	40,802	25	5,120	155	31,896	20	5,965
1824	188	46,162	11	[illegible]	188	46,857	9	2,699
1853	274	94,575	44	13,764	153	55,630	45	11,975
1878	428	219,521	178	64,918	419	198,267		

Interesting historical details will be found in *Memorials of James Watt*, by G. Williamson, 1856. The first volume of *Historical Sketches of the Town and Harbours of Greenock*, by Dugald Campbell, appeared in 1879. (J. PA.)

GREENOUGH, Horatio (1805–1852), an American sculptor, son of a Boston merchant, was born at Boston, September 6, 1805. At the age of sixteen he entered Harvard College; but while there he devoted his principal attention to art, and in the autumn of 1825 he went to Rome, where he enjoyed the advantage of instruction from Thorwaldsen. After a short visit in 1826 to Boston, where he executed busts of John Quincy Adams and other persons of distinction, he returned to Italy and took up his residence at Florence. Here one of his first commissions was from James Fenimore Cooper for a group of Chanting Cherubs; and the success of this work, joined to the strong recommendation of Cooper, Dana, Everett, and others, led to his being chosen by the Government to execute the colossal statue of Washington for the national capital. It was unveiled in 1843; and as an accurate likeness, conceived in a lofty and truly poetical spirit, it is entitled to high rank among modern works of a similar kind. Shortly afterwards he received a second commission from Government for a colossal group, the "Rescue," intended to represent the conflict between the Anglo-Saxon and Indian races. In 1851 he returned to Washington to superintend its erection, and in the autumn of 1852 he was attacked by brain fever, of which he died, 18th December. Among other works of Greenough may be mentioned a bust of Lafayette, the Medora, and the Venus Victrix in the gallery of the Boston Athenæum. Greenough was a man of wide culture, and his occasional productions in prose and verse gave evidence of a capacity to attain the same eminence in literature as in art. See *Memoir of Horatio Greenough*, by H. T. Tuckermann, 1853.

GREENSHANK, one of the largest of the birds commonly known as Sandpipers, the *Totanus glottis* of most ornithological writers. Some exercise of the imagination is however needed to see in the dingy olive-coloured legs of this species a justification of the English name by which it goes, and the application of that name, which seems to be due to Pennant, was probably by way of distinguishing it from two allied but perfectly distinct species of *Totanus* (*T. calidris* and *T. fuscus*), having red legs and usually called Redshanks. The Greenshank is a native of the northern parts of the Old World, but in winter it wanders far to the south, and occurs regularly at the Cape of Good Hope, in India, and thence throughout the Indo-Malay Archipelago to Australia. It has also been recorded from North America, but its appearance there must be considered accidental. Almost as bulky as a Woodcock, it is of a much more slender build, and its long legs and neck give it a graceful appearance, which is enhanced by the activity of its actions. Disturbed from the moor or marsh, where it has its nest, it rises swiftly into the air, conspicuous by its white back and rump, and uttering shrill cries flies round the intruder. It will perch on the topmost bough of a tree, if a tree be near, to watch his proceedings, and the cock exhibits all the astounding gesticulations in which the males of so many other *Limicolæ* indulge during the breeding-season—with certain variations, however, that are peculiarly its own. It breeds in no small numbers in the Hebrides, and parts of the Scottish Highlands from Argyllshire to Sutherland, as well as in the more elevated or more northern districts of Norway, Sweden, and Finland, and probably also from thence to Kamchatka. In North America it is represented by two species, *Totanus semipalmatus* and *T. melanoleucus*, there called Willets, Telltales, or Tattlers, which in general habits resemble the Greenshank of the Old World. (A. N.)

GREENWICH, a market-town and parliamentary borough in the county of Kent, England, is pleasantly situated on the right bank of the Thames, 6 miles S.E of London Bridge by the river. The streets towards the river are narrow and irregular, but in the higher situations there are many fine terraces and villas. The town has manufactories of various kinds, including the works of the telegraph maintenance company, engineering works, soap work, chemical works, and a brewery. On account of its picturesque views, its fine air, and its public park and other attractions, it is one of the favourite resorts of Londoners.

Fronting the river stands the splendid range of buildings in the Grecian style of architecture, formerly known as Greenwich Hospital, but now the Royal Naval College. It occupies the site of an ancient royal palace called Greenwich house, which was a favourite royal residence as early as 1300, but was granted by Henry V. to Thomas Beaufort, duke of Exeter, from whom it passed to Humphrey, duke of Gloucester; and it did not revert to the crown till his death in 1433. It was the birthplace of Henry VIII., Queen Mary, and Queen Elizabeth. The building was enlarged by Edward IV., by Henry VIII., who made it his chief residence and named it *Placentia*, by James I., and by Charles I., who erected the "Queen's House" for Henrietta Maria. Along with other royal palaces it was at the Revolution appropriated by the Protector, but it reverted to the crown on the restoration of Charles II., by whom it was pulled down, and the west wing of the present hospital was erected as part of an extensive design which was not further carried out. In its unfinished state it was assigned by the patent of William and Mary to certain of the great officers of state, as commissioners for its conversion into a hospital for seamen. As it now stands, the building consists of four blocks. Behind a terrace 860 feet in length, stretching along the river side, are the buildings erected in the time of Charles II. by Webb from Inigo Jones's designs, and in that of Queen Anne from designs by Sir Christopher Wren; and behind these buildings are on the west those of King William and on the east those of Queen Mary, both from Wren's designs. In the King William range is the painted hall. Its walls and ceiling were painted by Sir Thomas Thornhill with various emblematic devices, and it is hung with portraits of the most distinguished admirals, and paintings of the chief naval battles of England. In the centre of the principal quadrangle of the hospital there is a statue of George II. by Rysbrack, sculptured out of a single block of marble taken from the French by Admiral Sir George Rooke. The oldest part of the building was in some measure rebuilt in 1811, and the present chapel was erected to replace one destroyed by fire in 1779. The endowments of the hospital were increased at various periods from bequests and forfeited estates. Formerly 3000 retired seamen were boarded within it, and 5000 or 6000 others, called out-pensioners, received stipends at various rates out of its funds; but in 1865 an Act was passed empowering the Admiralty to grant liberal pensions in lieu of food and lodging to such of the inmates as were willing to quit the hospital, and in 1869 another Act was passed making their leaving on these conditions compulsory. It has since been devoted to the accommodation of the students of the Royal Naval College, for which purpose it was formally opened in 1873. Behind the College is the Royal Hospital School, where 1000 boys, sons of petty officers and seamen, are boarded.

Another of the attractions of Greenwich is the park, 190 acres in extent, in which is situated the Royal Observatory. It was enclosed by Humphrey, duke of Gloucester, in 1433, and laid out by Charles II. It still contains a fine avenue of Spanish chestnuts planted in his time; and the hill rising towards the south commands a fine prospect over London, the Thames, and the plains of Essex. The Royal Observatory was built in 1675, for the advancement of navigation and nautical astronomy. From it the exact time is conveyed at one o'clock every day by electric current to London and all the other chief towns of the kingdom; and English geographers reckon longitude from its meridian. Adjoining Greenwich Park is Blackheath, an open common much frequented by excursionists, and also used for golf and cricket.

Greenwich possesses a considerable number of almshouses and other charitable foundations, among which may be mentioned Queen Elizabeth's College; Trinity Hospital, founded by Henry Howard, earl of Northampton, in 1613; the Jubilee Almshouses, founded by subscription of the inhabitants in 1809 in commemoration of the fiftieth anniversary of George III.; the Green Coat School, the Grey Coat School, and the Orphan Girls' School. The parish church is dedicated to St Alphege, archbishop of Canterbury, who suffered martyrdom at Greenwich.

[illegible] is first noticed in the reign of Ethelred, when it was from 1011 to 1014 the station of the Danish fleet. [illegible] of the remains of Lord Nelson, [illegible] St Paul's Cathedral. [illegible] The population of the parish in 1871 was 40,412. [illegible] 361, and [illegible]

GREGOIRE, Henri (1750–1831), bishop of Blois and French revolutionist, was born at Vého near Lunéville, 4th December 1750. After studying at Metz and Nancy, he became curé of Embermesnil and professor at the college of Pont-à-Mousson. In 1783 he was crowned by the academy of Nancy for his *Éloge de la Poésie*, and in 1788 by that of Metz for an *Essai sur la régénération physique et morale des Juifs*. He was chosen in 1789 by the clergy of the district of Nancy to represent them in the states-general, where he took a leading part in the deliberations, and gave energetic support to the republicans. Along with four other curés he abandoned his order and joined that of the *tiers état*; he presided at the permanent sitting of sixty-two hours while the Bastile was being attacked by the people, and made a vehement speech against the enemies of the republic; and he subsequently took a prominent share in abolishing the privileges of birth and religion. Under the new constitution of the clergy he was chosen bishop by the department of Loir-et-Cher, taking the title of bishop of Blois. As a member of the national assembly he proposed the motion for the abolition of the kingly office, which was carried by acclamation. During the trial of Louis XVI., being absent with other three colleagues on a mission for the union of Saxony to France, he along with them wrote a letter urging the condemnation of the king, but omitting the words *à mort*; and he endeavoured to save the life of the king by proposing in the assembly that the penalty of death be suspended. His subsequent action was very influential in moderating extreme republican views: he opposed the national renunciation of Christianity, and was the first to advocate the reopening of the churches; exerted himself to get measures put in execution for restraining the vandalistic fury against the monuments of art; extended his protection to artists and men of letters, and obtained for them pecuniary encouragement from the state; and devoted much of his attention to the reorganization of the public libraries, the establishment of botanic gardens, and the improvement of technical education. He also took a great interest in negro emancipation, and on his motion men of colour in the French colonies were admitted to the same rights as whites. On the establishment of the new constitution, Grégoire was elected to the council of 500, and after the 18th Brumaire he became a member of the new legislative assembly. In this capacity he voted in the minority of five against the proclamation of the empire, and opposed the creation of the new nobility and the divorce of Napoleon from Josephine; but notwithstanding this he was subsequently created a count of the empire and officer of the legion of honour. During the later years of Napoleon's reign he travelled in England and Germany, but in 1814 he had returned to France and was one of the chief instigators of the action that was taken against the empire. After the second restoration he was excluded from the Institute, and when in 1819 he was elected to the assembly by the department of Isère, his election was annulled. From that time, therefore, he lived in retirement, occupying himself in literary pursuits and conducting a voluminous correspondence with most of the eminent savants of Europe; but as he had been deprived of his bishopric and of his pension as a senator, he was compelled to sell his library to obtain the means of support. He died at Paris, May 20, 1831. As he had remained steadfast to his republican principles the ecclesiastical authorities refused him the last offices of religion, and the rites of Christian sepulture, but through the intervention of the civil power mass was said over his body in the church of the Abbaye aux Bois by a [illegible] priest, and after the hearse set out from the church the populace unyoked the horses and themselves drew it to the cemetery of Mont Parnasse. Grégoire forms a striking exception to most of the French revolutionists in combining zeal for republicanism with a moderation which sought to check every form of licence, and with a steadfast adherence to the religion of which he was a priest; and it was further a remarkable feature of his character that, though a sincere Roman Catholic, he was thoroughly tolerant of the religious views of others.

Besides several political pamphlets, Grégoire was the author of *H[illegible]* [illegible] *[illegible]ique* [illegible], 2 vols., [illegible]; [illegible], 18[illegible]; [illegible] *du Christianisme* [illegible], 1821; *H[illegible]* [illegible], 1824; *H[illegible]* [illegible] [illegible] *[illegible] de* [illegible] *M. [illegible] Henri Grégoire*, preceded by a biographical notice by Cousin d'Avalon, was published in [illegible]; and the *Mémoires [illegible], politiques, et [illegible] de Grégoire*, with a biographical notice by H. Carnot, appeared in [illegible].

GREGORIAN CHANT. See PLAINSONG.

GREGORAS, NICEPHORUS. See BYZANTINE HISTORIANS, vol. iv. p. 613.

GREGORY, ST, surnamed THE GREAT (c. 540-604), the first pope of that name, and one of the four doctors of the Latin Church (Ambrose, Augustine, and Jerome being the other three), was born at Rome about the year 540. His father Gordianus possessed senatorial rank, and his mother Sylvia is said to have been remarkable for her mental endowments. Educated for the legal profession, Gregory about his thirtieth year was chosen by the citizens to the high position of prætor urbanus; this post he is said to have occupied for three years (571-574), discharging its duties with great pomp and magnificence; but on the death of his father, having become deeply impressed with a sense of the transitoriness and vanity of all earthly things, he retired from public life and gave up his whole fortune to pious uses, building six monasteries in Sicily and one in Rome; in this last, which was dedicated by him to St Andrew, he embraced the Benedictine rule, and divided his whole time between works of charity and the exercises of fasting, meditation, and prayer. It was while he was still a simple monk of St Andrew that the often repeated incident related by Bede is believed to have occurred. Having seen some English slaves of striking beauty exposed for sale in the public market, "non Angli sed Angeli," he set his heart upon the evangelization of Britain, and was only prevented by the command of his ecclesiastical superiors from setting out in person to seek the realization of his pious wish. About 578 or 579 he was appointed abbot of his monastery, and likewise one of the seven deacons (regionarii) of the Roman Church; and in 582 he was sent by Pelagius II. to Constantinople as papal apocrisiarius or responsalis at the imperial court. There he remained for upwards of three years, during which he negotiated several matters of importance and delicacy; but amid his diplomatic and other engagements he found time to begin, if not even to complete, one of his largest works, the *Moralia*, or exposition of the book of Job. A few years after his return from the Eastern capital, the death of Pelagius (590) caused a vacancy in the papal chair, and the choice of the clergy, senate, and people unanimously fell upon Gregory. He strongly deprecated the bestowal of this honour, and wrote to the emperor (Maurice) imploring him not to confirm the nomination. A pious fraud, committed by the city prætor then in office, prevented the letter from reaching its destination; and though Gregory hid himself for a time, he was at length obliged to yield to the urgency of his friends by accepting the papal crown (September 590). The pontificate of fourteen years which followed was marked by extraordinary vigour and activity, which made themselves felt throughout almost every department of the doctrine, discipline, and worship of the entire Western Church. By means of earnest prayer and wisely expended pains the aggressions of the Lombards were checked, and order and tranquillity were speedily restored to Rome; in Italy and France he tightened the too long relaxed reins of ecclesiastical discipline; in England, Spain, and Africa the powers of Paganism, Arianism, and Donatism were perceptibly weakened; as against the Eastern emperor and the patriarch of Constantinople the prerogatives of the bishop of Rome were asserted with a vigour previously unwitnessed; the ceremonies of the church were regulated and extended, the liturgy further developed. The anniversary of Gregory's death, which took place at Rome on the 12th of March 604, is observed as a duplex by the Latin Church, and even in the Greek Church his wisdom and sanctity continue to be commemorated. The hyperbolical panegyrics of those ecclesiastical writers who lived nearest his time (such as Gregory of Tours and Isidore of Seville) must of course be taken with considerable reservation; but they are interesting as showing how powerful and profound was the impression he left upon his contemporaries and immediate successors—an impression and an influence well entitling him to the epithet of "great." Of the personal qualities of Gregory, the most obtrusive are beyond all question the singular strength and energy of his character. Firmly and intensely convinced of the divineness of the Christian doctrine and life as these had presented themselves to his mind and heart, he suffered no obstacle and no discouragement to triumph over his determination to give them all the currency and prevalence that were possible in his day. Having clearly seen the end he had in view, he with equal discernment made choice of his measures for its attainment. The refinements alike of literature and of art had for him no place in the Christian scheme; it is needless to say that he therefore despised them both for himself and for others. There is some room for hoping indeed that the burning of the books of the Palatine library was due to some ruder pontiff; but there is no possibility of mistake as to the literary taste of the man who could write (pref. to *Moralia*)—"non metacismi collisionem fugio, non barbarismi confusionem devito, situs motusque etiam et præpositionum casus servare contemno, quia indignum vehementer existimo ut verba cœlestis oraculi restringam sub regulis Donati." The uniformity of the Roman ritual, the ascendency of the Roman hierarchy, the prevalency of the Catholic dogma,—these were not merely the highest, they were the only, ideals he had ever caught sight of. It ought not therefore to surprise us if in striving towards them he sometimes was tempted, and yielded to the temptation, to sacrifice truthfulness to what he conceived to be the truth, and the mere claims of humanity to the demands of what he regarded as a higher love. Never purely selfish, he was, apart from the exigencies of his ecclesiastical position, singularly tolerant, liberal, and kindly.

Of the numerous extant works attributed to Gregory the Great the following are undisputed:—the *Moralia*, in thirty-five books, being an exposition of the book of Job, composed between 580 and 590; the twenty-two *Homilies on Ezekiel* (about 595), and the forty *Homilies on the Gospels* (about 592); the *Regula* (or *Cura*) *Pastoralis*, dedicated to John, archbishop of Ravenna (about 590); the *Dialogues* with Peter the deacon, in four books, on the lives and miracles of the Italian saints (593 or 594); and the *Letters*, in fourteen "registers," arranged according to the years of his pontificate. He was also the author of various rhymed hymns, nine of which are still extant and appear in the collected editions of his works. They are characterized more by simplicity of language than by depth of feeling. The *Concordia quorundam testimoniorum sacrarum scripturarum*, and also the *Commentaries* on 1 Kings, Canticles, and the seven penitential psalms usually ascribed to him, are spurious. His liturgical works, the *Sacramentarium* and *Antiphonarium*, have been considerably tampered with by mediæval collectors and revisers; and even the *Letters* are not wholly free from interpolations. Of Gregory's merits as an expositor little need be said; he avowedly adopts in all cases the allegorical method, which in his hands is unflinchingly carried out, with, in many cases, sufficiently astounding results. As Milman has remarked, "It may safely be said that, according to Gregory's licence of interpretation, there is nothing which might not be found in any book ever written." In practical homiletics, however, he is very often just and profound as well as high-toned; but it would be too much to say that he was superior to the prejudices of his time; in particular his preference for the monastic and ascetic forms of the Christian life is carried to a height which a wider observation of the conditions of human usefulness and happiness will never cease to regard as excessive. His *Dialogues*, which have been translated into Anglo-Saxon, Greek, and even Arabic, describe the most astonishing miracles with an artless simplicity which, as suggestive of entire belief, is certainly interesting to the student; yet it is difficult, as Gibbon has pointed out, to free the lavish dispenser of miraculous filings from the chains of St Peter from the suspicion of some degree of pious insincerity. The *Letters* are, as might be expected, of great importance from the light they throw upon the history of those times.

The complete editions of the works of this great father of the Latin Church have been, as was to be expected, numerous. The earliest was that of Lyons (1516), which was rapidly followed by those of Paris (1518-19), Basel (1551), and Rome (1588). The best edition is the Benedictine (Paris, 1705), in 4 vols. fol., reprinted at Venice 1768-76, in 17 vols. 4to, and in Migne's *Patrologia*, vol. lxxv.-lxxix. See Wiggers, *De Gregorio Magno* (1838-40); Marggraf, *De Greg. M. Vita* (1844); Lau, *Gregor. d. Grosse nach s. Leben u. Lehre dargestellt* (1845); Pfahler, *Gregor der Grosse u. seine Zeit* (1852); and Baxmann, *Politik der Päpste von Gregor I. bis Gregor VII.* (1868-69). There is a convenient edition of the *Cura Pastoralis* by Westhoff (1860).

GREGORY II., St, pope from 715 or 716 to 731, succeeded Constantine I., his election being variously dated May 19, 715, and March 21, 716. Having, it is said, bought off the Lombards for thirty pounds of gold, he used the tranquillity thus obtained for vigorous missionary effort in Germany, and for strengthening the papal authority in the churches of England and Ireland. By excommunicating Leo the Isaurian, he prepared the way for a long series of revolts and civil wars, which tended greatly to the establishment of the temporal power of the popes. He died in 731, and subsequently attained the honour of canonization, February 13th being the day consecrated to his memory in the *Martyrology*.

GREGORY III., St, pope from 731 to 741, a Syrian by birth, succeeded Gregory II. in March 731. His pontificate, like that of his predecessor, was disturbed by the iconoclastic controversy, in which he vainly invoked the intervention of Charles Martel. During his reign also it was that Boniface in Germany, on whom he conferred the pallium, Wilibald in Bohemia, and Bede in England carried on their most successful missionary labours. He died 29th November 741, and was succeeded by Zacharias I.

GREGORY IV., pope from 827 to 844, was chosen to succeed Valentinus in December 827, on which occasion he recognized the supremacy of the Frankish emperor in the most unequivocal manner. His name is chiefly associated with the quarrels between Lothaire and Louis the Debonnaire, in which he espoused the cause of the former, for whom, in the Campus Mendacii, as it is usually called (833), he secured by his treachery a temporary advantage. The institution of the feast of All Saints is usually attributed to this pope. He died January 25, 844, and was succeeded by Sergius II.

GREGORY V., pope from 996 to 999, a grandson of the emperor Otho the Great, succeeded John XV. when only twenty-four years of age, and until the council of Pavia (997) had a rival in the person of the antipope John XVI., whom the people of Rome in revolt against the will of the youthful emperor Otho III., Gregory's cousin, had chosen. The most memorable acts of his pontificate were those arising out of the contumacy of the French king, Robert, who was ultimately brought to submission by the rigorous infliction of a sentence of excommunication. He died suddenly, and not without suspicion of foul play, 18th February 999. His successor was Sylvester II.

GREGORY VI., pope from 1044 to 1046, who as Johannes Gratianus had earned a high reputation for learning and probity, succeeded Benedict IX., having bought off the antipopes Sylvester III. and John XX. In a council held by the emperor Henry III. at Sutri, in 1046, he was accused of simony, and his election was found to have been informal. This led to his degradation, and was followed by his withdrawal into Germany, where he died in the following year (1047). He was succeeded by Clement II.

GREGORY VII., St, one of the greatest of the Roman pontiffs, was born about the year 1015 at Soana or Saona, a small town in Tuscany, where his father, Bonic or Bonizon, is said to have followed the trade of a carpenter. His own name, Hildebrand or Hellebrand, is suggestive of a German extraction; but of his remoter ancestry nothing is recorded. His youth was passed at Rome in the monastery of St Mary on the Aventine, where a relative was at that time prior; here the archpriest Johannes Gratianus (afterwards Gregory VI.) was one of his instructors, and the youthful scholar early attracted the attention of such visitors as Laurentius of Amalfi and Odilon of Clugny. There is some reason to believe that, after passing his novitiate in Rome, Hildebrand removed for some years to the great Burgundian cloister, at that time under the charge of the last-named ecclesiastic; but all the earlier years of his life are involved in considerable obscurity. In 1046 he became one of the chaplains of the newly elected pope, Gregory VI., whom he shortly afterwards accompanied into his German exile, and on the death of that pontiff, some two years later, he retired to Clugny, where his learning and sanctity made a deep impression, and where, according to some accounts, he was ultimately promoted to the office of prior. As a monk of Clugny he appears to have oftener than once visited the imperial court for the transaction of ecclesiastical business; and in 1049 he is said in a very special way to have come under the notice of Bruno, bishop of Toul, then on his way to Rome to take possession of the chair of St Peter, which he occupied for some years under the title of Leo IX. It was at Hildebrand's instance that Bruno, who had been nominated by the emperor merely, consented to refrain from assuming the pontifical vestments, and to present himself to the Romans in the garb of a simple pilgrim, until he should have been elected in a more regular manner. The ascendency which Hildebrand had thus acquired over this pope he never afterwards lost; in 1050 he became cardinal subdeacon, and in following years he was entrusted with various missions of great importance, taking also a prominent part in the important synods of Rheims and Mainz, as well as in those of Rome. On the death of Leo IX. in 1054 the Roman people had signified a desire that the subdeacon should succeed him; this honour and responsibility however Hildebrand declined; but he was one of three legates who went to Germany to consult with the emperor about the choice of a successor. The negotiations, which lasted eleven months, ultimately issued in the election of Gebhard of Eichstadt, a relative of the emperor, who up to that time had followed a distinctly antipapal policy, but who, immediately after his reception and consecration at Rome as Victor II. (13th April 1055), became as entirely a tool in the hand of Hildebrand as Leo had been. It was during this pontificate that Hildebrand, as papal legate, attended the French synods held for the purpose of repressing the heresy of Berengarius. On the election of Pope Stephen IX. (X.), Hildebrand was again sent to Germany to defend the choice before the empress Agnes; in this mission, which was ultimately successful, several months were spent. Again, in 1058, he succeeded in defeating the hostile party of Benedict X. and in securing the tiara for Nicholas II., and once more, in 1061, he successfully laboured for the election of Alexander II. to the papal chair. At length, in 1073, on the death of Alexander, Hildebrand was himself as it were compelled by the tumultuous demands of the mob to accept the vacant tiara (22d April); but he refused to receive consecration until the sanction of the emperor had been obtained. This did not arrive for more than a month, although meanwhile he had been practically exercising many of the papal functions; finally, however, he was ordained to the priesthood, and some days afterwards (30th June) solemnly consecrated pope by the title of Gregory VII., a name which he chose in testimony of his veneration for the memory and character of his earliest patron, Gregory VI.[1] Once firmly established on the papal throne, Gregory lost no time in giving the utmost possible practical effect to the two leading ideas of his life, the establishment of the supremacy of the papacy within the church, and the effective assertion of the supremacy of the church over the state. In March 1074 a synod was held in Rome which condemned the simony that had grown so prevalent throughout the church, and also enacted the old stringent laws of celibacy which had become almost a dead letter, especially in Germany and in the north of Italy; simoniacal or married priests were declared to be deposed and their priestly functions invalid. The resistance of the clergy to these decrees was utterly in vain; papal legates visited every country, and, supported by the popular voice, compelled submission. At a second synod held in Rome in February 1075 the decrees of the first were confirmed, and the first blow was struck which afterwards resulted in the long protracted wars of investitures. At that synod it was determined that any ecclesiastic who in future should accept office from the hands of a layman incurred the penalty of deposition, while the secular lord who bestowed investiture was to be excommunicated. The decree was aimed immediately at certain German bishops, Henry's personal advisers, but hardly less directly at Henry himself. The emperor, finding his hands at the moment fully occupied with the suppression of a revolt among the Saxons, was politic enough to conceal his resentment for the time, and to dismiss his advisers; but as soon as the war had been brought to a close, his defiance found ample expression. Meanwhile Gregory was not unopposed even in Italy, and during the Christmas festivities of 1075 a revolt in Rome itself was organized by Cencius, who had placed himself at the head of those nobles who were opposed to reform; the pope, however, had the popular enthusiasm on his side, and ultimately the insurgents were compelled to fly. A papal embassy was next sent, early in 1076, to Henry at Goslar, citing him to appear personally at Rome at a council to be held in the second week of Lent, and there answer for his simony, sacrilege, and oppression. Henry's rage at this knew no bounds; he dismissed the legates with insult, and at a diet held at Worms (24th January 1076) replied by declaring Gregory deposed on charges of tyranny, magic, and adultery, by sending notification of this fact to the Roman clergy, and by taking steps for appointing a successor to the dethroned pontiff. Gregory now lost no time in excommunicating all the bishops who had attended the diet of Worms, in solemnly deposing and excommunicating the emperor, and in absolving his subjects from their oath of allegiance (22d February 1076). This counter action produced a powerful effect upon the German princes and people, many of whom had had good cause to resent Henry's tyrannies; one by one the bishops who had announced their withdrawal from Gregory's obedience now signified their contrition, and at a diet held at Tribur (September 1076) the election of a new emperor began to be discussed. Resistance being in the meantime impossible, Henry resolved upon humbling himself to the utmost; in the dead of winter he set out to make his submission; Gregory was in waiting for him at Canossa, where (25th to 27th January 1077) that famous penance which Europe has not yet forgotten was imposed (see vol. x. p. 488). Absolved only on condition of his not assuming the royal dignity till his case had been investigated and decided, Henry had no sooner left the papal presence than he began to plot his revenge. Throwing himself upon the generosity of his Lombard vassals, he took courage to face the papal excommunication which was renewed in November 1078; and in the wars which ensued his arms were finally successful. Rudolf of Swabia having died soon after the battle of Merseburg in 1080, the emperor proceeded with a powerful army to escort into Italy Guibert of Ravenna, who had been chosen at Brixen (June 1080) as Gregory's successor. In three successive summers the attack on Rome was renewed, but it was not until 1084 (March 21) that the treachery of some of the nobles of the city opened the gate to the invader. Gregory was now at last compelled to take refuge in the castle of St Angelo, while Guibert was established on the pontifical throne as his successor with the title of Clement III. After receiving coronation from Clement, Henry determined to return at once to Germany, especially as Robert Guiscard was known to be approaching. Released accordingly by the arrival of the Norman duke, Gregory excommunicated once more both Henry and Clement; but not deeming himself secure at Rome, where he had reason to know that his power was no longer what it once had been, he in May 1084 placed himself under Robert's protection at Salerno, where he died, May 25, 1085, after a comparatively brief pontificate of not much more than ten years. His last words are reported to have been, "I have loved righteousness and hated iniquity, and therefore I die in exile." His festival (duplex) is observed throughout the Roman Church on the anniversary of his death. His successor was Victor III.

The lifework of Hildebrand may be thus summed up in the words of Sir James Stephen:—"He found the papacy dependent on the empire; he sustained her by alliances almost commensurate with the Italian peninsula. He found the papacy electoral by the Roman people and clergy; he left it electoral by a college of papal nomination. He found the emperor the virtual patron of the holy see; he wrested that power from his hands. He found the secular clergy the allies and dependants of the secular power; he converted them into the inalienable auxiliaries of his own. He found the higher ecclesiastics in servitude to the temporal sovereigns; he delivered them from that yoke to subjugate them to the Roman tiara. He found the patronage of the church the mere desecrated spoil and merchandize of princes; he reduced it within the dominion of the supreme pontiff. He is celebrated as the reformer of the impure and profane abuses of his age; he is more justly entitled to the praise of having left the impress of his own gigantic character on the history of all the ages which have succeeded him."

Unlike Gregory the Great, Hildebrand was no author; his literary remains are all comprised in eleven books or "Registers" of letters, which have often been printed. The *XXVII dictatus* often attributed to him are not now regarded as genuine. Among the numerous earlier biographies may be mentioned those of Paul of Bernriet, Pandulf of Pisa, Nicolas of Aragon, and Cardinal Bruno; among later monographs the most important are those of Voigt (*Hildebrand als Gregor VII. u. sein Zeitalter*, 1815; 2d ed. 1846; French translation, with introduction and notes, by Jager, 1834; 4th ed. 1854), Bowden (*The Life and Pontificate of Gregory VII.*, 1840), Söltl (*Gregor VII.*, 1847), Helfenstein (*Gregor's VII. Bestrebungen nach den Streitschriften seiner Zeit*, 1856), Gfrörer (*Papst Gregor VII. u. sein Zeitalter*, 7 vols., 1859-61), Villemain (*Histoire de Gregoire VII.*, 1873; English translation by Brockley, 1874), Langeron (*Gregoire VII. et les origines de la politique ultramontane*, 1874), and Meltzer (*Gregor VII. u. die Bischofswahlen*, 1876). The events of the period are also very fully treated by W. Giesebrecht in his *Geschichte der deutschen Kaiserzeit*, and in other works. For the epistles, see *S. Gregorii VII. epistolæ et diplomata pontificia, acc. vita ejusdem pontificis et appendices amplissimæ veterum et recentiorum monumenta perplurima Gregorii VII. apologetica complectentes* (1877).

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[1] Apart from the rich historical associations connected with the name of Gregory, its etymology (from ἐγρήγυρα), so suggestive of sleepless vigilance, had probably something to do with its selection by this and so many other popes.

GREGORY VIII. (Albert de Mora), who as papal legate had in 1172 attended the council of Avranches, which absolved Henry II. of England from the guilt of the murder of Thomas à Beckett, was consecrated pope in room of Urban III. October 25th, 1187, and died of fever on December 17th of the same year. Clement III. was his successor.

GREGORY IX., pope from 1227 to 1241, the successor of Honorius III., fully inherited the traditions of Gregory VII. and of his uncle Innocent III., and zealously gave himself up to the perpetuation of their policy. One of the first acts of his pontificate was to suspend the emperor Frederick II., then lying sick at Otranto, for dilatoriness in carrying out his promised crusade; the suspension was followed by excommunication and threats of deposition after Frederick had written to the sovereigns of Europe complaining of his treatment. A consequent invasion of the patrimony of St Peter at the instance of Frederick in 1228 having proved unsuccessful, the emperor was constrained to give in his submission and beg for absolution. Although peace was thus secured (August 1230) for a season, the Roman people were far from satisfied; driven by a revolt from his own capital in July 1232, the pope was compelled to take refuge at Anagni and invoke the aid of Frederick. A new outbreak of hostility led to a fresh excommunication of the emperor in 1239, and to a prolonged war which was only terminated by the death of Gregory (August 22, 1241). This pope, who was a remarkably skilful and learned lawyer, caused to be prepared in 1234 the well known *Nova Compilatio Decretalium*, printed at Mainz in 1473. He it was who canonized Saints Elizabeth, Dominic, and Antony of Padua, and also Francis of Assisi, of whom he had been a personal friend. His encroachments upon the rights of the English Church during the ignominious reign of Henry III. are well known; but similar attempts against the liberties of the national church of France only served to call forth the celebrated Pragmatic Sanction of St Louis. Gregory IX. was succeeded by Celestine IV.

GREGORY X., pope from 1271 to 1276, succeeded Clement IV. after the papal chair had been three years vacant; his election occurred while he was engaged in a pilgrimage to Saint Jean-d'Acre. On his arrival at Rome his first act was to summon the council which met at Lyons in 1274 for the purpose of considering the Eastern schism, the condition of the Holy Land, and the abuses of the Catholic Church. It was while returning from that council that he died at Arezzo on the 10th of January 1276. To him is due the bull which, subsequently incorporated into the code of canon law, continues to regulate all conclaves for papal elections. He was succeeded by Innocent V.

GREGORY XI. (Pierre Roger de Beaufort), pope from 1370 to 1378, born in Limousin in 1336, succeeded Urban V. in 1370 as one of the Avignon popes. During his pontificate vigorous measures were taken against the "[illegible]" which had broken out in Germany, England, and other parts of Europe; a sincere effort was also made to bring about a reformation in the various monastic orders. The nineteen propositions of Wickliffe and the thirteen articles of the "Sachsenspiegel" were formally condemned by him in 1373. His energy was largely stimulated by the stirring words of Catherine of Siena (see vol. v. p. 241), to whom in particular the transference of the papal see back to Italy, January 27, 1377, was almost entirely due. He did not long survive this removal, dying on March 27, 1378. His successor was Urban VI., but the anti-pope Clement VII. also received much support, and the schism lasted forty years.

GREGORY XII. (Angelo Corrario or Corraro), pope from 1406 to 1409, born at Venice about 1326, succeeded Innocent VII. on 30th November 1406, having been chosen at Rome by a conclave consisting of only fifteen cardinals, under the express condition that, should Benedict XIII. of Avignon renounce all claim to the papacy, he also would renounce his, so that a fresh election might be made by the no longer divided church. Along with Benedict he was deposed by the council of Pisa in March 1409 as schismatical, heretical, perjured, and scandalous; but it was not till after the council of Constance had set aside John XXIII. (1415) that through his ambassador he formally renounced the title and dignity of lawful pope. The rest of his life was spent in peaceful obscurity as cardinal bishop of Porto and legate of the mark of Ancona. He died October 18, 1417, having been succeeded in 1409 by Alexander V.

GREGORY XIII. (Ugo Buoncompagno), pope from 1572 to 1585, was born February 7, 1502, at Bologna, where he studied law and graduated in 1530, and afterwards taught jurisprudence for some years, Alexander Farnese and Charles Borromeo being among his pupils. At the age of thirty-six he was summoned to Rome by Paul III., under whom he held successive appointments as first judge of the capital, abbreviator, and vice chancellor of the campagna; by Paul IV. he was attached as datarius to the suite of Cardinal Carafa; and by Pius IV. he was created cardinal priest and sent to the council of Trent. On the death of Pius V. in May 1572, the choice of the conclave fell upon Buoncompagno, who assumed the name of Gregory XIII. His intervention in the affairs of Britain through Ireland and by means of his tool Philip II., and also the league which he sought to cement against France (the massacre of the St Bartholomew had taken place in September 1572), are matters which belong to the history of those countries. In order to raise funds for these and similar objects, he confiscated a large proportion of the houses and properties throughout the states of the church,—a measure which enriched his treasury, indeed, for a time, but by alienating the great body of the nobility and gentry, revived old factions, created new ones, and ultimately plunged his temporal dominions into a state bordering upon anarchy. Such was the position of matters at the time of his death, which took place on the 10th of April 1585. He was a liberal patron of the Jesuit order, for which he founded many new colleges; the new and greatly improved edition of the *Corpus juris canonici* was also due to his care; but the work with which the name of Gregory XIII. is most intimately and honourably associated is that of the reformation of the calendar, which has been already described under that heading (vol. iv. p. 671). Gregory XIII. was succeeded by Sixtus V.

GREGORY XIV. (Niccolo Sfondrato), pope from 1590 to 1591, a native of Cremona, succeeded Urban VII., 5th December 1590. As a monk he had been eminent for the decency and strictness of his life; but his brief pontificate was marked by no important occurrence, except that, instigated by the king of Spain and the duke of Mayenne, he excommunicated Henry IV. of France, declaring him, as a heretic and persecutor, to be deprived of his dominions, and also levied an army for the invasion of France. The history of that country records how this proceeding was regarded alike by clergy, parliament, and people. The biographers mention as a curious personal trait of Gregory XIV. a nervous tendency to laughter which occasionally became irresistible, and which manifested itself even at his coronation. He was succeeded by Innocent IX.

GREGORY XV. (Alessandro Ludovisio), pope from 1621 to 1623, born at Bologna in 1554, succeeded Paul V. on the 9th of February 1621. Beyond assisting the German emperor against the Protestants, and the king of Poland against the Turks, he interfered little in European politics. He was a learned divine and manifested a reforming spirit; and his pontificate was marked by the canonization of St Theresa, Francis Xavier, Ignatius Loyola, and Philip Neri. He died on the 18th of July 1623, and was succeeded by Urban VIII.

GREGORY XVI. (Bartolommeo Alberto Cappellari), pope from 1831 to 1846, was born at Belluno on September 18, 1765, and at an early age entered the order of the Camaldoli, among whom he rapidly gained distinction for his theological and linguistic acquirements. His first appearance before a wider public was in 1799, when he published against the Italian Jansenists a controversial work entitled *Trionfo della Santa Sede*, which, besides passing through several editions in Italy, was translated into several European languages. In 1800 he became a member of the Academy of the Catholic Religion, founded by Pius VII., to which he contributed a number of memoirs on theological and philosophical questions. When Pius VII. was carried off from Rome in 1809, Cappellari withdrew to the monastery of San Michele at Murano, near Venice, and in 1814, with some other members of his order, he removed to Padua; but soon after the restoration of the pope he was recalled to Rome, where he received successive appointments as vicar-general of the Camaldoli, councillor of the Inquisition, prefect of the Propaganda, and examiner of bishops. In March 1825 he was created cardinal by Leo XII., and shortly afterwards was entrusted with an important mission to adjust a concordat regarding the interests of the Catholics of Belgium and the Protestants of Holland. On the 2d February 1831 he was, after sixty-four days' conclave, unexpectedly chosen to succeed Pius VIII. in the papal chair. The revolution of 1830 had just inflicted a severe blow on the ecclesiastical party in France, and it seemed as if similar disasters to the papal cause were imminent in other parts of Europe, when Gregory XVI. entered upon his fifteen years' pontificate. Almost the first act of the new Government of France was to unfurl the tricolor at Ancona; and the immediate effect was to throw all Italy, and particularly the Papal States, into a state of excitement such as seemed to call for strongly repressive measures. In the course of the struggle which ensued, the temporal reign of Gregory was marked accordingly by executions, banishments, imprisonments, to an extent which makes it impossible for the candid reader to absolve him from the charges of cruelty and bigotry which were so frequently raised at the time. The embarrassed financial condition in which he left the States of the Church also makes it doubtful how far his lavish expenditure in architectural and engineering works, and his magnificent patronage of learning in the hands of Mai, Mezzofanti, and others, were for the real benefit of his subjects. The years of his pontificate were marked by the steady development and diffusion of those ultramontane ideas which were ultimately formulated under the presidency of his successor Pius IX. by the council of the Vatican. He died 1st June 1846.

GREGORY, St, the Illuminator (in Armenian *Gregor Lusarovitch*, in Greek *Gregorios Phoster* or *Photistes*), the founder and patron saint of the Armenian Church, was born about 257 A.D. He belonged to the royal race of the Arsacides, being the son of a certain Prince Anak, who assassinated Chosroes of Armenia, and thus brought ruin on himself and his family. His mother's name was Okohe, and the Armenian biographers tell how the first Christian influence he received was at the time of his conception, which took place near the monument raised to the memory of the holy apostle Thaddeus. Educated by a Christian nobleman, Euthalius, in Cæsarea in Cappadocia, Gregory sought, when he came to man's estate, to introduce the Christian doctrine into his native land. At that time Tiridates I., a son of Chosroes, sat on the throne, and, influenced partly it may be by the fact that Gregory was the son of his father's enemy, he subjected him to much cruel usage, and imprisoned him for fourteen years. It would be useless to relate the various forms of torture which the orthodox accounts represent the saint to have endured without permanent hurt; almost any one of his twelve trials would have been certain death to an ordinary mortal. But vengeance and madness fell on the king, and at length Gregory was called forth from his pit to restore his royal persecutor to reason by virtue of his saintly intercession. The cause of Christianity was now secured; king and princes and people vied with each other in obedience to Gregory's instruction, and convents, churches, and schools were established. Gregory in 302 received consecration as patriarch of Armenia from Leontius of Cæsarea, and in 318 he appointed his son Aristax to be his successor. About 331 he withdrew to a cave in the mountain Sebuh in the province of Daranalia in Upper Armenia, and there he died a few years afterwards unattended and unobserved. When it was discovered that he was dead his corpse was removed to the village of Thordanum or Thortan. The remains of the saint were scattered far and near in the reign of Zeno. His head is said to be now in Italy, his right hand at Etchmiadzin, and his left at Sis. It is almost impossible to get at Gregory's real personality through the tangled growth of ecclesiastical legend; but he would appear to have possessed some of that consideration for expediency which is so frequently of service to the reformer. While he did his best to undermine their system, he left the pagan priests in enjoyment of their accustomed revenues.

A number of homilies, possibly spurious, several prayers, and about thirty of the canons of the Armenian Church are ascribed to Gregory. The homilies appeared for the first time in a work called *Haschounapadum* at Constantinople in 1737; a century afterwards a Greek translation was published at Venice by the Mekhitarists; and they have since been edited in German by J. M. Schmid (Ratisbon, 1872). The original authorities for Gregory's life are Agathangelos, whose *History of Tiridates* was published by the Mekhitarists in 1835; Moses of Chorene, *Historiæ Armenicæ*; and Simeon Metaphrastes. A *Life of Gregory* by the vartabed Matthew, published in Armenian at Venice in 1749, was translated into English by Rev. S. C. Malan, 1868. See also Bonucci, *Istoria della vita di S. Gregorio*, 1717; Neumann, *Gesch. der Armenischen Literatur*, 1835; and Dulaurier, *Hist. des dogmes, &c., de l'église Armenienne*, 1859.

GREGORY, St, of Nazianzus, surnamed Theologus, one of the four great fathers of the Eastern Church, was born about the year 329 A.D., at or near Nazianzus, Cappadocia. His father, also named Gregory, a convert from Hypsistarianism, had lately become bishop of the diocese; his mother Nonna, an eminently pious woman, by whom he was dedicated to the service of God from his birth, appears to have exercised a powerful influence over the religious convictions of both father and son. In pursuit of a more liberal and extended culture than could be procured in the insignificant town of Nazianzus, Gregory visited successively the two Cæsareas, Alexandria, and Athens, as a student of grammar, mathematics, rhetoric, and philosophy; at the last-named seat of learning, where he prolonged his stay until he had entered his thirtieth year, he enjoyed the society and friendship of Basil, who afterwards became the famous bishop of Cæsarea; the prince Julian, destined soon afterwards to play so prominent a part in the world's history, was also a fellow-student. Shortly after his return to his father's house at Nazianzus (about the year 360) Gregory received baptism, and renewed his dedication to the service of religion; he still continued, however, for some time, and indeed more or less throughout his whole life, in a state of hesitation as to the form which that service ought to take. Strongly inclined by nature and education to a contemplative life spent among books and in the society of congenial friends, he was yet continually urged by outward circumstances, and doubtless also by some inward call, to active pastoral labour. The spirit of refined intellectual monasticism, which clung to him through life and never ceased to struggle for the ascendency, was about that time strongly encouraged by his intercourse with Basil, who was then revelling in the exalted pleasures of his retirement in Pontus; the preparation of the φιλοκαλία, a sort of chrestomathy compiled by the two friends from the writings of Origen, belongs to this period. But the events which were at that time stirring the political and ecclesiastical life of Cappadocia, and indeed of the whole Roman world, made a career of learned leisure difficult if not impossible to a man of Gregory's position and temperament. The emperor Constantius, having by a course of artful intrigue and intimidation succeeded in thrusting a semi-Arian formula upon the Western bishops assembled at Ariminum in Italy, had next attempted to follow the same course with the Eastern episcopate. The aged bishop of Nazianzus having yielded to the imperial threats, a great storm arose among the monks of the diocese, which was only quelled by the influence of the younger Gregory, who shortly afterwards (about 361) was ordained to the priesthood. After a vain attempt to evade his new duties and responsibilities by flight, he appears to have continued to act as a presbyter in his father's diocese without interruption for some considerable time; and it is probable that his two *Invectives* against Julian are to be assigned to this period. Subsequently (about 372), under a pressure which he somewhat resented, he allowed himself to be nominated by Basil as bishop of Sasima, a miserable little village some 32 miles from Tyana; but he seems hardly, if at all, to have assumed the duties of this diocese, for after another interval of "flight" we find him once more (about 372–3) at Nazianzus, assisting his aged father, on whose death (374) he retired to Seleucia in Isauria for a period of some years. Meanwhile a more important field for his activities was opening up. Towards 378–9 the small and depressed remnant of the orthodox party in Constantinople sent him an urgent summons to undertake the task of resuscitating the catholic cause, so long persecuted and borne down by the Arians of the capital. With the accession of Theodosius to the imperial throne, the prospect of success to the Nicene doctrine had dawned, if only it could find some courageous and devoted champion. The fame of Gregory as a learned and eloquent disciple of Origen, and still more of Athanasius, pointed him out as such a defender; nor could he resist the appeal made to him, although he took the step sorely against his will. Once arrived in Constantinople, he laboured so zealously and well that the orthodox party speedily gathered strength, and the small apartment in which they had been accustomed to meet was soon exchanged for a vast and celebrated church which received the significant name of Anastasia, the Church of the Resurrection. Among the hearers of Gregory were to be found, not only churchmen like Jerome and Evagrius, but also heretics and heathens; and it says much for the sound wisdom and practical tact of the preacher that from the outset he set himself less to build up and defend a doctrinal position than to urge his flock to the cultivation of the loving Christian spirit which cherishes higher aims than mere heresy hunting or endless disputation. Doctrinal, nevertheless, he was, as is abundantly shown by the famous five discourses on the Trinity, which earned for him the distinctive appellation of ὁ θεολόγος (θεολογία being here used in the stricter sense to designate the doctrine of Christ's divinity, and distinguished from οἰκονομία, which denotes the doctrine of His incarnation). He continued to labour in the Eastern capital till the arrival of Theodosius, and the visible triumph of the orthodox cause; the metropolitan see was then conferred upon him, and after the assembling of the second œcumenical council in 381 he received consecration from Meletius. In consequence, however, of a spirit of discord and envy which had manifested itself in connexion with this promotion, he soon afterwards, in an oration, not without some bitterness of tone, resigned his dignity, and withdrew into comparative retirement. The rest of his days were spent partly at Nazianzus, where he appears still to have mixed himself in ecclesiastical affairs, and partly on his patrimonial estate at Arianzus, where he devoted himself to his favourite literary pursuits, and especially to poetical composition, until his death, which occurred in 389 or 390. His festival is celebrated in the Eastern Church on January 25th and 30th, in the Western on 9th May (duplex).

His extant works consist of poems, epistles, and orations. The poems, which include epigrams, elegies, and an autobiographical sketch, have been frequently printed, the *editio princeps* being the Aldine (1504). Other editions are those of Tollius (1696) and Muratori (1709); a volume of *Carmina Selecta* also has been edited by Dronke (1840). The tragedy entitled Χριστὸς πάσχων usually included is certainly not genuine. Of Gregory's poetry there is not much to be said. His best energies were not devoted to it; it was adopted in his later years as a recreation rather than as a serious pursuit; thus it is occasionally delicate, graphic, beautiful, as could not fail to be the case with a writer of his culture and power, but it is not sustained. Of the hymns none have passed into ecclesiastical use. The letters are entitled to a higher place in literature. They are always easy and natural; and there is nothing forced in the manner in which their acute, witty, and proverbial sayings are introduced. As an orator he is held to have surpassed all his contemporaries "in the purity of his words, the nobleness of his expressions, the ornaments of his discourse, the variety of his figures, the justness of his comparisons, the beauty of his reasonings, and the sublimity of his thoughts." Thus, though possessed neither of Basil's gift of government nor of Gregory of Nyssa's power of speculative thought, he worthily takes a place in that triumvirate of Cappadocians whom the Catholic Church gratefully recognizes as having been, during the critical struggles in the latter half of the 4th century, the best defenders of its faith. The *Opera Omnia* were first published by Hervagius (Basel, 1550); the subsequent editions have been those of Billius (Paris, 1609, 1611; aucta ex interpretatione Morelli, 1630), of the Benedictines (begun in 1778, but interrupted by the French Revolution and not completed until 1840, Caillau being the final editor), and of Migne.

Scattered notices of the life of Gregory Nazianzen are to be found in the writings of Socrates, Sozomen, Theodoret, and Rufinus, as well as in his own letters and poems. The data derived from these sources do not always harmonize with the account of Suidas. The earlier memoirs and treatises, such as Tillemont (*Mém. Eccl.*, t. ix.) and Leclerc (*Bibl. Univ.*, t. xviii.) have been made use of by Gibbon in his brief but able sketch of this father. Among recent monographs may be mentioned those of Ullmann (*Gregorius von Nazianz der Theologe*, 1825; Eng. transl. by G. F. Cox, M.A., 1857), Benoît (*St Grégoire de Nazianze, sa vie, ses œuvres, et son époque*, 1877), and Montaut (*Revue critique de quelques questions historiques se rapportant à St Grégoire de Nazianze*, 1879).

GREGORY, St, of Nyssa, one of the great Cappadocians, and designated by one of the later œcumenical councils as "a father of fathers," was a younger brother of St Basil, and was born (probably) at Neocæsarea about 331 A.D. For his education, which was the best that could be got at that time, he appears to have been chiefly indebted to his elder brother. At a comparatively early age he entered the church, and held for some time the office of anagnost or reader; subsequently he manifested a desire to devote himself to the secular life as a rhetorician; but this impulse was checked by the earnest remonstrances of Gregory Nazianzen. Finally, in 371 or 372 he was ordained by his brother Basil to the bishopric of Nyssa, a small town in Cappadocia. Here he is usually said (but on inadequate data) to have adopted the opinion then gaining ground in favour of the celibacy of the clergy, and to have separated from his wife Theosebia, who became a deaconess in the church. His strict orthodoxy on the subject of the Trinity and the Incarnation, together with his vigorous eloquence, combined to make him peculiarly obnoxious to the Arian faction, which was at that time in the ascendant through the protection of the emperor Valens; and in 375, on the ground of alleged irregularities in his election, and in the administration of the finances of his diocese, he was driven into exile, whence he did not return till the publication of the edict of Gratian in 378. Shortly afterwards he took part in the proceedings of the synod which met at Antioch in Caria, principally in connexion with the Meletian schism. At the great oecumenical council held at Constantinople in 381, he was a conspicuous champion of the orthodox faith; according to Nicephorus, indeed, the additions made to the Nicene creed were entirely due to his suggestion, but this statement is of doubtful authority. That his eloquence was highly appreciated is shown by the facts that he pronounced the discourse at the consecration of Gregory of Nazianzus, and that he was chosen to deliver the funeral oration on the death of Meletius the first president of the council. In the following year, moreover (382), he was commissioned by the council to inspect and set in order the churches of Arabia, in connexion with which mission he also visited Jerusalem. The impressions he gathered from this journey may, in part at least, be gathered from his famous letter *De Euntibus Hierosolymam*, in which an opinion strongly unfavourable to pilgrimages is expressed. In 383 he was probably again in Constantinople; where in 385 he pronounced the funeral orations of the princess Pulcheria and afterwards of the empress Placilla. Once more we read of him in 394 as having been present in that metropolis at the synod held under the presidency of Nectarius to settle a controversy which had arisen among the bishops of Arabia, in the same year he assisted at the consecration of the fine new church of the apostles at Chalcedon, on which occasion there is reason to believe that his discourse commonly but wrongly known as that *εἰς τὴν ἑαυτοῦ χειροτονίαν* was delivered. The exact date of his death is unknown; some authorities refer it to 396, others to 400. His festival is observed by the Greek Church on January 10th; in the Western martyrologies he is commemorated on March 9th.

Gregory of Nyssa is generally admitted to have excelled both his brother Basil and Gregory of Nazianzus alike in the natural vigour of his intellect and in the wide extent of his acquirements. His teaching, though strictly trinitarian, shows considerable freedom and originality of thought; in many points his mental and spiritual affinities with Origen show themselves with advantage; though in one particular—namely, in his doctrine of *ἀποκατάστασις* or final restoration—his views have since been repudiated by the orthodox. His style has been frequently praised by competent authorities for sweetness, richness, and elegance. His numerous works may be classified under five heads:—(1.) Treatises in doctrinal and polemical theology. Of these the most important is that *Against Eunomius* in twelve books. Its doctrinal thesis (which is supported with great philosophic acumen and rhetorical power) is the divinity and consubstantiality of the Word; incidentally the character of Basil, which Eunomius had aspersed, is vindicated, and the heretic himself is held up to scorn and contempt. This is the work which, most probably in a shorter draft, was read by its author when at Constantinople before Gregory Nazianzen and Jerome in 381 (Jerome, *De Vir. Ill.*, 128). To the same class belong the treatise *To Ablabius*, against the tritheists; *On Faith*, against the Arians; *On Common Notions*, in explanation of the terms in current employment with regard to the Trinity; *Ten Syllogisms*, against the Macedonians; *To Theophilus*, against the Apollinarians; an *Antirrhetic* against the same; *Against Fate*, a disputation with a heathen philosopher; the *Oratio Catechetica Magna*; and the dialogue *De Anima et Resurrectione*. (2.) Practical treatises. To this category belong the tracts *On Virginity* and *On Pilgrimages*; as also the *Canonical Epistle* upon the rules of penance. (3.) Expository and homiletical works, including the *Hexaemeron*, and several series of discourses *On the Workmanship of Man*, *On the Inscriptions of the Psalms*, *On the Sixth Psalm*, *On the first three Chapters of Ecclesiastes*, *On Canticles*, *On the Lord's Prayer*, and *On the Eight Beatitudes*. (4.) Biographical, consisting chiefly of funeral orations. (5.) Letters. The only complete editions of the whole works are those by Fronton le Duc (Fronto Ducaeus, Paris, 1615; with additions, 1618 and 1638) and by Migne. Of the new edition projected by F. Oehler only the first volume, containing the *Opera Dogmatica*, has appeared (1865). There have been numerous editions of several single treatises, as for example of the *Oratio Catechetica*, *De Precatione*, and *De Anima et Resurrectione*. See the monograph by Rupp (*Gregors, des Bischofs von Nyssa, Leben und Meinungen*, Leipsic, 1834), and compare Heyns (*Disputatio historico-theologica de Greg. Nyss.*, 1835), Moller (*Gregorii Nyss. doctrinam de hominis natura et illustravit et cum Origeniana comparavit*, 1854), and Stigler, *Die Psychologie des h. Gregors von Nyssa* (Ratisbon, 1857).

GREGORY, St, surnamed in later ecclesiastical tradition THAUMATURGUS (the miracle worker), was born of noble and wealthy heathen parents at Neocaesarea, towards the beginning of the 3d century of the Christian era. His original name was Theodorus. Destined by his parents for the bar, he studied civil law at Athens, Alexandria, and Berytus, it is said; he afterwards (about 231) accompanied his sister to Cæsarea in Palestine, where he became the pupil and finally the convert of Origen. In returning to Cappadocia some five years after his conversion, it had been his original intention to live a retired ascetic life (Euseb., *H. E.*, vii. 30); but this wish he was not permitted to gratify. Urged by Origen, and at last almost compelled by Phædimus of Amasia, his metropolitan, neither of whom was willing to see so much learning, piety, and masculine energy practically lost to the church, he, after many attempts to evade the dignity, was consecrated bishop of his native town (about 240). His episcopate, which lasted some thirty years, was characterized by great zeal, and by so much success that, according to the (doubtless somewhat rhetorical) statement of Gregory of Nyssa, whereas at the outset of his labours there were only seventeen Christians in the city, there were at his death only seventeen persons in all who had not embraced Christianity. This result he achieved in spite of the Decian persecution (250), during which he had felt it to be his duty to absent himself from his diocese, and notwithstanding the demoralizing effects of an irruption of barbarians who laid waste the diocese in 260. Gregory, although he has not always escaped the charge of Sabellianism, now holds an undisputed place among the fathers of the church; and although the turn of his mind was practical rather than speculative, he is known to have taken an energetic part in most of the doctrinal controversies of his time. He was active at the synods of Antioch which investigated and condemned the heresies of Paul; and the rapid spread in Pontus of a Trinitarianism approaching the Nicene type is attributed in large measure to the weight of his influence. Gregory is believed to have died in the reign of Aurelian, about the year 270, though some accounts place his death six years earlier. His festival (semiduplex) is observed by the Church of Rome on the 17th of November. For the facts of his biography our earliest and best authority is the *Life* or rather *Panegyric* by Gregory of Nyssa; but there are also incidental notices of him in the writings of Basil the Great. Both these writers represent him as having wrought miracles of a very startling description; but nothing related by them comes near the astounding narratives given in the *Martyrologies*, or even in the *Breviarium Romanum*, in connexion with his name.

The principal works of Gregory Thaumaturgus are the *Panegyricus in Origenem* (εἰς Ὠριγένην πανηγυρικὸς λόγος), which he wrote when on the point of leaving the school of that great master; a *Metaphrasis in Ecclesiasten*, characterized by Jerome as "short but useful"; and an *Epistola Canonica*, which treats of the discipline to be undergone by those Christians who under pressure of persecution had relapsed into paganism, but desired to be restored to the privileges of the church. An *Expositio Fidei*, usually attributed to Gregory, and traditionally alleged to have been received by him immediately in vision from the apostle John himself, is of doubtful authenticity. There have been several editions of the works of this father; of these may be mentioned that of Gerard Voss, in Greek and Latin (Mainz, 1604); the Paris edition of 1622; and that contained in the third volume of Galland's *Bibliotheca Patrum* (Paris, 1788). They are also to be found in a Latin translation in Migne's *Patrologia Græca*, vol. vii. A separate reprint of the *Panegyricus in Origenem* was published by Bengel in 1722. The life of Gregory has been written by Pallavicini (Rome, 1644) and by Boye (Jena, 1703).

GREGORY, St, of Tours (*c.* 540–594), historian of the Franks, was born at Clermont, Auvergne, not earlier than 539 and not later than 543 A.D. He was the youngest son of Florentius, a provincial senator, and head of one of the oldest and most powerful Christian families in the country; at his baptism he received the name of George, that of Gregory not having been assumed until his consecration at least thirty years afterwards. He received his education under the superintendence of his uncle Gallus, at that time bishop of Clermont, and afterwards under Avitus, who succeeded to that see. Having been ordained a deacon on attaining the canonical age, the youthful Georgius Florentius for a time attended in some ecclesiastical capacity the court of Sigebert of Austrasia; and when in 573 a vacancy occurred in the see of Tours, which had been occupied by many of his kindred, his reputation for piety and wisdom led to his being immediately designated as a suitable successor to that bishopric. Circumstances soon occurred which brought into great prominence his peculiar fitness for this post; first in 575, when Guntran had taken refuge from Chilperic in the sanctuary of St Martin, and afterwards in 577, when Pretextatus of Rouen had been unjustly condemned by the rest of his brethren. The firmness and courage which he showed on these and other occasions brought upon him the bitter hostility of the strong-minded Queen Fredegond, who caused him to be summoned before a council at Braine on a charge of treason, of which, however, he was acquitted. In 581 he took a leading part in adjusting that arrangement between Chilperic and Childebert which gave peace to France for many years. During the later years of his life he used his political influence and prestige, which were now immense, with singular unselfishness and judgment in the interest alike of his diocese and of the whole country. He died at Tours on the 17th of November 594, and subsequently attained the honours of beatification and canonization, his day in the calendar (semiduplex) being November 17th.

Of his writings, besides the *Historia Francorum* in ten books, we possess a treatise *De Miraculis* in seven books, containing the miracles of Christ and his apostles, those of Julian, of Martin, and also of others. Other treatises which he mentions have perished. The *De Miraculis* appears to have occupied him at intervals during the whole of his public life; of the *Historia Francorum* he is supposed to have written as far as to about the middle of the fifth book by 577; the eighth book was completed before 585, and the tenth about 591, the epilogue being of still later date. This work, which gives Gregory of Tours a just title to be called the father of French history, has no pretensions to elegance or even grammatical accuracy of style, is wholly uncritical, and betrays in every page the prejudices and ignorance of the age to which it belongs. But it is honest, and is evidently written from the point of view of one whose avowed aim was to trace "the wars of kings with hostile nations, of martyrs with pagans, of churches with heretics," and as an original source for the period of 174 years which it covers it is still, [illegible] judgment which Gibbon has expressed, invaluable.

[illegible] works of Gregory of Tours, which appeared at Paris in 1511-12, has been [illegible] superseded by that of Ruinart (Paris, 1699). [illegible] life of the saint [illegible]. [illegible] adds to a reprint [illegible] Gregory [illegible], and others [illegible] repeatedly [illegible], a [illegible] in 1847 [illegible] followed [illegible]. See Kries, [illegible]; Löbell, [illegible] (Leipsic, [illegible]; 2d ed., [illegible]), and an article in the [illegible].

GREGORY, the name of a Scottish family, many members of which attained high eminence in various departments of science, eleven having held professorships. Of the most distinguished of their number a notice is given below.

I. David Gregory (1628-1720), eldest son of the Rev. John Gregory of Drumoak, Aberdeenshire, was born in 1628. For some time he was connected with a mercantile house in Holland, but on succeeding to the family estate of Kinardie he returned to Scotland, and occupied most of his time in scientific pursuits, freely giving his poorer neighbours the benefit of his medical skill. He is said to have been the first possessor of a barometer in the north of Scotland; and on account of his success by means of it in predicting changes in the weather, he was accused of witchcraft before the presbytery of Aberdeen, but he succeeded in convincing that body of his innocence. He died in 1720.

II. James Gregory (1638-1675), the author of important discoveries in mathematics and optics, younger brother of the preceding, was born in 1638. He was educated at the grammar school of Aberdeen and at Marischal College of that city. At an early period he manifested a strong inclination and capacity for mathematics and kindred sciences; and before completing his twenty-third year he published his famous treatise *Optica Promota*, in which he made known his great invention the Gregorian reflecting telescope. About 1665 he went to the university of Padua, where he studied for some years, and in 1667 published *Vera Circuli et Hyperbolæ Quadratura*, in which he propounded his method of an infinitely converging series for the areas of the circle and hyperbola. In the following year he published also at Padua *Geometriæ Pars Universalis*, in which he laid down a series of rules for the transmutation of curves and the measurement of their solids of revolution. On his return to England in this year he was elected a member of the Royal Society; in the following year he became professor of mathematics in the university of St Andrews; and in 1674 he was transferred to the chair of mathematics in Edinburgh. In October 1675, while showing the satellites of the planet Jupiter to some of his students through one of his telescopes, he was suddenly struck with blindness; and he died a few days afterwards at the early age of thirty-seven.

Besides the works already mentioned Gregory is the author of *Exercitationes Geometricæ*, 1668, and, it is alleged, of a satirical tract entitled *The Great and New Art of Weighing Vanity*, intended to ridicule certain fallacies of a contemporary writer on hydrostatics, and published at Glasgow in 1672, professedly by "Patrick Mathers, archbeadle of the university of St Andrews."

III. David Gregory (1661-1708), nephew of the preceding and son of the David Gregory above mentioned, was born in Aberdeen in 1661. He was educated partly in his native city and partly in Edinburgh, where at the age of twenty-three he became professor of mathematics. In 1691 he was appointed Savilian professor of astronomy at Oxford, an office which he held till his death in 1708. His principal works are *Exercitatio Geometrica de dimensione figurarum* (1684), *Catoptricæ et Dioptricæ Sphæricæ Elementa* (1695), and *Astronomiæ Physicæ et Geometricæ Elementa* (1702),—the last a work highly esteemed by Newton, of whose system it is an illustration and a defence. A *Treatise on Practical Geometry* which he left in manuscript was translated from the Latin and published in 1745. He was succeeded in the chair of mathematics in Edinburgh by his brother James; another brother, Charles, was in 1707 appointed professor of mathematics in the university of St Andrews; and his eldest son, David, became professor of modern history at Oxford, and canon and latterly dean of Christ Church.

IV. John Gregory (1724-1773), professor of medicine in the university of Edinburgh, grandson of James Gregory, the inventor of the Gregorian telescope, and youngest son of Dr James Gregory, professor of medicine in King's College, Aberdeen, was born at Aberdeen, June 3, 1724. After studying at the grammar school of Aberdeen, and completing his literary course at King's College in that city, he attended the medical classes at Edinburgh university. In 1745 he went to Leyden to complete his medical studies, and during his stay there he received without solicitation the degree of doctor of medicine from King's College, Aberdeen. On his return from Holland he was elected professor of philosophy at King's College, but in 1749 he resigned his professorship on account of its duties interfering too much with his practice as a physician. In 1754 he proceeded to

London, where he made the acquaintance of many persons of distinction, and the same year was chosen fellow of the Royal Society. On the death in November 1755 of his brother Dr James Gregory, who had succeeded his father as professor of medicine in King's College, Aberdeen, he was appointed to that office. In 1764 he removed to Edinburgh in the hope of obtaining a more extended field of practice as a physician, and in 1766 he was appointed professor of the practice of physic in the university of Edinburgh, to whose eminence as a medical school he largely contributed. From his eighteenth year Dr Gregory had been subject at irregular intervals to attacks of gout, and on the morning of February 10th, 1773, he was found dead in bed apparently from the results of this disease.

He is the author of *A Comparative View of the State and Faculties of Man with those of the Animal World*, 1765; *Observations on the Duties and Offices of a Physician*, 1772; *Elements of the Practice of Physic*, 1772; and *A Father's Legacy to his Daughters*, 1774. His *Whole Works*, with a life by Mr Tytler (afterwards Lord Woodhouselee), were published at Edinburgh in 1788.

V. James Gregory (1753-1821), professor of the practice of medicine in the university of Edinburgh, eldest son of the preceding, was born at Aberdeen in 1753, and received there the rudiments of his education. He accompanied his father to Edinburgh in 1764, and after going through the usual course of literary studies at that university, he was for a short time a student at Christ Church, Oxford. It was there probably that he acquired that taste for classical learning which afterwards distinguished him. He then entered on the study of medicine at Edinburgh, and, after graduating doctor of medicine in 1774, spent the greater part of the next two years in Holland, France, and Italy. Shortly after his return to Scotland he was appointed in 1776 to the chair his father had formerly held, and in the following year he also entered on the duties of teacher of clinical medicine in the Royal Infirmary. On the illness of Dr Cullen in 1790 he was appointed joint-professor of the practice of medicine; he became sole professor on the death of Dr Cullen in the same year; and he continued to deliver lectures on that subject, to audiences almost regularly increasing, until his last illness in 1821. He died on the 2d April of that year. As a medical practitioner Dr Gregory was for the last ten years of his life decidedly at the head of the profession in Scotland; and as a professor his quickness and commanding energy of intellect, his power of perspicuous and elegant exposition, and his genuine sense of humour gave him a remarkable ascendency over the minds of his pupils.

Besides his *Conspectus Medicinæ Theoreticæ*, published in 1788 as a text-book for his lectures on the institutes, Dr Gregory was the author of "A Theory of the Moods of Verbs," published in the *Edin. Phil. Trans.*, 1787, and of *Literary and Philosophical Essays*, published in two volumes in 1792.

VI. William Gregory (1803-1858), son of the preceding, was born 25th December 1803. In 1837 he became professor of chemistry at the Andersonian Institution, Glasgow, in 1839 at King's College, Aberdeen, and in 1844 at Edinburgh University. He died April 24, 1858. Gregory was one of the first in England to advocate the theories of Liebig, and translated several of his works. He is also the author of *Outlines of Chemistry*, 1845, and an *Elementary Treatise on Chemistry* reprinted from the *Encyclopædia Britannica*, 1855.

VII. Duncan Farquharson Gregory (1813-1844), brother of the preceding, was born 13th April 1813. After studying at the university of Edinburgh he in 1833 entered Trinity College, Cambridge, where he was for a time assistant professor of chemistry, and was one of the founders of the chemical society. He latterly devoted his chief attention to mathematics, in which he made some important discoveries. He died 23d February 1844.

The *Cambridge Mathematical Journal* was originated, and for some time edited, by Gregory; and he also published a *Collection of Examples of Processes in the Differential and Integral Calculus*, 1841. A *Treatise on the Application of Analysis to Solid Geometry*, which he left unfinished, was completed by W. Walton, and published posthumously in 1846. His *Mathematical Writings*, edited by W. Walton, with a biographical memoir by Robert Leslie Ellis, appeared in 1865.

GREGORY, Olinthus, LL.D. (1774–1841), was born 29th January 1774 at Yaxley, in Huntingdonshire. He was only nineteen when he published *Lessons Astronomical and Philosophical* (1793), and soon after, by a manuscript on the "Use of the Sliding Rule," he was fortunate enough to excite the interest of Dr Hutton, professor of mathematics at the Royal Military Academy of Woolwich. Having settled at Cambridge in 1798, Gregory first acted as subeditor of a provincial newspaper, and then opened a bookseller's shop; but before long he found that he would be better off as a private teacher of mathematics. In 1802 he obtained an appointment as mathematical master at Woolwich through the influence of Hutton; and when Hutton resigned in 1807, Gregory succeeded him in the professorship. Failing health obliged him to retire in 1838, and he died at Woolwich 2d February 1841.

Of Gregory's numerous mathematical works it is enough to mention *Hints for the Use of Teachers of Elementary Mathematics* (1840; new edition, 1853), and *Mathematics for Practical Men* (1825), which was revised and enlarged by Henry Law in 1848, and again by J. R. Young in 1862. His *Letters on the Evidences of Christianity* (1815) have been several times reprinted, and an abridgment was published by the Religious Tract Society in 1853. He will probably be longest remembered for his *Biography of Robert Hall*, which first appeared in the collected edition of Hall's works, was published separately in 1833, and has since passed through several editions. The minor importance of his *Memoir of John Mason Good* (1828) is due to the narrower fame of the subject. Gregory was one of the founders of the Royal Astronomical Society. In 1802 he was appointed editor of the *Gentlemen's Diary*, and in 1818 editor of the *Ladies' Diary* and superintendent of the almanacs of the Stationers' Company.

GREIFENBERG, the chief town of a circle in the Prussian province of Pomerania and government of Stettin, is situated on the Rega, 45 miles N.E. of Stettin. It possesses a royal gymnasium and a higher girls' school. Agriculture, linen-weaving, and the manufacture of stoves are the principal industries. Griefenberg possessed town rights as early as 1262, and in the 14th and 15th centuries had a considerable shipping trade, but lost much of its prosperity during the Thirty Years' War. Including the garrison, the population in 1875 was 5631. See Riemann, *Geschichte der Stadt Greifenberg in Pommern*, 1862.

GREIFENHAGEN, the chief town of a circle in the Prussian province of Pomerania and government of Stettin, is situated on the Reglitz, 12 miles S.S.W. of Stettin. Its prosperity depends chiefly on agriculture, and it has a considerable cattle trade. There are also linen manufactories and saw-mills. Greifenhagen was built in 1230, and was raised to the rank of a town and fortified in 1262. In the Thirty Years' War it was taken both by the imperialists and the Swedes, and in 1675 it was captured by the Brandenburgers, into whose possession it came finally in 1679. The population in 1875 was 6759.

GREIFSWALD, or Greifswalde, the chief town of a circle in the Prussian province of Pomerania and government of Stralsund, is situated on the Ryck, 3 miles from its mouth in the Baltic, and 20 miles S. by E. of Stralsund. It has wide and regular streets, and is surrounded by promenades formed out of its old ramparts. It is the seat of a court of appeal for the government district of Stralsund. The university, founded in 1456, is attended by nearly 500 students, about one-half of whom belong to the medical faculty; connected with it are an anatomical theatre, an infirmary, a chemical laboratory, a pathological institute, and a library containing nearly 140,000 volumes. The principal other buildings are the church of St Nicholas (with a tower 330 feet high and a valuable library), the old town-house, the theatre, the gymnasium, the orphanage, and the lunatic asylum. There is a considerable shipping trade in Pomeranian corn with England, France, and the Mediterranean ports. Fish-curing, shipbuilding, and the manufacture of machines, railway waggons, needles, soap, tobacco, and oil, are the principal other industries. The population in 1875 was 18,022.

Greifswald was founded about 1240 by mechanics and merchants from the Netherlands. In 1250 it received a town constitution and Lübeck rights from Duke Wratislaus of Pomerania. In 1270 it formed a league with the Hanse towns, Stralsund, Rostock, Wismar, and Lübeck; and it took part in the wars which they carried on against the kings of Denmark and Norway. During the Thirty Years' War it was formed into a fortress by the imperialists, but they vacated it in 1631 to the Swedes, in whose possession it remained after the peace of Westphalia. In 1678 it was captured by the elector of Brandenburg, but it was restored to the Swedes in the following year; in 1713 it was devastated by the Russians; in 1715 it came into the possession of Denmark; and in 1721 it was again restored to Sweden, under whose protection it remained till 1815, when, along with the whole of Swedish Pomerania, it came into the possession of Prussia. See Kosegarten, *Geschichte der Universität Greifswald*, 1856, and Gesterding, *Beitrag zur Geschichte der Stadt Greifswald*, 3 vols., 1827-29.

GREIZ, or GREITZ (formerly *Grewitz* or *Grewz*), a town of Germany, capital of the principality of Reuss-Greiz, is situated in a pleasant valley on the right bank of the White Elster, near the borders of Saxony, and 14 miles W. by S. of Zwickau. It is surrounded by walls, and is tolerably well built. The principal buildings are the prince's palace surrounded by a fine park, the old "residence" castle on a rock overlooking the town, the summer palace with a fine garden, the old town church dating from 1225 and possessing a beautiful tower, the town-house, the city school buildings, the normal seminary for the principality, and the lower city school. The industries include dyeing, tanning, and the manufacture of woollen, cotton, and silk cloth, shawls, coverlets, and paper. The population in 1875 was 12,657.

Greiz is apparently of Slavic origin. From the 12th century it was governed by bailiffs, but in 1236 it came into the possession of Gera, and in 1550 of the younger line of the house of Plauen. It was wholly destroyed by fire in 1494, and almost wholly in 1802. See Weise, *Greiz und seine Umgebung*, 1875.

GRENADA, the most southern island of the Antilles, lies between 11° 58′ and 12° 30′ N. lat. and 61° 20′ and 61° 35′ W. long. It is 30 leagues S.W. of Barbados, and about 60 miles from the nearest point of South America. Its length from north to south is about 24 miles, and its greatest breadth is 12 miles. The area is 133 square miles.

Grenada is rendered highly picturesque by ridges of hills covered with trees and brushwood, and by an irregular but continuous range of mountains which traverses the island from north to south, in some parts rising to 3000 feet above the level of the sea. Lesser ridges branch off, forming rich and picturesque valleys. The mountains and some parts of the lowlands consist of red and gray sandstone, greywacke, hornblende, and argillaceous schist. The strata are much diversified and irregular. Sulphur and fuller's earth are found. Porphyry, limestone, and basaltic rocks occur at certain places. Rivers are numerous, but not large. In the centre of the island, 1740 feet above the level of the sea, is the Grand Étang, a circular lake 2 miles in circumference and 14 feet deep, feeding numerous small rivers. Lake Antoine is another remarkable natural feature. There are several hot chalybeate and sulphurous springs. Along the coast are numerous excellent bays and harbours. The waters abound with fish; game and birds of various species are found. Hurricanes are comparatively unfrequent, but earthquake shocks are sometimes experienced. The average temperature is 82° Fahr., but the higher parts are cooler. Considerable rain falls. The soil is extraordinarily fertile; but cotton, indigo, and tobacco are not now cultivated. Fruits and some kinds of European vegetables grow luxuriantly. Sugar cultivation is not extending, but cocoa is now making rapid strides. The island is divided into six parishes. Formerly it had a house of assembly, but is now a crown colony under the general government of the Windward Islands. It has a lieutenant-governor and a council consisting of officials and members nominated by the crown.

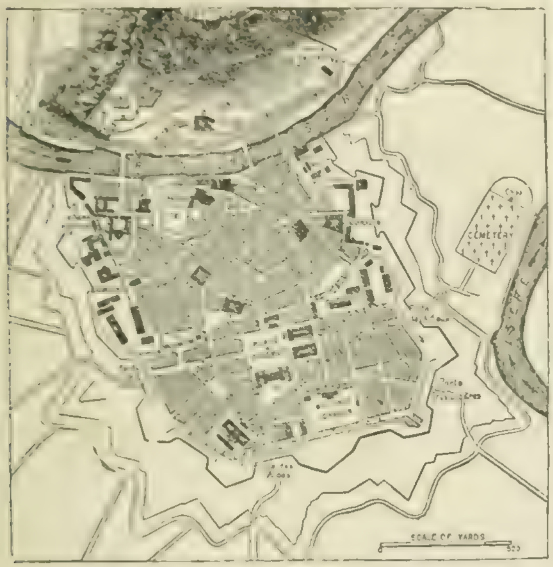
The capital, St George's (population about 5000), is built upon a peninsula projecting into a spacious bay on the west side of the island, near the southern extremity. The houses are of brick or stone, and stand on high ground which rises from the bay. The town is divided by a ridge running into the sea, forming on one side the carcenage, a large basin of water, where ships lie landlocked, close to wharves and stores. A saluting battery, Fort George, overlooks the entrance. On the left, the land rises to the fortifications of Hospital Hill; and a long ridge connects this fort with Richmond Heights, which form the background of the scene and are also fortified. The ridge which connects Fort George with Hospital Hill separates the carcenage from the larger portion of the town, which contains an extensive market-place, and looks upon the bay. Besides the carcenage, there is a spacious sheet of water called the lagoon, separated from the former by a reef passable only by boats.

Between Grenada and St Vincent there are several small islands called Grenadines, some being included in the government of Grenada. Of these Carriacou is the most important. It is about 19 miles in circumference, and contains 3071 inhabitants. Ground provisions, live stock, and some cocoa are cultivated.

The exports in 1877 were—cocoa, 1244 tons; whale oil, 6720 galls.; rum, 53,069 galls.; sugar, 2792 tons. The cocoa exports in 1878 were 1900 tons, an amount considerably exceeded in 1879. The total value of imports amounted in 1877 to £127,204,—including £60,291 from the United Kingdom, and £46,724 from the British West Indies. The value of exports to the United Kingdom was £122,821, and to other countries, £23,085;—total, £145,906. The revenue was £29,084, of which customs produced £13,460, and the expenditure was £29,581. Population (1877), 41,865. About 400 Coolie immigrants were introduced in 1877. Considerable immigration takes place from Barbados. The legislature grants £1500 annually for education, distributed among 30 schools,—16 Anglican, 5 Wesleyan, 9 Roman Catholic,—with 2908 scholars.

Grenada was discovered by Columbus in 1498. The Spaniards, however, did not form a settlement there. The island is one of the "Caribbees" granted to the earl of Carlisle in 1627, but it was inhabited only by warlike Caribs until 1650-51, when Du Parquet, governor of Martinique, organized two expeditions to it. The Frenchmen were at first well received by the natives, but great cruelty was exercised in the extirpation of the latter. The island made little progress until after 1700. In 1714 the French West India Company acquired their property in Grenada; commercial intercourse sprang up with Martinique, and when the company was dissolved the island became vested in the crown of France. In 1753 it contained 1262 whites, 11,991 slaves, and 83 sugar plantations. In 1762 Grenada capitulated to the British forces, and it was formally ceded in the treaty of peace of 1763. It was, however, retaken by the French in 1779, and not finally restored to Great Britain in 1783 till the general peace.

GRENOBLE, a fortified city of France, formerly the chief town of Dauphiné and now of the department of the Isère, lies 58 miles E. of Lyons, in 45° 11′ 57″ N. lat. and 5° 43′ 20″ E. long. Few of the cities of France have a finer situation. The Isère unites with the Drac a few miles further down, and the broad and fertile valley through which the rivers flow is encompassed by a fine panorama of hills and mountains. From the botanic gardens, for example, the eastward view comprises the Savoy Alps with the summit of Mount Blanc, and the westward the mountains of St Nizier, while more to the north the hills rise directly above the town, and are crowned by the fort of the Bastille. The beauty of the Isère itself is enhanced by fine bridges and quays. With the exception of its more modern portions, the town of Grenoble is characterized by the tortuous and crowded streets usual in places that have long been confined within strong fortifications. The cathedral of Notre Dame, a vast brick building of various periods from the 10th to the 17th century, the foundation of which is traditionally ascribed to Charles the Great; the church of St Laurence, with a remarkable crypt of the 11th century, long believed to be an old temple of Æsculapius; and the church of St Andre, founded by the dauphin Guigues Andre about 1220, and frequently visited for the sake of the tomb of Bayard removed thither in 1822, are the most noteworthy of the ecclesiastical edifices. The palais de justice is a striking erection of the 15th and 16th centuries occupying the site of the old castle of the dauphins, and in front is a statue of Bayard dating from 1823. The old town hall has nothing remarkable about it; but the new prefecture, built at a cost of 1,404,000 francs about 1867, is a handsome structure. Besides its university or academy, with the three faculties of law, science, and literature, Grenoble possesses a lyceum, an episcopal seminary, a school of artillery of the first class, two normal schools, and a great variety of special educational institutions. The library, which since 1868 has been located along with the museum in a building which cost more than 1,500,000 francs, is a noble collection of upwards of 178,875 volumes, on which the town has expended 2,000,000 francs.[1] Among the numerous societies of Grenoble it is enough to mention the *Académie delphinale* (1772), the statistical society, the society of the friends of the arts, the society of agriculture, and the zoological society of the Alps, which maintains zoological gardens. At the head of the benevolent institutions is the general hospital, originally founded by Aimon Chissay in 1424, and now comprising civil and military departments, an orphanage, and an asylum for the aged and infirm. It was in Grenoble that the first mutual benefit society was founded in 1803, and the number of such associations in the town was upwards of 40 about 1870. In 1836 M. Berriat Saint Prix established a society for the extinction of mendicity, and in 1851 M. Frédéric originated an *association alimentaire* for the purpose of providing the poorer classes with good food at the cheapest possible rate. The staple industry of Grenoble is the making of gloves; 115 establishments, employing 2000 workmen and 20,000 needlewomen in the town and neighbourhood, turn out annually 850,000 dozen pairs. Liqueurs, leather, straw hats, paper, lime, and cement hold a principal place among the miscellaneous products. The population of Grenoble was 26,852 in 1851, 35,280 in 1872, and 43,054 in 1876.



Plan of Grenoble.

1 Church of St Laurence
2 Church of St Marie.
3. Palais de Justice.
4 Theatre.
5. Church of St André.
6 Notre Dame.
7. Market.
8. College.
9 Museum and Library.
10. School of Artillery.
11 New Prefecture.
12 New Prison.

Grenoble occupies the site of Cularo, a village of the Allobroges which first became of importance when it was fortified by Diocletian and Maximian. Its present name is a corruption of Gratianopolis, a title assumed in honour of Gratian, who had strengthened the walls. From the Burgundians who gained possession in 467 the little town passed under the Franks, and on the dismemberment of the empire of Charles the Great it was included in the limits of Cisjuran Burgundy. After the 10th century its bishops grew into power, but they were finally supplanted in the 13th century by the counts of Albon, afterwards known as the Dauphins. Though it was ceded in 1349 to France along with Dauphine, the city continued to enjoy special privileges. In 1563 it was sacked by the Baron des Adrets, but in 1572 the energy of its governor De Gorde saved it from sharing in the massacre of St Bartholomew. Lesdiguières (Roi des Montagnes) took the town by siege in 1590 in name of Henry IV., and he afterwards made his governorship memorable by his fortifications, quays, and other serviceable enterprises. In the close of the 18th century the name of Grenoble appears in the van of the revolutionary movement; the attempt of the Government to substitute a new judicial régime for that of the too independent provincial parliament roused the people to arms and the "day of the tiles" (7th June 1788) is memorable for the defeat of the royal forces. Grenoble was the first town to open its gates to Napoleon on his return from Elba in 1815, but a few months afterwards it was obliged to surrender to the Austrians. Owing to its situation Grenoble is subject to inundations; in 1219 it was almost swept away, and from that date to 1856 no fewer than 15 similar disasters are enumerated. The great flood of 1778 is known as the "Deluge de la Saint Crépin." In 1859 the water was 3 feet deep throughout the town. Among the celebrated natives of Grenoble are Vaucanson, Mably, Condillac, Beyle (Stendhal), Barnave, and Casimir Perier.

See Champollion Figeac, *Antiquités de Grenoble*, (Grenoble, 1807); Pitot, *Hist. de Grenoble et de ses environs* (Grenoble, 1829).

GRENVILLE, George (1712–1770), an English statesman, second son of Richard Grenville and Hester Temple, afterwards Countess Temple, was born October 14th, 1712. He was educated at Eton and at Christ Church, Oxford, and in his twenty-fifth year was called to the bar. The habits of industry, the technical knowledge, and the intellectual discipline which he acquired in connexion with his legal training were of great advantage to him in his political career, and for a considerable period sufficiently compensated for the absence of every oratorical gift except inexhaustible fluency, and of all but the merest rudimentary qualities of statesmanship. He entered Parliament in 1741 as member for Buckingham, and continued to represent that borough till his death in 1770. In December 1744 he became a lord of the admiralty, in June 1747 a lord of the treasury, and in 1754 treasurer of the navy and privy councillor. He remained in office in 1761, when his brother Lord Temple and his brother-in-law Pitt resigned upon the question of the war with Spain, and in the administration of Lord Bute he was entrusted with the leadership of the House of Commons. In May 1762 he was appointed secretary of state, and in October first lord of the admiralty; and in April 1763 he became first lord of the treasury and chancellor of the exchequer. The most prominent measures of his administration were the prosecution of Wilkes and the passing of the American Stamp Act, which led to the first symptoms of alienation between America and the mother country. During the latter period of his term of office he was on a very unsatisfactory footing with the young king George III., who gradually came to feel a kind of horror of the interminable persistency of his conversation, and whom he endeavoured to make use of as the mere puppet of the ministry. The king made various attempts to induce Pitt to come to his rescue by forming a ministry, but without success, and at last had recourse to the marquis of Rockingham, on whose agreeing to accept office Grenville was dismissed July 1765. He never again held office, and died 13th November 1770. In 1749 he was married to Elizabeth, daughter of Sir William Wyndham, by whom he had a large family. His son, the second Earl Temple, was created Marquis, and his grandson Duke, of Buckingham.

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[1] See Cariel, *La Bibliothèque de Grenoble*, 1772–1878, Paris, 1878.

A contemptuous application by Pitt to Grenville of the lines "Gentle Shepherd, tell me where," caused him to be dubbed the "gentle shepherd" for the remainder of his life; and this would seem to indicate a deficiency in the personal characteristics which insure any high degree of general respect. Exemplary in the observance of all the decencies of private life, and upright and honourable in all his political relations, he yet possessed none of those attractive or commanding qualities which are sometimes found an advantageous substitute for strict moral integrity, and which the possessor of moral integrity cannot afford to despise. He was moreover under the dominion of an ambition ludicrously out of proportion to his abilities, and the self-confidence with which he pursued his own purposes can be attributed only to the narrow range of his political vision. Though few excelled him in a knowledge of the forms of the House or in mastery of administrative details, his tact in dealing with men and with affairs was so defective that there is perhaps no one who has been at the head of an English administration to whom a lower place can be assigned as a statesman. *The Grenville Papers, being the Correspondence of Richard Grenville, Earl Temple, K.G., and the Right Hon. George Grenville, their Friends and Contemporaries*, was published at London in 1852.

GRENVILLE, WILLIAM WYNDHAM GRENVILLE, LORD (1759–1834), English statesman, son of the preceding, was born 25th October 1759. He was educated at Eton and Oxford, and for some time studied at the Inns of Court, but never practised at the bar. In February 1782 he was elected a member of parliament for the county of Buckingham, and in the September following he became secretary to his brother the marquis of Buckingham, who had been named lord lieutenant of Ireland. On the overthrow of the cabinet of Lord Shelburne in the following year he returned to England, and in December he was appointed by his cousin Pitt paymaster-general of the forces. In 1789 he was chosen speaker of the House of Commons, but he vacated the chair in the same year, and was transferred to the Upper House with the title of Lord Grenville, on being appointed secretary of state. He exchanged this office in 1791 for that of secretary of foreign affairs, being regarded by Pitt as the person best fitted to carry out his policy in reference to France. Along with Pitt he resigned office in 1801, on account of the king declining to grant any concessions to the Catholics; and when Pitt, on accepting office in 1804, did not stipulate for Catholic emancipation he declined to join his ministry, and entered into a close alliance with Fox. On the death of Pitt in 1806 he became the nominal head of the Government of "All the Talents," whose military projects resulted very unsuccessfully, but which deserves to be remembered with honour on account of the Act for the abolition of the slave trade. Its influence was, however, considerably weakened by the death of Fox; and as the king in March 1807 demanded from Grenville an assurance that he would initiate no measures for the relief of the Catholics he and his colleagues found it necessary to resign. His colleagues were not unanimous in approving of his conscientiousness, and Sheridan expressed the opinion of more than himself when he remarked: "I have known many men knock their heads against a wall, but I never before heard of a man collecting bricks and building a wall for the express purpose of knocking out his own brains against it." Lord Grenville never again held office. He continued to be one of the principal supporters of Catholic emancipation, and during the remainder of his political career generally voted with the Whigs, although in 1815 he separated himself from Lord Grey and supported the warlike policy of Lord Liverpool. In 1819, when the marquis of Lansdowne brought forward his motion for an inquiry into the cause of the distress and discontent in the manufacturing districts, Grenville delivered an alarmist speech in which he advocated the adoption of severely repressive measures. He died at his residence, Dropmore, Buckinghamshire, 12th January 1834.

Though the talents of Lord Grenville were not of a high order, his straightforwardness, great industry, political knowledge, firmness of mind, and moderate opinions secured him considerable political influence. He can also lay claim to be enrolled among those English statesmen who have distinguished themselves in literature. Besides editing the letters of the earl of Chatham to his nephew Thomas Pitt, afterwards Lord Camelford, he printed for private circulation an edition of Homer with annotations, and also a small volume entitled *Nugæ Metricæ*, consisting of translations into Latin from Greek, English, and Italian. In 1809 he was chosen chancellor of the university of Oxford. He married in 1792 Anne Pitt, daughter of Lord Camelford, but had no issue, and the title became extinct.

GRESHAM, SIR THOMAS (1519–1579), a London merchant, the founder of the Royal Exchange and of Gresham College, London, was born in 1519. Descended from an old Norfolk family, he was the only son of Sir Richard Gresham, a leading London merchant, who for some time held the office of lord mayor and for his services as agent of Henry VIII. in negotiating loans with foreign merchants received the honour of knighthood. Though his father intended him to follow his own profession, he nevertheless sent him for some time to Caius College, Cambridge, but there is no information as to the duration of his residence. It is uncertain also whether it was before or after this that he was apprenticed to his uncle Sir John Gresham, who was also a merchant, but we have his own testimony that he served an apprenticeship of eight years. In 1543 at the age of twenty four he was admitted a member of the Mercers' Company, and in the same year he went to the Low Countries, where, either on his own account or on that of his father or uncle, he both carried on business as a merchant and acted in various matters as an agent for Henry VIII. In 1544 he married the widow of William Read, a London merchant, but he still continued to reside principally in the Low Countries, having his headquarters at Antwerp. When in 1551 the mismanagement of Sir William Dansell, "king's merchant" in the Low Countries, had brought the English Government into great financial embarrassment, Gresham was called in to give his advice, and chosen to carry out his own proposals. Their leading feature was the adoption of various methods—highly ingenious, but quite arbitrary and unfair—for raising the value of the pound sterling on the "bourse" of Antwerp, and it was so successful that in a few years nearly all King Edward's debts were discharged. The advice of Gresham was likewise sought by the Government in all their money difficulties, and he was also frequently employed in various diplomatic missions. He had no stated salary, but in reward of his services received from Edward various grants of lands, the annual value of which at that time was ultimately about £400 a year. On the accession of Mary the council resolved on his recall, but before the letter was sent they changed their opinion; and as he professed his zealous desire to serve the queen, and manifested great adroitness both in negotiating loans and in smuggling money, arms, and foreign goods, not only were his services retained throughout her reign, but besides his salary of twenty shillings *per diem* he received grants of church lands to the yearly value of £200. Under Queen Elizabeth, besides continuing to act as financial agent of the crown, he was for some time ambassador at the court of the duchess of Parma. In 1559 he received the honour of knighthood. By the outbreak of the war in the Low Countries he was compelled to leave Antwerp on the 19th March 1567; but, though he spent the remainder of his life in London, he continued his business as merchant and financial agent of the Government in much the same way as formerly. Elizabeth also found him useful in a great variety of other ways, among which was that of acting as jailer to Lady Mary Grey, who, as a punishment for marrying Thomas Keys the sergeant porter, was detained a prisoner in his house from June 1569 to the end of 1572. In 1565 Gresham made a proposal to the court of aldermen of London to build at his own expense a bourse or exchange, on condition that they purchased for this purpose a piece of suitable ground. In this proposal he seems to have had an eye to his own interest as well as to the general good of the merchants, for by a yearly rental of £700 obtained for the shops in the upper part of the building he received a sufficient return for his trouble and expense. Gresham died suddenly, apparently of apoplexy, 21st November 1579. His only son predeceased him, and his illegitimate daughter Anne he married to Sir Nicolas Bacon, brother of the great Lord Bacon. With the exception of a number of small sums bequeathed to the support of various charities, the bulk of his property, consisting of estates in various parts of England of the annual value of more than £2300, was bequeathed to his widow and her heirs with the stipulation that after her decease his residence in Bishopsgate Street, as well as the rents arising from the Royal Exchange, should be vested in the hands of the corporation of London and the Mercers' Company, for the purpose of instituting a college in which seven professors should read lectures—one each day of the week—on astronomy, geometry, physic, law, divinity, rhetoric, and music. The lectures were begun in 1597, and were delivered in the original building until 1768, when, on the ground that the trustees were losers by the gift, it was made over to the crown for a yearly rent of £500, and converted into an excise office. From that time a room in the Royal Exchange was used for the lectures until in 1843 the present building was erected at a cost of £7000. It contains a large library, professors' rooms, and a theatre capable of holding 500 persons.

A notice of Gresham is contained in Fuller's *Worthies* and Ward's *Gresham Professors*; but the fullest account of him, as well as of the history of the Exchange and Gresham College is that by J. M. Burgon in his *Life and Times of Sir Thomas Gresham*, 2 vols., 1839. See also *[illegible] of Sir Thomas Gresham*, 1833; and *The Life of Sir Thomas Gresham, Founder of the Royal Exchange*, 1845.

GRESSET, JEAN BAPTISTE (1709-1777). The literary history of Gresset might be dismissed with the simple statement that he wrote *Vert Vert*. By that one poem he is remembered. His life is, however, interesting from another fact, that he, who almost alone among French poets wrote nothing of which a moralist need be ashamed, spent the last twenty-five years of his life in regretting the frivolity which enabled him to produce the most charming of poems. He was born at Amiens, and brought up by the Jesuits of that place. As a boy he displayed such great promise that, according to the usual custom of the society, the fathers resolved to receive him among themselves. He was accepted as a novice at the age of sixteen, and sent to pursue his studies at the Collége Louis le Grand in Paris. After completing his course he was appointed, being then under twenty years of age, to a post as professor or assistant master in a college at Rouen. He was, it must be remembered, a son of the society of Jesus; as such he had been drilled and disciplined to perfect obedience; in every point except that of orders he was an ecclesiastic. Probably it was not the intention of the society that he should become a priest. They reckoned upon his continuing a lay brother, and helping the cause by his position as a teacher. From such a mind so trained, so taught to regard everything from the priestly point of view, devoted to the most severe studies, occupied in the grave and responsible work of teaching, what literary fruit was to be expected? Perhaps a treatise on a Greek particle, an essay on Latin style, a grammatical thesis, anything but that which really appeared,—the graceful, pleasant poem by which he will ever be remembered. He published *Vert Vert* at Rouen, being then twenty-four years of age. It is a story, in itself exceedingly humorous, showing how a parrot, the delight of a convent, whose talk was all of prayers and pious ejaculations, was conveyed to another convent as a visitor to please the nuns. On the way he falls among bad companions, forgets his convent language, and shocks the sisters on arrival by profane swearing. He is sent back in disgrace, punished by solitude and plain bread, presently repents, reforms, and is killed by kindness. The story, however, is nothing. The treatment of the subject, the atmosphere which surrounds it, the delicacy in which the little prattling ways of the nuns, their jealousies, their tiny trifles, are presented, takes the reader entirely by surprise. The poem stands absolutely unrivalled, even among French *contes en vers*.

Gresset found himself famous. He left Rouen, went up to Paris, where he found refuge in the same garret which had sheltered him when a boy at the Collége Louis le Grand, and there wrote his second poem, *Ma Chartreuse*. Then trouble came upon him; complaints were made to the fathers of the alleged licentiousness of verses which were as innocent as any school-girl's novel, the real cause of complaint being the ridicule which *Vert Vert* seemed to throw upon the whole race of nuns. An example, it was urged, must be made; Gresset was expelled the order. Men of robust mind would have been glad to get rid of such a yoke. Gresset, who had never been taught to stand alone, went forth weeping. He became a man of letters; he wrote many other poems, none of which made any mark. He never in fact attained the same level as *Vert Vert*. He wrote two or three comedies. One, called *Le Méchant*, still keeps the stage, though it is difficult to assign it much merit. He was admitted to the Academy. And then, still young, he retired to Amiens, where he fell into the hands of the priests, and became their abject slave. His brief relapse from the discipline of the church became the subject of the deepest remorse. He repented of his poems, and even went so far as to address to the bishop an abjuration of his title of dramatist, and to implore pardon of the Virgin for having written plays. The history of French literature presents many examples of poets in old age repenting the sins of their youth; the example of Gresset is unique as beginning, while in full manhood, a senile repentance for having even in so pleasant and innocent a way brought into ridicule the institutions of the church.

GRETRY, ANDRÉ ERNEST MODESTE (1741-1813), a celebrated composer of French opera, was born at Liége, February 11, 1741. He received his first musical education in the *maîtrise* of the college of St Denis, where his father, a poor musician, occasionally acted as violinist. Leclerc and Renekin were his early masters. But of greater importance was the practical tuition he received by attending the performance of an Italian opera company. Here he heard the operas of Galuppi, Pergolesi, and other masters; and the desire of completing his own studies in Italy was the immediate result. To find the necessary means he composed in 1759 a mass which he dedicated to the canons of the Liége cathedral, who in return sent him to the Collége de Liege at Rome, founded by a citizen of Liége for the benefit of his townsmen studying in Rome. Here Grétry resided for five years, studiously employed in completing his musical education under Casali. His proficiency in harmony and counterpoint was, however, according to his own confession, at all times very moderate. Neither was any deep scholarship required for the style of composition to which he soon exclusively devoted himself. His first great success was achieved by an Italian intermezzo or operetta, *Le vendemiatrici*, composed for the Aliberti theatre in Rome, and received with universal applause. It is said that the study of the score of one of Monsigny's operas, lent to him by a secretary of the French embassy in Rome, decided Grétry to devote himself to French comic opera. On New-Year's Day 1767 he accordingly left Rome, and after a short stay at Geneva (where he made the acquaintance of Voltaire, and produced another operetta) went to Paris. There for two years he had to contend with the difficulties incident to poverty and obscurity. He was, however, not without friends, and by the intercession of one of these, Count Creutz, the Swedish ambassador, Grétry obtained a libretto from the celebrated Marmontel, which he set to music in less than six weeks, and which, on its performance in August 1768, met with unparalleled success. The name of the opera was *Le Huron.* Two others, *Lucile* and *Le Tableau Parlant*, soon followed, and thenceforth Grétry's position as the leading composer of comic opera was safely established. Of the fifty operas which embody his musical activity only two or three have survived, and perhaps as many more are worth remembering. His masterpieces are *Zémire et Azor* and *Richard Cœur de Lion*,—the first produced in 1771, the second in 1784. The latter in an indirect way became connected with a great historic event. In it occurs the celebrated romance, *O Richard, ô mon roi, l'univers t'abandonne*, which was sung at the banquet—"fatal as that of Thyestes," remarks Carlyle—given by the bodyguard to the officers of the Versailles garrison on October 3, 1789. The *Marseillaise* not long afterwards became the reply of the people to the expression of loyalty borrowed from Grétry's opera. The composer himself was not uninfluenced by the great events he witnessed, and the titles of some of his operas, such as *La Rosière Républicaine* and *La Fête de la Raison* sufficiently indicate the epoch to which they belong; but they are mere *pièces de circonstance*, and the republican enthusiasm displayed is not genuine. Little more successful was Grétry in his dealings with classical subjects, and none of his operas belonging to that class are worth remembering. His genuine power lies in the delineation of character, and in the expression of tender and typically French sentiment. For the first-named purpose the careful and truly admirable fidelity with which his music is wedded to the words is invaluable. In this respect Grétry's works are indeed representative of French operatic music at its best. The structure of his concerted pieces on the other hand is frequently flimsy, and his instrumentation so feeble that the orchestral parts of some of his works had to be rewritten by other composers, in order to make them acceptable to modern audiences. Of his deficiencies of harmonization Grétry himself was well aware, and his confessions in that respect are strangely at variance with the self-sufficient tone which pervades his literary effusions on musical and even on political and social topics. During the Revolution Grétry lost much of his property, but the successive Governments of France vied in favouring the composer, regardless of political differences. From the old court he received distinctions and rewards of all kinds; the republic made him an inspector of the Conservatoire; Napoleon granted him the cross of the legion of honour and a pension. Gretry died September 24, 1813, at the Hermitage in Montmorency, formerly the house of Rousseau. Fifteen years later his heart was transferred to his birthplace, permission having been obtained after a tedious lawsuit. In 1842 Grétry's colossal statue in bronze was inaugurated at Liége.

GREUZE, Jean Baptiste (1725–1805), in the full tide of the 18th century, when professional distinction appeared to be reserved exclusively for those who devoted themselves to the production of historical or allegorical subjects, achieved an immense reputation as a painter of scenes of domestic life. He was born at Tournus in 1725, and is generally said to have formed his own talent; this is, however, true only in the most limited sense, for at an early age his inclinations, though thwarted by his father, were encouraged by a Lyonnese artist named Grandon or Grondom who enjoyed during his lifetime considerable reputation as a portrait-painter. Grandon not only persuaded the father of Greuze to give way to his son's wishes, and permit the lad to accompany him as his pupil to Lyons, but when at a later date he himself left Lyons for Paris—where his son-in-law Grétry the celebrated composer enjoyed the height of favour—Grandon carried young Greuze with him. Settled in Paris, Greuze worked from the living model in the school of the Royal Academy, but did not attract the attention of his teachers; and when he produced his first picture, Le Père de Famille expliquant la Bible à ses Enfants, considerable doubt was felt and shown as to his share in its production. By other and more remarkable works of the same class Greuze soon established his claims beyond contest, and won for himself the notice and support of the well-known connoisseur La Live de Jully, the brother-in-law of Madame d' Épinay. In 1755 Greuze exhibited his Aveugle Trompé, upon which, presented by Pigalle the sculptor, he was immediately *agréé* by the Academy. Towards the close of the same year he left France for Italy, in company with the Abbé Louis Gougenot, who had deserted from the magistrature,—although he had obtained the post of "conseillier au Châtelet,"—in order to take the "petit collet." Gougenot had some acquaintance with the arts, and was highly valued by the Academicians,—who, during his journey with Greuze elected him an honorary member of their body—on account of his studies in mythology and allegory; his acquirements in these respects are said to have been largely utilized by them, but to Greuze they were of doubtful advantage, and he lost rather than gained by this visit to Italy in Gougenot's company. He had undertaken it probably in order to silence those who taxed him with ignorance of "great models of style," but the Italian subjects which formed the entirety of his contributions to the Salon of 1757 showed that he had been put on a false track, and he speedily returned to the source of his first inspiration. In 1759, 1761 (L'Accordée de Village,—Louvre), and 1763 Greuze exhibited with ever increasing success; in 1765 he reached the zenith of his powers and reputation. In that year he was represented with no less than thirteen works, amongst which may be cited La Jeune Fille qui pleure son Oiseau mort, La Bonne Mère, Le Mauvais Fils puni (Louvre), and La Malédiction Paternelle (Louvre). The Academy took occasion to press Greuze for his diploma picture, the execution of which had been long delayed, and forbade him to exhibit on their walls until he had complied with their regulations. "J'ai vu la lettre," says Diderot, "qui est un modèle d'honnêteté et de douceur; j'ai vu la réponse de Greuze qui est un modèle de vanité et d'impertinence: il fallait appuyer cela d'un chef d'œuvre, et c'est ce que Greuze n'a pas fait." Greuze wished to be received as an historical painter, and produced a work which he intended to vindicate his right to despise his qualifications as a *peintre de genre.* This unfortunate canvas,—

Sevère et Caracalla (Louvre),—was exhibited in 1769 side by side with Greuze's portrait of Jeaurat (Louvre), and his admirable Petite Fille au Chien Noir. The Academicians received their new member with all due honours, but at the close of the ceremonies the Director addressed Greuze in these words—"Monsieur, l'Academie vous a reçu, mais c'est comme peintre de genre; elle a eu egard à vos anciennes productions, qui sont excellentes, et elle a ferme les yeux sur celle-ci, qui n'est digne ni d'elle ni de vous." Greuze, greatly incensed, quarrelled with his *confrères*, and ceased to exhibit until, in 1804, the Revolution had thrown open the doors of the Academy to all the world. In the following year, on 4th March 1805, he died in the Louvre in great poverty. He had been in receipt of considerable wealth, which he had dissipated by extravagance and bad management, so that during his closing years he was forced even to solicit commissions which his enfeebled powers no longer enabled him to carry out with success. The brilliant reputation which Greuze acquired seems to have been due, not to his acquirements as a painter,—for his practice is evidently that current in his own day,—but to the character of the subjects which he treated. That return to nature which inspired Rousseau's attacks upon an artificial civilization demanded expression in art. Diderot in *Le Fils Naturel et le Père de Famille* tried to turn the vein of domestic drama to account on the stage; that which he tried and failed to do, Greuze, in painting, achieved with extraordinary success, although his works, like the plays of Diderot, were affected by that very artificiality against which they protested. The touch of melodramatic exaggeration, however, which runs through them finds an apology in the firm and brilliant play of line, in the freshness and vigour of the flesh tints, in the enticing softness of expression (often obtained by almost an abuse of *méplats*), by the alluring air of health and youth, by the sensuous attractions, in short, with which Greuze invests his lessons of bourgeois morality. As Diderot said of La Bonne Mère, "ça prèche la population;" and a certain piquancy of contrast is the result which never fails to obtain admirers. La Jeune Fille à l'Agneau fetched, indeed, at the Pourtalis sale in 1865 no less than 1,000,200 francs. One of Greuze's pupils, Madame Le Doux, imitated with success the manner of her master; his daughter and granddaughter, Madame de Valory, also inherited some traditions of his talent. Madame de Valory published in 1813 a Comédie-vaudeville, *Greuze, ou l'Accordée de Village*, to which she prefixed a notice of her grandfather's life and works, and the *Salons* of Diderot also contain, besides many other particulars, the story at full length of Greuze's quarrel with the Academy. Four of the most distinguished engravers of that date, Massard père, Flipart, Gaillard, and Levasseur, were specially entrusted by Greuze with the reproduction of his subjects, but there are also excellent prints by other engravers, notably by Cars and Le Bas. (E. F. S. P.)

GREVILLE, CHARLES CAVENDISH FULKE (1794–1865), a great grandson by his father of the fifth earl of Warwick, and son of Lady Charlotte Bentinck, daughter of the duke of Portland, formerly a leader of the Whig party, and first minister of the crown. Greville was born 2d April 1794. Much of his childhood was spent at his grandfather's house at Bulstrode. He was one of the pages of George III., and was educated at Eton and Christ Church, Oxford; but he left the university early, having been appointed private secretary to Earl Bathurst before he was twenty. The interest of the duke of Portland had secured for him the secretaryship of the island of Jamaica, which was a sinecure office, the duties being performed by a deputy, and the reversion of the clerkship of the council. Greville entered upon the discharge of the duties of clerk of the council in ordinary in 1821, and continued to perform them for nearly forty years. He therefore served under three successive sovereigns,—George IV., William IV., and Victoria,—and although no political or confidential functions are attached to that office, it is one which brings a man into habitual intercourse with the chiefs of all the parties in the state. Well born, well-bred, handsome, and accomplished, Greville led the easy life of a man of fashion, taking an occasional part in the transactions of his day and much consulted in the affairs of private life. But the celebrity which now attaches to his name is entirely due to the posthumous publication of a portion of a Journal or Diary which it was his practice to keep during the greater part of his life. These papers were given by him to his friend Mr Reeve a short time before his death (which took place on the 18th January 1865), with an injunction that they should be published, as far as was feasible, at not too remote a period after the writer's death. The journals of the reigns of George IV. and William IV. (extending from 1820 to 1837) were accordingly so published in obedience to his directions about ten years after that event. Few publications have been received with greater interest by the public; five large editions were sold in little more than a year, and the demand in America was as great as in England. These journals were regarded as a faithful record of the impressions made on the mind of a competent observer, at the time, by the events he witnessed and the persons with whom he associated. Their characteristic is the love of truth, of justice, and of sincerity. The court was irritated at the scornful disclosure of the vices and follies of former sovereigns, and fashionable society was annoyed at the writer's absolute indifference to its pretensions. But Greville did not stoop to collect or record private scandal. His object appears to have been to leave behind him some of the materials of history, by which the men and actions of his own time would be judged. He records not so much public events as the private causes which led to them; and perhaps no English memoir-writer has left behind him a more valuable contribution to the history of this century. Greville published anonymously, in 1845, a volume on the policy of England to Ireland, in which he advocated the payment of the Roman Catholic clergy; and he was also the author of several pamphlets on the events of his day.

GREW, NEHEMIAH (1628–1711), the earliest vegetable anatomist and physiologist of England, was the son of Obadiah Grew, nonconformist divine of St Michael's, Coventry. At the Restoration, his father being ejected from his living, he went to a foreign university, where he took the degree of doctor of physic. Returning to Coventry, his native town, he commenced a series of observations on the physiology of plants, communicating the results to the Royal Society, by which they were so well received that he was induced to remove to London (1672). There he acquired an extensive practice as a physician. He was elected a fellow of the Royal Society on the recommendation of Bishop Wilkins, and in 1677 he succeeded Mr Oldenburg as secretary, in which capacity he prepared a descriptive catalogue of the rarities preserved at Gresham College (1681). The following year appeared his celebrated work on the *Anatomy of Plants*, in which he displayed great originality as an investigator, especially in pointing out the sex-differences of plants. Linnæus named a genus of plants *Grewia* (natural family of *Tiliaceæ*) in his honour.

He edited the *Philosophical Transactions*, begun in 1665, and wrote treatises on *Sea-Water made Fresh*, which passed through several editions, and on the *Nature and Use of the Salt contain'd in Epsom and such other Waters* (1697), a rendering of the *Tractatus de Salis, &c., Usu* (1695). Besides the *Anatomy of Plants*, he wrote a *Comparative Anatomy of Trunks* (1675), and an *Idea of a Phytological History* (1673), as well as *Cosmologia Sacra* (1701). There is also a *Disputatio de liquore nervoso* by him (1672), and *Recueil d'expériences . . . . sur le combat qui procède du mélange des corps* (1679).

GREY, Earl (1764-1845). Charles, second Earl Grey, was the eldest surviving son of General Sir Charles Grey, afterwards first Earl Grey. He was born at his father's residence, Fallodon, near Alnwick, March 13, 1764. General Grey, who was a younger son of the house of Grey of Howick, one of the most considerable territorial families in Northumberland, had already begun a career of active service which, like the political career of his son, covered nearly half a century. Before the latter was born, General Grey had served on the staff of Prince Ferdinand of Brunswick in the Seven Years' War, and had been wounded at Minden. While the son was making verses at Eton, the father was serving against the revolted colonists in Pennsylvania and New Jersey, and while the young member for Northumberland was denouncing Pitt's war against the Convention, the veteran soldier was destroying the remnant of the French colonial empire by the capture of Martinique and Guadaloupe. When Napoleon threatened an invasion, General Grey took the command of the southern district, and at the peace of Amiens he was rewarded with a peerage. His elder brother, Sir Henry Grey of Howick, the head of the family, had supported the Government in parliament. But the political career of young Grey, who was heir presumptive to the family estates, took a different complexion, which needs to be explained by the circumstances in which it began.

Young Grey expected to reoccupy the seat which had been his uncle's; and his early years were spent in preparation for a parliamentary career. He was sent to Eton, and proceeded thence to Cambridge. William Pitt, a youth five years older, was then in residence as a master of arts, studiously paying court to the Whigs of the university; and at the general election of 1780 he came forward as a candidate for the academical seat. His name stood last on the poll, but he was brought in elsewhere, and his first speech proved him a man of the first mark. The unparalleled successes which followed portended grave changes. Pitt's elevation to the premiership, his brilliant and hard fought battle in the house, and his complete rout of the Whig party at the general election of 1784, when he came in for Cambridge at the head of the poll, threatened the great territorial interest with nothing less than extinction. It was to this interest that Grey belonged; and hence, when at length returned for Northumberland in 1786, he at once came forward as a vigorous assailant of the Government of Pitt. He was hailed by the opposition, and associated with Fox, Burke, and Sheridan as a manager in the Hastings impeachment. During the nineteen years which remained of the career of Fox, he followed the great Whig statesman with absolute fidelity, and succeeded him as leader of the party. The shortcomings of Fox's statesmanship were inherited by Grey. Both were equally devoid of political originality, shunned the severer labours of the politician, and instinctively feared any deviation from the traditions of their party. Such men cannot save a party in its decadence, and the history of Fox and Grey has been aptly termed the history of the decline and fall of Whiggism.

The stunning blow of 1784 was the first incident in this history. Its full significance was not at once perceived. An opposition, however weak in the beginning, generally has a tendency to revive, and Grey's early successes in the house helped to revive the Foxites. The European situation became favourable to this revival. The struggle in France for popular rights, culminating in the great Revolution, was watched by Fox with interested sympathy. He affected to regard the domination of Pitt as the domination of the crown, and as leading logically to absolutism, and saw in that popular sympathy for the French Revolution which naturally arose in England an instrument which might be employed to overthrow this domination.

But Pitt gathered the fruits of the windfall. The spread of "Jacobinism," or "French principles," became the pretext on which the stronger half of the opposition went over to the Government. Burke led the movement in the Commons, the duke of Portland and Lord Fitzwilliam in the Lords, and with this second incident in the Whig decline began the difficulties of Grey's career. The domination of the premier had already stirred the keenest resentment in the younger and more ambitious members of the Whig party. Freed from the restraint of the steadier politicians under Burke and Portland, the residuum under Fox fell into a series of grave mistakes. Of this residuum Grey became the moving spirit, for though Fox did not check their activity, he disclaimed the responsibility of their policy. Fox had refused to condemn "French principles," and denounced the war with France; but he would take no part in exciting agitation in England. It was otherwise with the restless spirits among whom Grey was found. Enraged by the attitude of Pitt, which was grounded on the support of the constituencies as they then stood, the residuum plotted an ill-timed agitation for parliamentary reform.

The demand for parliamentary reform was as yet in a rudimentary stage. Forty years later it had become the demand of an unenfranchised nation, disabused by a sudden spread of political and economical knowledge. It was as yet but the occasional instrument of the scheming politician. Chatham had employed the cry in this sense. The Middlesex agitators had done the same; even the premier of the time, after his accession to power, had sought to strengthen his hands in the same way. But Pitt's hands were now strengthened abundantly; whereas the opposition had nothing to lose and much to gain by such a measure. The cry for reform thus became their natural expedient. Powerless to carry reform in the House, they sought to overawe parliament by external agitation, and formed the Society of the Friends of the People, destined to unite the forces of all the "patriotic" societies which already existed in the country, and to pour their violence irresistibly on a terrified parliament. Grey and his friends were enrolled in this portentous association, and presented in parliament its menacing petitions. Such petitions, which were in fact violent impeachments of parliament itself, proceeding from voluntary associations having no corporate existence, had been hitherto unknown in the English parliament. They had been well known in the French assembly. They had heralded and furthered the victory of the Jacobins, the dissolution of the constitution, the calling of the Convention, and the fall of the monarchy.

The Society of the Friends of the People was originally an after-dinner folly, extemporized at the house of a man who afterwards gained an earldom by denouncing it as seditious. Fox discountenanced it, though he did not directly condemn it; but Grey was overborne by the fierce Jacobinism of Lauderdale, and avowed himself the parliamentary mouthpiece of this dangerous agitation. But Pitt, strong in his position, cut the ground from under Grey's feet by suppressing the agitation with a strong hand. The suspension of the Habeas Corpus Act, the Gagging Acts, and the state prosecutions form a painful historical episode. But the discredit belongs as much to Grey and Lauderdale as to Pitt. Grey always spoke regretfully of his share in the movement. "One word from Fox," he said, "would have kept me out of all the mess of the Friends of the People. But he never spoke it."

It was Grey who moved the impeachment of Pitt, and he next promoted the equally foolish "Secession." Since the parliament did not properly represent the nation, and refused to reform itself or to impeach the minister, nothing remained but to disown it; and the opposition announced their intention of "seceding," or systematically absenting themselves from their places in parliament. This futile movement was originated by Grey, Lauderdale, and the duke of Bedford. It obtained a somewhat wider support. It suited the languor of some dispirited politicians, like Fox, and the avarice of some lawyers in large practice, like Erskine; but sensible politicians at once condemned it. It directly ignored parliamentary government, and amounted to nothing but a pettish threat of revolution. "Secession," said Lord Lansdowne, with characteristic shrewdness, "either means rebellion, or it is nonsense." Pitt easily dashed this feeble weapon from the hands of his opponents. He roused jealousy in the absent by praising the parts and the patriotism of the rest, and thus gradually brought them back. Grey himself reappeared to protest against the union with Ireland.

When Pitt died in 1806, nothing could prevent the reunited opposition from coming into power, and thus the Broad bottom ministry was formed under Fox. On his death, Grenville became premier, and Grey, now Lord Howick, Foreign Secretary, and leader of the House of Commons. Disunion, always the bane of English Liberalism, lurked in the coalition, and the Foxites and Grenvillites were only ostensibly at one. Grey opposed the war policy of Grenville; and this policy was not more successful than it had been in the hands of Pitt. And the change from the leadership of Fox to that of Grenville was only too perceptible. Both in court and country Grenville affected the role of Pitt, and assumed a stiff and peremptory attitude which ill became him. An ill advised dissolution weakened their majority; they lost ground by the "delicate investigation" into the conduct of the Princess of Wales; Lord Henry Petty's budget was too specious to command confidence; and the king, fully aware of their weak situation, resolved to get rid of them. When they proposed to concede a portion of the Catholic claims, George refused, and demanded of them an undertaking never to propose such a measure again. This was refused, and the Grenville-Grey cabinet retired in March 1807. In the same year Grey's father died, and Grey went to the Upper House. Opposition united Grey and Grenville for a time, but the parties finally split on the old war question. When Napoleon returned from Elba in 1815, and once more seized the government of France, the same question arose which had arisen in 1792, Was England to go to war for the restoration of the Bourbons? Grenville followed the traditions of Pitt, and supported the ministry in at once renewing hostilities. Grey followed those of Fox, and maintained the right of France to choose her own governors, and the impossibility of checking the reaction in the emperor's favour. The victory of Waterloo put an end to the dispute, but the disruption became permanent. The termination of the war, and the cessation of all action in common, reduced the power of the opposition to nothing. Grenville retired from public life, and his adherents reinforced the ministry. Little remained for the Whigs to do. But the scandalous persecution of the queen afforded an opportunity of showing that the ministry were not omnipotent; and the part taken on that occasion by Grey won him at once the increased respect of the nation and the undying aversion of George IV. It sealed the exclusion of himself and his few friends from office during the king's life; and when in 1827 Grey came forth to denounce the ministry of Canning, he declared that he stood alone in the political world. His words were soon justified, for when Lord Goderich resigned, the remnant which had hitherto supported Grey hastened to support the ministry of the duke of Wellington. Thus was the original Whig party dissolved, after a series of struggles which had begun with the longest reign upon record, and had outlasted it.

We now reach the principal episode in Grey's career. In 1827 he seemed to stand forth the solitary and powerless relic of an extinct party. In 1832 we find that party restored to its old numbers and activity, supreme in parliament, popular in the nation, and Lord Grey at its head. The duke of Wellington's foolish declaration against parliamentary reform, made in a season of great popular excitement, suddenly deprived him of the confidence of the country, and a coalition of the Whigs and Canningites became inevitable. The Whigs had in 1827 supported the Canningites; the latter now supported the Whigs, of whom Grey remained the traditional head. George IV. was dead, and no obstacle existed to Grey's elevation. Grey was sent for by William IV. in November 1830, and formed a coalition cabinet, pledged to carry on the work in which the duke of Wellington had faltered. But Grey himself was the mere instrument of the times. An old-fashioned Whig, he had little personal sympathy with the popular cause, though he had sometimes indicated a certain measure of reform as necessary. When he took office, he guessed neither the extent to which the Reform Act would go, nor the means by which it would be carried. That he procured for the country a measure of constitutional reform for which he had agitated in his youth was little more than a coincidence. In his youth he had put himself at the head of a frantic agitation against parliament, because he there found himself powerless. In his old age the case was reversed. Suddenly raised to a position of authority in the country, he boldly stood between parliament, as then constituted, and the formidable agitation which now threatened it, and by a forced reform saved it from revolution. In his youth he had assailed Pitt's administration because Pitt's administration threatened with extinction the political monopoly of that landed interest to which he belonged. In his old age, on the contrary, unable to check the progress of the wave, he swam with it, and headed the movement which compelled that landed interest to surrender its monopoly.

The second reading of the first Reform Bill was carried in the Commons by a majority of one. This was equivalent to a defeat, and further failures precipitated a dissolution. The confidence which the bold action of the ministry had won was soon plainly proved, for the second reading was carried in the new parliament by a majority of 136. When the bill had at length passed the Commons after months of debate, it was Grey's task to introduce it to the Lords. It was rejected by a majority of 41. The safety of the country now depended on the prudence and courage of the ministry. The resignation of Grey and his colleagues was dreaded even by the opposition, and they remained in office with the intention of introducing a third Reform Bill in the next session. The last months of 1831 were the beginning of a political crisis such as England had not seen since 1688. The two extreme parties, the Ultra-Radicals and the Ultra-Tories, were ready for civil war. Between them stood the ministry and the majority of intelligent peace-loving Englishmen; and their course of action was soon decided. The bill must be passed, and there were but two ways of passing it. One was to declare the consent of the House of Lords unnecessary to the measure, the other to create, if necessary, new peers in sufficient number to outvote the opposition. These two expedients did not in reality differ. To swamp the house in the way proposed would have been to destroy it. The question whether the ministry should demand the king's consent to such a creation, if necessary, was debated in the cabinet in September. Brougham proposed it, and gradually a majority of the cabinet were won over. Grey had at first refused to employ even the threat of so unconstitutional a device as a means to the proposed end. But his continued refusal would have broken up the ministry, and the breaking up of the ministry must now have been the signal for revolution. The second reading in the Commons was passed in December by a majority of 162, and on New-Year's Day 1832 the majority of the cabinet resolved on demanding power to carry it in the Lords by a creation of peers. Grey carried the resolution to the king. Some time still remained before the bill could be committed and read a third time. It was not until the 9th of April that Grey moved the second reading in the Lords. A sufficient number of the opposition temporized; and the second reading was allowed to pass by a majority of nine. Their intention was to mutilate the bill in committee. The Ultra Tories, headed by the duke of Wellington, had entered a protest against the second reading, but they were now politically powerless. The struggle had become a struggle on the one hand for the whole bill, to be carried by a creation of peers, and on the other for some mutilated measure. Grey's instinct divined that the crisis was approaching. Either the king must consent to swamp the House, or the ministry must cease to stand in the breach between the peers and the country. The king, a weak and inexperienced politician, had in the meantime been wrought upon by the temporizing leaders in the Lords. He was induced to believe that if the Commons should reject the mutilated bill when it was returned to them, and the ministry should consequently retire, the mutilated bill might be reintroduced and passed by a Tory ministry. He was deaf to all representations of the state of public opinion, and to the surprise of the ministry, and the terror and indignation of every man of sense in the country, he rejected their proposal, and accepted their resignation, May 9, 1832. The duke of Wellington undertook the hopeless task of constructing a ministry which should pass a restricted or sham Reform Bill. The only man who could have made the success of such a ministry even probable was Peel, and Peel's conscience and good sense forbade the attempt. He refused, and after a week of the profoundest agitation throughout the country, the king, beaten and mortified, was forced to send for Grey and Brougham. On being told that his consent to the creation of peers was the only condition on which they could undertake the Government, he angrily and reluctantly yielded. The chancellor, with cool forethought, demanded this consent in writing. Grey thought such a demand harsh and unnecessary. "I wonder," he said to Brougham, when the interview was over, "you could have had the heart to press it." But Brougham was inexorable, and the king signed the following paper:—"The king grants permission to Earl Grey, and to his Chancellor, Lord Brougham, to create such a number of peers as will be sufficient to ensure the passing of the Reform Bill, first calling up peers' eldest sons.—WILLIAM R., Windsor, May 17, 1832." This brief paper may be called the Magna Charta of responsible government. It established the right of a ministry to break down, by some convenient means, a factious opposition in the Lords; and this right has never since been practically disputed.

Grey had now won the game. There was no danger that he would have to resort to the expedient which he was authorized to employ. The introduction of sixty new peers would have destroyed the opposition, but it would have been equivalent to the abolition of the House. The king's consent made known, a sufficient number of peers were sure to withdraw to enable the bill to pass, and thus the dignity of both king and peerage would be saved. The duke of Wellington headed this movement on the part of the opposition; and the third reading of the bill was carried in the Lords by a majority of 84.

It is well known that in after years both Grey and Brougham disclaimed any intention of executing their threat. If this were so, they must have merely pretended to brave a danger which they secretly feared to face, and intended to avoid; and the credit of rescuing the country would belong to the duke of Wellington and the peers who seceded with him. To argue such cowardice in them from statements made when the crisis was long past, and when they were naturally willing to palliate the rough policy which they were forced to adopt, would be to set up a needless and unjustifiable paradox. Nothing else in the career of either Grey or Brougham leads us to suppose them capable of the moral baseness of yielding up the helm of state, in an hour of darkness and peril, to reckless and unskilled hands. Such would have been the result if they had lacked the determination to carry out their programme to the end. The influence of every statesman in the country would then have been extinguished, and the United Kingdom would have been absolutely in the hands of O'Connell and Orator Hunt.

Grey took but little part in directing the legislation of the reformed parliament. Never anxious for power, he had executed the arduous task of 1831–2 rather as a matter of duty than of inclination, and wished for an opportunity of retiring. Such an opportunity very shortly presented itself. The Irish policy of the ministry had not conciliated the Irish people, and O'Connell denounced them with the greatest bitterness. On the renewal of the customary Coercion Bill, the ministry was divided on the question whether to continue to the lord-lieutenant the power of suppressing public meetings. Mr Littleton, the Irish secretary, was for abolishing it; and with the view of conciliating O'Connell, he informed him that the ministry intended to abandon it. But the result proved him to have been mistaken, and O'Connell, with some reason supposing himself to have been duped, called on Mr Littleton to resign his secretaryship. It had also transpired in the discussion that Lord Althorp, the leader of the House of Commons, was privately opposed to retaining those clauses which it was his duty to push through the house. Lord Althorp therefore resigned, and Grey, who had lately passed his seventieth year, took the opportunity of resigning also. It was his opinion, it appeared, which had overborne the cabinet in favour of the public meeting clauses; and his voluntary withdrawal enabled Lord Althorp to return to his post, and to proceed with the bill in its milder form. Grey was succeeded by Lord Melbourne; but no other change was made in the cabinet. Grey took no further part in politics. During most of his remaining years he continued to live in retirement at Howick, where he died on the 17th of July 1845, in his eighty-second year. By his wife Mary Elizabeth, only daughter of the first Lord Ponsonby, whom he married November 18, 1794, he became the father of ten sons and five daughters, of whom eight sons and four daughters survived him.

In public life, Grey could always be upon occasion bold, strenuous, and self-sacrificing; but he was little disposed for the active work of the politician. He was not one of those who took the statesman's duty "as a pleasure he was to enjoy." A certain stiffness and reserve ever seemed in the popular eye to hedge him in; nor was his oratory of the kind which stirs enthusiasm and delight. A tall, stately figure, fine voice, and calm aristocratic bearing reminded the listener of Pitt rather than of Fox, and his speeches were constructed on the Attic rather than the Asiatic model. Though simple and straightforward, they never lack either point or dignity; and they were admirably adapted to the audience to which they were addressed. The scrupulous uprightness of Grey's political and private character completed the ascendency which he gained; and no politician could be named who, without being a statesman of the highest class, has left a name more enviably placed in English history. (E. J. P.)

GREY, Lady Jane (1537–1554), a person remarkable no less for her accomplishments than for her misfortunes, was the great granddaughter of Henry VII. of England. Her descent from that king was traced through a line of females. His second daughter Mary, after being left a widow by Louis XII. of France, married Charles Brandon, duke of Suffolk, who was a favourite with her brother King Henry VIII. Of this marriage came two daughters, the elder of whom, Lady Frances Brandon, was married to Henry Grey, marquis of Dorset; and their issue, again, consisted of daughters only. Lady Jane, the subject of this article, was the eldest of three whom the marquis had by Lady Frances. Thus it will appear that even if the crown of England had ever fallen into the female line of descent from Henry VII., she could not have put in a rightful claim unless the issue of his elder daughter, Margaret, had become extinct. But Margaret had married James IV. of Scotland; and, though her descendant, James VI., was ultimately called to the English throne, Henry VIII. had placed her family after that of his second sister in the succession; so that, failing the lawful issue of Henry himself, Lady Jane would, according to this arrangement, have succeeded. It was to these circumstances that she owed her exceptional position in history, and became the victim of an ambition which was not her own.

She was born at her father's seat named Broadgate in Leicestershire, about the year 1537. Her parents, though severe disciplinarians, bestowed more than ordinary care upon her education, and she herself was so teachable, and delighted so much in study, that she became the marvel of the age for her acquirements. She not only excelled in needlework and in music, both vocal and instrumental, but while still very young she had thoroughly mastered Latin, Greek, French, and Italian. She was able to speak and write both Greek and Latin with an accuracy that satisfied even such critics as Ascham and her tutor Dr Aylmer, afterwards bishop of London. She had also acquired some knowledge of at least three Oriental tongues, Hebrew, Chaldee, and Arabic. In Ascham's *Schoolmaster* is given a touching account of the devotion with which she pursued her studies and the harshness she experienced from her parents. The love of learning was her solace; in reading Demosthenes and Plato she found a refuge from domestic unhappiness. After the fashion of those days she was, when about ten years old, placed for a time in the household of Thomas, Lord Seymour, who induced her parents to let her stay with him by promising to marry her to his nephew King Edward VI. Lord Seymour, however, was attainted of high treason and beheaded in 1549, and his brother, the duke of Somerset, made some overtures to the marquis of Dorset to marry her to his son the earl of Hertford. These projects, however, came to nothing. The duke of Somerset in his turn fell a victim to the ambition of Dudley duke of Northumberland, and was beheaded three years after his brother. Meanwhile, the dukedom of Suffolk having become extinct by the deaths of Charles Brandon and his two sons, the title was conferred upon the marquis of Dorset, Lady Jane's father. Northumberland, who was now all-powerful, fearing a great reverse of fortune in case of the king's death, whose health soon began visibly to decline, endeavoured to strengthen himself by marriages between his family and those of other powerful noblemen, especially of the new-made duke of Suffolk. His three eldest sons being already married, the fourth, who was named Lord Guildford Dudley, was accordingly wedded to Lady Jane Grey about the end of May 1553. The match received the full approval of the king, who furnished the wedding apparel of the parties by royal warrant. But Edward's state of health warned Northumberland that he must lose no time in putting the rest of his project into execution. He persuaded the king that if the crown should descend to his sister Mary, the work of the Reformation would be undone and the liberties of the kingdom would be in danger. Besides, both Mary and her sister Elizabeth had been declared illegitimate by separate Acts of Parliament, and the objections to Mary Queen of Scots did not require to be pointed out. Edward was easily persuaded to break through his father's will and make a new settlement of the crown by deed. The document was witnessed by the signatures of all the council and of all but one of the judges; but those of the latter body were not obtained without difficulty by threats and intimidation.

Edward VI. died on the 6th July 1553, and it was announced to Lady Jane that she was queen. She was then but sixteen years of age. The news came upon her as a most unwelcome surprise, and for some time she resisted all persuasions to accept the fatal dignity; but at length she yielded to the entreaties of her father, her father-in-law, and her husband. The better to mature their plans the cabal had kept the king's death secret for some days, but they proclaimed Queen Jane in the city on the 10th. The people received the announcement with manifest coldness, and a vintner's boy was even so bold as to raise a cry for Queen Mary, for which he next day had his ears nailed to the pillory and afterwards cut off. Mary, however, had received early intimation of her brother's death, and, retiring from Hunsdon into Norfolk, gathered round her the nobility and commons of those parts. Northumberland was despatched thither with an army to oppose her; but after reaching Newmarket he complained that the council had not sent him forces in sufficient numbers, and his followers began to desert. News also came that the earl of Oxford had declared for Queen Mary; and as most of the council themselves were only seeking an opportunity to wash their hands of rebellion, they procured a meeting at Baynard's Castle, revoked their former acts as done under coercion, and caused the lord mayor to proclaim Queen Mary, which he did amid the shouts of the citizens. The duke of Suffolk was obliged to tell his daughter that she must lay aside her royal dignity and become a private person once more. She replied that she relinquished most willingly a crown that she had only accepted out of obedience to him and her mother; and her ten days' reign was over.

The leading actors in the conspiracy were now called to answer for their deeds. Northumberland was brought up to London a prisoner, tried and sent to the block, along with some of his partisans. The duke of Suffolk and Lady Jane were also committed to the Tower; but the former, by the influence of his duchess, procured a pardon. Lady Jane and her husband Lord Guildford Dudley were also tried, and received sentence of death for treason. This, however, was not immediately carried out; on the contrary the queen seems to have wished to spare their lives, and mitigated the rigour of their confinement. Unfortunately, owing to the general dislike of the queen's marriage with Philip of Spain, Sir Thomas Wyatt soon after raised a rebellion in which the duke of Suffolk and his brothers took part, and on its suppression the queen was persuaded that it was unsafe to spare the lives of Lady Jane and her husband any longer. On hearing that they were to die, Lady Jane declined a parting interview with her husband lest it should increase their pain, and prepared to meet her fate with Christian fortitude. She and her husband were executed on the same day, February 12, 1554, her husband on Tower Hill, and herself within the Tower an hour afterwards, amidst universal sympathy and compassion.

See Ascham's *Schoolmaster*; *Biog. Brit.*; Burnet's *History of the Reformation*; Howard's *Lady Jane Grey*; Nicolas's *Literary Remains of Lady Jane Grey*. (J. GA.)

GREYHOUND. See Dog, vol. vii. p. 327, and Coursing.

GREYTOWN, or more correctly San Juan del Norte, a small town of Nicaragua, worthy of note as the only port of the republic on the coast of the Atlantic and as the eastern terminus proposed for the Nicaraguan inter-oceanic canal. According to the survey of Commanders Hatfield and Lull, U.S.N., in 1872–3, the church is situated in 10° 55′ 14″ N. lat. and 83° 42′ 18″ W. long. The town lies along the seaward side of a narrow peninsula formed by the windings of the San Juan river, and most of its buildings are insignificant erections raised 2 or 3 feet on piles. Though it is still a port of call for mail steamers, and monopolizes the export and import trade of Nicaragua, Greytown is in a decadent condition. Its fine harbour has become almost useless. Between 1832 and 1848 the Arenas Point, which formed one of its boundaries, advanced westward nearly a nautical mile, and now the whole seaward frontage of the bay is a moving sand-bank. In 1853 the channel of entrance was still about one-third of a mile in width and had 23 to 25 feet of water in the bar, so that even vessels of war were able to take shelter within the harbour; but by 1861 the channel was only 100 yards wide and 12 feet deep, and in 1875 the passage was sometimes practically closed, with at the most only 5 feet of water. The inhabitants of the town, however, have increased from 955 in 1863 to about 1200 in 1875. As the vicinity of their town is unfitted for agriculture, they are almost entirely dependent for provisions on supplies from the interior or abroad, and sometimes the commonest articles of consumption are exceedingly scarce. In terms of the treaty of 1860 trial by jury is maintained in all civil and criminal cases, and there is perfect freedom of religious worship, both private and public. The seventh article, however, by which Greytown was to remain a free port has become a dead letter. A duty of 5 per cent. was allowed by the merchants on all imports consumed in the place in order to provide means for constructing a lighthouse; and in 1863 the central Government of the republic imposed another 5 per cent., so that all goods really pay 10 per cent. *ad valorem*. The imports in 1875 and 1876 respectively were £25,350 and £105,000, and the exports £60,500 and £145,000.

The harbour of San Juan, first discovered by Columbus, was brought into further notice by Captain Diego Machuca, who in 1529 sailed thither down the river from the Lake of Nicaragua. The date of the first Spanish settlement on the spot is not known, but in the 17th century there were fortifications at the mouth of the river. In 1796 San Juan was made a port of entry by royal charter, and new defences were erected in [illegible]. The [illegible] of Nicaragua [illegible] the place [illegible] in January 1848 by the British, who, assuming the protectorate in name of the "king of the Mosquito Indians," retained it in possession till the treaty of 1860. In 1854 the town was bombarded by the United States forces for an alleged insult.

GRIBOYEDOFF, Alexander Sergueevich (1795–1829), was born in 1795 at Moscow, where he studied at the university from 1810 to 1812. He then obtained a commission in a hussar regiment, but resigned it in 1816. Next year he entered the civil service, and in 1818 was appointed secretary of the Russian legation in Persia, whence he was transferred to Georgia. There he began the drama which has made him famous. He had commenced writing early, and had produced on the stage at St Petersburg in 1816 a comedy in verse, translated from the French, called *The Young Spouses*, which was followed by some other pieces of the same kind. But neither these, nor the essays and verses which he wrote for periodicals, would have been long remembered but for the immense success gained by his comedy in verse, *Gore ot uma*, or "Misfortune from Intelligence." A satire upon Russian society, or, as a high official styled it, "A pasquinade on Moscow," its plot is slight, its merits consisting in its accurate representation of certain social and official types,—such as Famousoff, the lover of old abuses, the hater of reforms; his secretary, Molchanin, servile fawner upon all in office; the aristocratic young liberal and Anglomaniac, Repetiloff; contrasted with whom is the hero of the piece, Tchatsky, the ironical satirist, just returned from the west of Europe, who exposes and ridicules the weaknesses of the rest, his words echoing that outcry of the young generation of 1820 which reached its climax in the military insurrection of 1825, and was then sternly silenced by Nicholas. Griboyedoff spent the summer of 1823 in Russia, completed his play, and took it to St Petersburg. There it was rejected by the censorship. Many copies were made and privately circulated, but Griboyedoff never saw it published. The first edition was printed in 1833, four years after his death. Only once did he see it on the stage, when it was acted by the officers of the garrison at Erivan. Soured by disappointment he returned to Georgia, made himself useful by his linguistic knowledge to his relative Count Paskievitch-Erivansky during a campaign against Persia, and was sent to St Petersburg with the treaty of 1828. Brilliantly received there, he thought of devoting himself to literature, and commenced a romantic drama, *A Georgian Night*. But he was suddenly sent to Persia as minister-plenipotentiary. Soon after his arrival at Teheran a tumult arose, caused by the anger of the populace against some Georgian and Armenian captives,—Russian subjects,—who had taken refuge in the Russian embassy. It was stormed, Griboyedoff was killed (February 11, 1829), and his body was for three days so ill-treated by the mob that it was at last recognized only by an old scar on the hand, due to a wound received in a duel. It was taken to Tiflis, and buried in the monastery of St David. There a monument was erected to his memory by his widow, to whom he had been but a few months married. But his memory is best preserved by his play *Gorè ot uma*, which has since his death been repeatedly published and performed, and will always be quoted as one of the masterpieces of Russian literature. An English translation by N. Benardaky appeared in London in 1857.

GRIESBACH, Johann Jakob (1745–1812), one of the most distinguished of the band of scholars to whom the modern science of New Testament textual criticism owes its origin, was born at Butzbach, a small town of Hesse-Darmstadt, where his father was pastor, on the 4th of January 1745. He received his school education at Frankfort-on-the-Main, and carried on his university studies at Tubingen and Leipsic, but especially at Halle, where he became one of Semler's most ardent disciples. At the close of his undergraduate career, he undertook a literary tour which, apart from the advantages of stimulative contact with many of the most distinguished scholars of England, France, and Holland, as well as of his own country, was of great utility to him in providing him with materials for the great work of his subsequent life. On his return to Halle, he acted for some time as "privat docent," but in 1773 was appointed to a professorial chair; in 1775 he was translated to Jena, where the remainder of his life was spent in ever-increasing usefulness and honour, and where he died 24th March 1812.

Griesbach's critical edition of the New Testament first appeared at Halle, in three volumes, in 1774–75. The first volume contained the first three gospels synoptically arranged; the second, the fourth gospel and the Acts of the Apostles. All the historical books were reprinted in a second volume in 1777, the synoptical arrangement of the gospels having been abandoned as inconvenient. Of the second edition, very considerably enlarged and improved, the first volume appeared in 1796 and the second in 1806 (Halle and London). Of a third edition, edited by Schulz, only the first volume, containing the four gospels, has appeared (1827).

For the construction of his critical text Griesbach took as his basis the Elzevir edition, from which he departed only when valid reasons seemed to require it. In all such cases he placed the Elzevir reading on the inner margin along with such other readings as he thought worthy of special consideration (these last, however, being printed in smaller type). To all the readings on this margin he attached special marks indicating the precise degree of probability in his opinion attaching to each. In weighing these probabilities he proceeded upon a particular theory which in its leading features he had borrowed from Bengel and Semler, dividing all the MSS. into three great families or recensions—the Alexandrian, the Western, and the Byzantine. The Alexandrian recension had (as the name imported) originated in Alexandria, and thence had spread over Egypt and the East; it is characterized by a general tendency to tone down all Hebraisms, inelegancies, and harshnesses. The Western on the other hand had retained the Hebraisms unimpaired, but had incorporated many glosses, as well as interpolations from parallel passages, with the purpose of making the text more intelligible (Grammaticum egit Alexandrinus censor, interpretem occidentalis). The Byzantine he regarded as much later, and as combining and exaggerating the peculiarities of both the others. A reading that was supported by only one recension he considered as having only one witness in its favour; those readings on the other hand which were supported by all the three recensions, or even by two of them, especially if these two were the Alexandrian and the Western, he unhesitatingly accepts as genuine. Only when each of the three recensions gives a different reading does he proceed to discuss the question on other grounds. See his *Symbolæ criticæ ad supplendas et corrigendas variarum Novi Testamenti lectionum collectiones; accedit multorum N. T. codicum Græcorum descriptio et examen*, 2 vols. (Halle, 1785, 1793), and his *Commentarius criticus in textum Græcum N. T.*, which extends to the end of Mark, and discusses the more important various readings with great care and thoroughness (Jena, 1798–1811). Among the other works of Griesbach (which are comparatively unimportant, however) may be mentioned his university thesis *De codicibus quatuor evangelistarum Origenianis* (Halle, 1771) and a work upon systematic theology (*Anleitung zur Kenntniss der populären Dogmatik*, Jena, 1779). His *Opuscula*, consisting chiefly of university "programs" and addresses, were edited by Gabler, in 2 vols. (Jena, 1824).

GRIFFIN, or GRYPHON (*gryphus*, γρύψ), in the natural history of the ancients, the name of an imaginary rapacious creature of the eagle species, represented with four legs, wings, and a beak,—the fore part resembling an eagle, and the hinder a lion. In addition, some writers describe the tail as a serpent. This animal, which was supposed to watch over gold mines and hidden treasures, and to be the enemy of the horse, was consecrated to the Sun; and the ancient painters represented the chariot of the Sun as drawn by griffins. According to Spanheim, those of Jupiter and Nemesis were similarly provided. The griffin of Scripture is probably that species of the eagle called in Latin *Ossifraga*, or osprey. The griffin is related to inhabit Asiatic Scythia, where the lands abound in gold and precious stones; and when strangers approach to gather these the creatures leap upon them and tear them in pieces, thus showing their use in chastising human avarice and greed. The one-eyed Arimaspi wage constant war with them, according to Herodotus (iii. 16). The celebrated Sir John de Mandeville, in his *Travels*, described a griffin as eight times larger than a lion. The griffin is frequently seen on early seals and medals, and is still borne as a favourite device on seals and as a charge in heraldry. Papworth, in his laborious *Ordinary of British Armorials*, ascribes this creature to several hundred family coats, as a single charge, and in connexion with other heraldic devices the griffin was constantly borne in English and especially in Welsh armoury. Berry in his *Encyclopædia Heraldica* declares that the combination of the eagle and lion signified strength and swiftness conjoined; if this be so, the reason of its almost universal adoption as an emblem by a military and chivalric people is not far to seek. The seals of Baldwin de Redvers, second earl of Devon (1137–1155), and his son William de Vernun, sixth earl, exhibit two most curious examples of the griffin, and being anterior to the consolidation of heraldic rules and a succession of heraldic devices from father to son, are yet proofs that particular devices or emblems were in use with powerful lords of the 12th and 13th centuries, and retained by the members of the family as carefully and as conventionally as the true heraldic bearings of the following century were. Guillim blazons this monster as *rampant*, alleging that any very fierce animal may be so blazoned as well as the lion; but Sylvester, Morgan, Burke, Berry, and other writers upon heraldic subjects, use the term *segreant*, *i.e.*, *se greant*, pluming or arranging himself by lifting himself up and flapping his wings, as all birds do occasionally, instead of rampant. Palliot, one of the most interesting of all writers on arms, in his *Vraye et Parfaite Science des Armoires*, describes this creature as generally rampant, and points out its connexion with the Minotaur, Centaurs, and Chimæra, "fronte Leo, postremo Draco, medioque Chimæra." The same writer, in reference to the possibility of such productions of nature, describes a curious monster of similar character, called a *hippocervus*, presented in 1534 by Frederick, duke of Mantua, to Francis the Great, the fore part being that of a horse, the hind part that of a stag, which could be saddled and bridled, but always threw his rider and trampled on him. Much might be written on the subject of hybrids and fabulous monsters such as these, but the various aspects of natural history and archæology which they illustrate have never been yet worked out. The griffin was also an architectural ornament among the Greeks, and was copied from them, with other architectural embellishments, by the Romans. A fine example of the Assyrian griffin occurs on the sculptured slabs from Kouyunjik, now in the British Museum. The *Dictionary of Early Drawings and Illuminations*, by W. de Gray Birch and H. Jenner, gives a collection of references to the finest examples of these creatures among the manuscripts from the Saxon age to the close of the 15th century.

GRIFFIN, GERALD (1803–1840), an Irish novelist and dramatic writer, was descended from a family of good position, and was born at Limerick 12th December 1803. He was the youngest of nine sons. After attending for some time the school of an eccentric preceptor in Limerick, he, on the removal of the family in 1810 to Fairy Lawn, a country place on the banks of the Shannon, was placed under the instruction of a private tutor, but in 1814 he returned to Limerick to attend a classical school. In his youth his devotion seems to have been pretty equally divided between books and out-door recreations with the rod and gun. His parents and a portion of the family emigrated in 1820 to America, but he and some others were left with an elder brother who was settled as a medical practitioner at Adare near Limerick, and under his direction Gerald made some progress in medical studies with the view of adopting that profession. It would appear, however, that very soon his intentions underwent a change, for, besides devoting a large part of his time to literary composition, he as early as his eighteenth year undertook for a short time the editorship of a newspaper in Limerick. Having completed a tragedy, *Aguire*, which was highly lauded by his friends, he finally in 1823 set out for London with the purpose of "revolutionizing the dramatic taste of the time by writing for the stage." Notwithstanding, however, the efforts and recommendations of the novelist Banim, who showed him great kindness, he found no manager willing to accept any of his plays; and for a considerable period he had such a hard and wearisome struggle with poverty and disappointment as permanently to injure his health. For some time he barely supported himself by reporting trials for the newspapers and by various kinds of hack work; but his prospects began to brighten a little when he obtained occupation as a parliamentary reporter, and gradually the *Literary Gazette*, the *News of Literature*, and other periodicals of standing began to look upon his contributions with favour. Some of his dramatic pieces were accepted also by one of the theatres; and the publication in 1827 of a series of tales under the title of *Holland Tide* was so successful that he at once set about the preparation of a similar series, which appeared the same year in two volumes under the title of *Tales of the Munster Festivals*, and were still more popular. In 1828 appeared the *Collegians*, afterwards so successfully adapted for the stage under the title of the *Colleen Bawn*. It is said to have been the favourite novel of O'Connell; and, besides exhibiting that masterly delineation of both the pathetic and the humorous features of Irish character already shown in his other works, it was written with a verve and a dramatic intensity and realism far surpassing all his previous or subsequent efforts. His principal other works are *The Invasion*, *The Rivals*, *Tracey's Ambition*, and *The Tales of Five Senses*. He is also the author of a number of lyrics which are generally pervaded by a tender and sad cast of sentiment. When Griffin appeared to have achieved the literary success for which he had had such a hard struggle, he began to feel a growing distaste for his profession. He became doubtful as to the moral influence of his writings, and as to whether on that account he had not been "misspending his time;" and ultimately he came to the conclusion that his true sphere of duty was to be found within the walls of a monastery,—a resolve doubtless partly attributable to the state of his health. He was admitted into a Dublin monastery in September 1838 under the name of Brother Joseph, and in the following summer he removed to Cork, where he died of typhus fever 12th June 1840. Previous to adopting the monastic habit he burned all his manuscripts; but *Gisippus*, a tragedy which he had composed in his twenty-fifth year, accidentally escaped destruction, and in 1842 was put on the Drury Lane stage by Mr Macready, and acted with great success. The collected works of Gerald Griffin were published in 1843 in eight volumes, with a memoir by his brother. See also *Dublin University Magazine* for February 1844.

GRILLPARZER, Franz (1791–1872), a distinguished German dramatist, was born in Vienna on the 15th January 1791. His father, a respectable advocate, destined him for his own profession; but on the conclusion of his legal studies, in 1811, Grillparzer became a tutor in a noble family, and two years afterwards accepted a subordinate post in the civil service. He rose slowly in his profession, but in 1833 was made director of the archives in the court chamber (Hofkammer). He retired in 1856, receiving the title of Hofrath, a title which was replaced in 1861 by the higher one of Reichsrath. In 1847 he was made a member of the Academy of Sciences. From early youth he displayed a strong literary impulse. He devoted especial attention to the Spanish drama, and nearly all his writings bear marks of the influence of Calderon. When he began to write, the German stage was dominated by the wild plays of Werner, Müllner, and other authors of the so-called "fate tragedies." His first play, *Die Ahnfrau* (The Ancestress), published in 1816, was penetrated by their spirit. A lady, who has been slain by her husband for infidelity, is doomed to visit "the glimpses of the moon" till her house is extinguished, and this end is reached in the tragedy amid scenes of violence and horror. Some of Grillparzer's admirers draw a sharp distinction between this play and the works with which it is usually classed, and in doing so they follow his own example. But its general character is exactly similar to that of Werner's dramas; it only differs from them in containing individual passages of much force and beauty. It at once became extremely popular, and Grillparzer was encouraged to write a second tragedy, *Sappho* (1818), the most artistically finished of his productions. An Italian rendering of this play fell into the hands of Lord Byron, who, although the translation was very bad, expressed his conviction that the author's name would be held in reverence by posterity. It is full of the aspiration of the Romantic school, but its form is classic, and its chastened style presents a striking contrast to the noise and fury of the *Ahnfrau*. The problem of the play has some resemblance to that of Goethe's *Torquato Tasso*, for in both we find the struggles of a poetic nature which is unable to reconcile itself to the conditions of the actual world. Grillparzer's conceptions are not so clearly defined as Goethe's, nor is his diction so varied and harmonious; but the play has the stamp of genius, and ranks as one of the best of those works in which an attempt has been made to combine the passion and sentiment of modern life with the simplicity and grace of ancient masterpieces. Another and more ambitious work in the classic style was *Das goldene Vlies* (The Golden Fleece), a trilogy published in 1822. Of its three parts the greatest is *Medea*, which some critics consider his highest achievement. There is delicate art in the delineation of the mingled fascination and repulsion which Medea and Jason feel for each other, and when at last repulsion becomes the dominant force, the dramatist gives splendid utterance to the rage of the disappointed wife and mother. In *Des Meeres und der Liebe Wellen* (Waves of the Sea and of Love), which appeared in 1840, Grillparzer again formed his work on classic models; but in this instance his feeling is so distinctly modern that it does not find adequate expression in his carefully measured verse. The subject is the story of Hero and Leander, and it has never been more happily treated than in some passages, which, however, are marked rather by lyrical than dramatic qualities.

In 1825 Grillparzer published *König Ottokar's Glück und Ende* (King Ottocar's Fortune and End). It appealed strongly to the patriotic sympathies of Vienna, dealing as it does with one of the proudest periods of Austrian history,—the time of Rudolf I., the founder of the house of Hapsburg. In a harsh criticism of Grillparzer, which appeared in the *Foreign Review* in 1829, and is now included in his *Miscellanies*, Mr Carlyle said that Schiller's *Piccolomini* differed from *Ottokar* as "a living rose [differs] from a mass of dead rose leaves, or even of broken Italian gum flowers." This judgment has not been confirmed by later criticism. It cannot, indeed, be said that the materials of the play are welded into a compact whole, but the characters are vigorously conceived, and there is a fine dramatic contrast between the brilliant, restless, and unscrupulous Ottocar and the calm, upright, and ultimately triumphant Rudolf. Another historical play, *Ein treuer Diener seines Herrn* (A faithful Servant of his Lord), appeared in 1830, and brought down upon the author a storm of abuse from the liberals, who accused him of servility. On the other hand, the play displeased the court, and its representation was stopped. It hardly deserved to be made the subject of so much contention, for it is one of the least powerful of Grillparzer's later dramas. A more pleasing work was the dramatic study *Der Traum, ein Leben* (The Dream, a Life), which is to some extent a direct imitation of Calderon, and has something of his brilliance and charm. In the same year in which this was issued (1840) Grillparzer published *Weh dem der lügt* (Woe to him who Lies), a comedy. It was so badly received that he wrote no more for the stage. Several dramatic fragments, however, composed at a later time, appeared among his posthumous writings.

Grillparzer was a lyrical as well as a dramatic poet. He used to say that all his lyrics were written for the purpose of obtaining relief from feelings by which he happened to be oppressed. The same thing was said of himself by Goethe; but Goethe's emotion in passing into verse was purified and generalized; Grillparzer's remained for the most part strictly personal, and rarely touches the deepest sympathies. He is most successful in epigrams, in which he often gives sharp expression to a keen, biting humour. He wrote also several prose tales, one of which, *Der Spielmann* (The Musician), is marked by delicate and graceful fancy. His autobiography, which was written in 1853 and brings down the narrative of his life to 1836, is a model of clear, simple, and elegant prose, and it throws much interesting light both on his personal character and on the tendencies of his time. Among his posthumous writings are many fragments of literary, philosophic, and political criticism, all of them indicating a strong and independent spirit, not invariably just, but distinct, penetrating, and suggestive. It is characteristic of him that he expresses extreme dislike of Hegel's philosophy on the ground that its terms are unintelligible. On the other hand, he gives evidence of careful and sympathetic study of Kant. Of modern literary critics Gervinus was most repugnant to him, mainly because of the tendency of this writer to attribute moral aims to authors who created solely for art's sake. He rather maliciously says that Gervinus had one advantage and one disadvantage in writing his history of German Literature,—the advantage of common sense, the disadvantage of knowing nothing of his subject.

Of a quiet contemplative nature, Grillparzer shunned general society. He never married. To a stranger he seemed cold and distant, but in conversation with any one he liked his real disposition revealed itself; his manner became animated, his eyes brightened, and a sarcastic but not ill-natured smile would play upon his lips. It was one of his sayings that the art of writing poetry can neither be taught nor learned, but he also held that inspiration will not visit a poet who neglects to make himself master of his subject. Hence before writing a play he worked hard, striving to comprehend the spirit of the age he wished to represent. He was exceedingly fond of travel, and at different times visited all the leading European countries. After 1840, when his solitary comedy was rejected by the public, he almost passed from the memory of his contemporaries. Fortunately for him, Heinrich Laube, an admirer of his genius, settled in Vienna in 1849 as artistic director of the court theatre. By and by Laube reintroduced on the stage some of the forgotten works, and their success was immediate and profound. To his own surprise, Grillparzer became the most popular author of the day; he was ranked with Goethe and Schiller, and lauded as the national poet of Austria. On the eightieth anniversary of his birthday all classes from the court downwards united to do him honour; never, probably, did Vienna exert herself so much to prove her respect for a private citizen. He died on the 21st January 1872, and was buried with an amount of ceremony that surpassed even the pomp displayed at Klopstock's funeral. A monument of him has recently been erected at Baden, near Vienna.

After his death an admirable edition of his works, in ten volumes, was issued by Heinrich Laube and J. Weilen. There are several English translations of *Sappho*, and *Medea* has also been translated. For accounts of his life and critical notices, see Kuh, *Zwei Dichter Oesterreichs* (Pesth, 1872); Betty Paoli, *Grillparzer und seine Werke* (Stuttgart, 1875); and Gottschall, "Franz Grillparzer," and "Franz Grillparzer's Nachlass," in *Unsere Zeit* for 1872 and 1873. (J. SI.)

GRIMALDI, GIOVANNI FRANCESCO (1606–1680), an architect and painter, named Il Bolognese from the place of his birth, was a relative of the Caracci family, under whom it is presumed he studied first, and afterwards under Albani. He went to Rome, and was appointed architect to Pope Paul V., and patronized by succeeding popes also. Towards 1648 he was invited to France by Cardinal Mazarin, and for about two years was employed in buildings for that minister and for Louis XIV, and in fresco-painting in the Louvre. His colour was strong, somewhat excessive in the use of green; his touch light. He painted at once history, portraits, and landscape,—the last with predilection, especially in his advanced years,—and executed engravings and etchings from his own landscapes, and from those of Titian and the Caracci. Returning to Rome, he was made president of the Academy of St Luke; and in that city he died on 28th November 1680, in high repute not only for his artistic skill but for his upright and charitable deeds as well. His son Alessandro assisted him both in painting and in engraving. Paintings by Grimaldi are preserved in the Quirinal and Vatican palaces, and in the church of S. Martino a' Monti; there is also a series of his landscapes in the Colonna Gallery.

GRIMM, FRIEDRICH MELCHIOR, BARON VON (1723–1807), the author of the celebrated *Correspondance littéraire*, was, though a naturalized Frenchman, both of German descent and a native of Germany, having been born of poor parents at Ratisbon, 26th December 1723. He studied at the university of Leipsic, where he had as professor the celebrated Ernesti, to whom he was doubtless in no small degree indebted for his critical appreciation of classical literature. On completing his studies he made his literary début by a tragedy which was received with ridicule by the audience and by the critics, including Lessing, and which is now forgotten even in Germany. In all probability it was this disappointment which led him to think of seeking his fortune in Paris, whither he accompanied the count of Schonberg as tutor to his sons, and where afterwards, at a small salary, he was for some time reader to the young hereditary prince of Saxe-Gotha. In 1749 he made the acquaintanceship of J. J. Rousseau, which, through a mutual sympathy in regard to musical matters, soon ripened into intimate friendship. Through Rousseau he was introduced to the Encyclopedists, and about the same time he became secretary to Count Friesen, nephew of Marshal Saxe, which gained him admission to the most brilliant society of Paris. Endowed with more than average intellectual abilities, thoroughly versed in all current topics of interest in literature, science, and art, gifted with remarkable insight into character, possessing engaging manners and great social tact, and actuated in all his conduct by a keen regard to his own interest, he won almost immediately general appreciation and respect. He rapidly obtained a thorough knowledge of the French language, and acquired so perfectly the tone and sentiments of the society in which he moved that all marks of his foreign origin and training seemed completely effaced. A witty pamphlet entitled *Le petit Prophète de Boehmischbroda*, written by him on the respective merits of the Italian and French operas, a subject which at that time greatly exercised the society of Paris and on which he sided with the Italian section, at once firmly established his literary reputation. It is possible that the origin of the pamphlet is partly to be accounted for by his admiration of Mdlle. Fel, the *prima donna* of the Italian company. This admiration quickly developed into a passion so vehement that he was seized with a kind of catalepsy which continued for several days, but from which he suddenly awoke completely recovered both in body and mind. In 1753 Grimm was engaged by the Abbé Raynal to aid him in conducting his literary correspondence with German sovereigns; and this opened up to him that sphere for his ambition which perhaps was most in accordance with his peculiar tastes, and in which his abilities best fitted him to excel. Although from the beginning he had the principal share in the work, it was probably conducted until 1759 in the name of the Abbé Raynal. With the aid of friends during his temporary absences from France, he carried it on until 1790, and it latterly extended to six sovereigns, including the empress of Russia, the king of Sweden, and the king of Poland. It was probably in 1754 that Grimm was introduced by Rousseau to Madame d'Épinay, his relations with whom led to an irreconcilable rupture between him and Rousseau. The exact amount of Grimm's blameworthiness it is impossible to determine, and the whole matter would be of little consequence but for the fact that Rousseau allowed his resentment to gain such a complete possession of his mind as to induce him to give in his *Confessions* a wholly mendacious portrait of Grimm's character, by which his reputation was for a considerable time injuriously affected. After the death of Count Friesen Grimm obtained the patronage of the duke of Orleans, through whom he was appointed secretary to Marshal d'Estrées during the campaign of Westphalia in 1756–57. Subsequently he was named minister of Saxe-Gotha at the court of France, but he was deprived of that office on account of having criticized rather caustically certain French ministers in a despatch that was intercepted by Louis XV. His introduction to Catherine II. of Russia took place in 1773, when he accompanied the suite of the landgrave of Hesse-Darmstadt to St Petersburg on occasion of the marriage of a daughter of that prince to the only son of Catherine. After the Revolution Grimm retired to Gotha, and in 1792 he emigrated to Russia, where he enjoyed high favour at the court of Catherine, and had assigned him the nominal and agreeable duty of entertaining her for so many hours a day by his conversation. This state of things came, however, to an end in 1795, when, notwithstanding his supplications to be retained at court if only as one of her majesty's dogs, he was appointed minister of Russia at Hamburg. He died at Gotha, 19th December 1807.

The correspondence of Grimm forms perhaps the most valuable of existing records of any important literary period. It embraces nearly the whole period from 1750 to 1790, and although parts of it during his absence from France were written by Diderot, Madame d'Épinay, and others, the work as a whole may be regarded as substantially his. At first he contented himself with enumerating in the simplest manner the chief current views in literature and art, and indicating only very slightly the contents of the principal new books, but gradually his criticisms became more extended and trenchant, and he touched on nearly every subject—political, literary, artistic, social, and religious—which interested the Parisian society of the time—his narrative, which moves lightly and easily from one theme to another, being frequently seasoned by piquant anecdotes or witty reflexions. Not only, however, did he aim to give a truthful and just account of the subjects on which he wrote; his purpose extended considerably beyond that of affording a few hours' amusement to his royal patrons, and his descriptions and criticisms were fitted to satisfy more than a superficial curiosity. His notices of contemporaries are somewhat severe, and he exhibits in all the nakedness of truth the foibles and selfishness of the society in which he moved; but he appears to have been unbiassed in his literary judgments, and such is their justness and penetration that time has only served to confirm them. In style and manner of expression he is thoroughly French. He is generally somewhat cold in his appreciation, but his literary taste is delicate and subtle; and it is the opinion of Sainte-Beuve that the quality of his thought in his best moments will compare not unfavourably even with that of Voltaire. His religious and philosophical opinions were entirely negative, and his references to Christianity generally assume the form of either a sneer or a witticism.

Grimm's *Correspondance littéraire, première partie de 1753 à 1770*, was published at Paris in 1813 in 6 vols. 8vo; *deuxième partie de 1771 à 1782*, in 1812 in 5 vols. 8vo; and *troisième partie, pendant une partie des années 1775 et 1776, et pendant les années 1782 à 1790 inclusivement*, in 1813 in 5 vols. 8vo. A supplementary volume appeared in 1814; the whole correspondence was collected and published by M. Jules Taschereau in a *Nouvelle édition, revue et mise dans un meilleur ordre, avec des notes et des éclaircissements, et où se trouvent rétablies pour la première fois les phrases supprimées par la censure impériale*, Paris, 1829–1831, 15 vols. 8vo; and the *Correspondance inédite, et recueil de lettres, poésies, morceaux, et fragments retranchés par la censure impériale en 1812 et 1813* was published in 1829. Grimm's *Mémoire historique sur l'origine et les suites de mon attachement pour l'impératrice Catherine II. jusqu'au décès de sa majesté impériale*, and Catherine's correspondence with Grimm to September 1774, have been published in the *Collection* of the Russian Imperial Historical Society. She treats him very familiarly, and calls him Heraclite, George Dandin, &c. He signs himself "Pleureur." See also Mme. d'Épinay's *Mémoires*; Rousseau's *Confessions*; the notice by Gaigues in the introduction to the second part of the *Correspondance*, and that by Taschereau in the introduction to the new edition; Sainte-Beuve, *Causeries du lundi*, vol. vii.

GRIMM, Jacob Ludwig Carl (1785–1863), was born on the 4th of January 1785 at Hanau, in Hesse-Cassel. His father, who was a lawyer, died while he was still a child, and the mother was left with very small means; but her sister, who was lady of the chamber to the landgravine of Hesse, helped to support and educate her numerous family. Jacob with his younger brother Wilhelm (born on the 24th of February 1786) was sent in 1798 to the public school at Cassel. In 1802 he proceeded to the university of Marburg, where he applied himself to the study of law, a profession for which he had always been destined by his father, and which seemed to offer the best prospect of speedy independence. His brother joined him at Marburg a year later, having just recovered from a long and severe illness, and likewise began the study of law. Up to this time Grimm had been actuated only by a general thirst for knowledge and the instinct of intellectual activity, and his energies had not found any aim beyond the practical one of making himself a position in life. The first definite impulse came from the lectures of Savigny, the celebrated investigator of Roman law, who, as Grimm himself says (in the preface to the *Deutsche Grammatik*), first taught him to realize what it meant to study any science, whether that of law or any other. Savigny's lectures at the same time awakened in him that love for historical and antiquarian investigation which forms the basis of all his work. Then followed personal acquaintance, and it was in Savigny's well-provided library that Grimm first turned over the leaves of Bodmer's edition of the Old German minnesingers and other early texts, and felt an eager desire to penetrate further into the obscurities and half-revealed mysteries of their language. In the beginning of 1805 he received an invitation from Savigny, who had removed to Paris to continue his researches among the libraries there, to join him and help him in his literary work. This offer was joyfully accepted by young Grimm, who passed a very happy time in Paris, enjoying the society of Savigny, and strengthening his taste for the literatures of the Middle Ages by his studies in the Paris libraries. Towards the close of the year he returned to Cassel, where his mother and Wilhelm had settled, the latter having finished his studies. The next year he obtained a situation in the war office with the very small salary of 100 thalers. One of his grievances was, as he himself tells us in his autobiography, that he had to exchange his stylish Paris suit for a stiff uniform and pigtail. But he had full leisure for the prosecution of his studies. In 1808, soon after the death of his mother, he was appointed superintendent of the private library of Jerome Buonaparte, king of Westphalia, into which Hesse Cassel had been incorporated by Napoleon. He was treated with marked favour by the king, who appointed him an auditor to the state council, while he still retained his other post. His salary was increased in a short interval from 2000 to 4000 francs, which removed all anxiety as to the means of subsistence and his official duties were hardly more than nominal. After the expulsion of Jerome and the reinstalment of an elector, Grimm was appointed in 1815 secretary of legation, to accompany the Hessian minister to the headquarters of the allied army. In 1814 he was sent to Paris to demand restitution of the books carried off by the French, and in 1814-15 he attended the congress of Vienna as secretary of legation. On his return he was again sent to Paris on the same errand as before. Meanwhile Wilhelm had received an appointment in the Cassel library, and in 1816 Jacob was made second librarian under Volkel. On the death of Volkel in 1828 the brothers expected to be advanced to the first and second librarianships respectively, and were much dissatisfied when the first place was given to Rommel, keeper of the archives. So they removed next year to Gottingen, where Jacob received the appointment of professor and librarian, Wilhelm that of under-librarian. Jacob Grimm lectured on legal antiquities, historical grammar, literary history, and diplomatics, explained Old German poems, and commented on the *Germania* of Tacitus. At this period he is described as small and lively in figure, with a harsh voice, speaking a broad Hessian dialect. His powerful memory enabled him to dispense with the "heft" which most German professors rely on, and he spoke extempore, referring only occasionally to a few names and dates written on a slip of paper. He himself regretted that he had begun the work of teaching so late in life, and as a lecturer he was not successful; he had no idea of digesting his facts and suiting them to the comprehension of his hearers; and even the brilliant, terse, and eloquent passages which abound in his writings lost much of their effect when jerked out in the midst of a long array of dry facts. In 1837, being one of the seven professors who signed a protest against the king of Hanover's abrogation of the constitution which had been established some years before, he was dismissed from his professorship, and banished from the kingdom of Hanover. He returned to his native Cassel together with his brother, who had also signed the protest, and remained there till, in 1840, they accepted an invitation from the king of Prussia to remove to Berlin, where they both received professorships, and were elected members of the Academy of Sciences. Not being under any obligation to lecture, Jacob very seldom did so, but together with his brother worked at the great dictionary, the plan of which had already been partly developed. During their stay at Cassel Jacob regularly attended the meetings of the academy, where he read papers on the most varied subjects. The best known of these are those on Lachmann, Schiller, and his brother Wilhelm (who died in 1859), on old age, and on the origin of language. He also described his impressions of Italian and Scandinavian travel, interspersing his more general observations with linguistic details, as is the case in all his works. He died in 1863, working up to the last.

Grimm's physical constitution was an excellent one. He possessed in the highest degee that Teutonic energy and endurance which are as essential to the sedentary student as to the pioneer in other regions of human activity. He was never ill, and worked on all day, without haste and without pause. He himself (in his biography) speaks of his "iron industry." He was not at all impatient of interruption, but seemed rather to be refreshed by it, returning to his work without effort. He wrote for press with great rapidity, and hardly ever made corrections. He never revised what he had written, remarking with a certain wonder of his brother, "Wilhelm reads his manuscripts over again before sending them to press!" He often started on a journey which he had determined upon only the day before. His temperament was uniformly cheerful, and he was easily amused. He took a keen interest in politics, and when the newspapers arrived, he would often read them through at once, breaking off his work for the purpose. Outside his own special work he had a marked taste for botany, and always liked to have flowers about him while working, a taste which was shared by his brother. The spirit which animated his work is best described by himself at the end of his autobiography. "Nearly all my labours have been devoted, either directly or indirectly, to the investigation of our earlier language, poetry, and laws. These studies may have appeared to many, and may still appear, useless; to me they have always seemed a noble and earnest task, definitely and inseparably connected with our common fatherland, and calculated to foster the love of it. My principle has always been in these investigations to undervalue nothing, but to utilize the small for the illustration of the great, the popular tradition for the elucidation of the written monuments." We may, in fact, sum up Grimm's tendencies by saying that he was inspired by an intense enthusiasm for research, guided into definite channels by a not less enthusiastic love and veneration for everything German,—this word including, in its widest sense, all the great brotherhood of the Teutonic nations,—and limited by his decided predilection for history and antiquities. It will be observed that, whenever he refers to living dialects or traditions, it is in order to throw light on the past, not the reverse. Even in his great German dictionary the historical tendency strongly predominates.

The purely scientific side of Grimm's character developed itself but slowly, and it was long before he applied to the study of etymology and inflexions the system and method Savigny had taught him to develop in legal history. He seems to have felt the want of definite principles of etymology without being able to discover them, and indeed even in the first edition of his grammar (1819) he seems to be often groping in the dark, and to have but a vague idea of the necessity of rigorous principles of letter-comparison. As early as 1815 we find A. W. Schlegel reviewing the *Altdeutsche Wälder* (a periodical published by the two brothers) very severely, condemning the lawless etymological combinations it contained, and insisting on the necessity of strict philological method and a fundamental investigation of the laws of language, especially in the correspondence of sounds. This criticism is said to have had a considerable influence on the direction of Grimm's studies.

The first work he published, *Ueber den altdeutschen Meistergesang* (1811), was of a purely literary character. But even here we see the difference between the more passive contemplation of the æsthetic literary critic and the activity of the investigator who is always seeking definite results and definite laws. In this essay Grimm showed that *Minnesang* and *Meistersang* were really one form of poetry, of which they merely represented different stages of development, and also announced his important discovery of the invariable division of the *Lied* into three strophic parts.

His text-editions were mostly prepared in common with his brother. In 1812 they published the two ancient fragments of the *Hildebrandslied* and the *Weissenbrunner Gebet*, Jacob having discovered what till then had never been suspected—the alliteration in these poems. However, Jacob had but little taste for text-editing, and, as he himself confessed, the evolving of a critical text gave him little pleasure. He therefore left this department to others, especially Lachmann, who soon turned his brilliant critical genius, trained in the severe school of classical philology, to Old and Middle High German poetry and metre. Both brothers were attracted from the beginning by all national poetry, whether in the form of epics, ballads, or popular tales. They published in 1816-18 an analysis and critical sifting of the oldest epic traditions of the Germanic races under the title of *Deutsche Sagen*. At the same time they collected all the popular tales they could find, partly from the mouths of the people, partly from manuscripts and books, and published in 1812–15 the first edition of those *Kinder- und Haus-Märchen* which have carried the name of the brothers Grimm into every household of the civilized world, and founded the science of what is now called folk-lore. The closely allied subject of the satirical beast epic of the Middle Ages also had a great charm for Jacob Grimm, and he published an edition of the *Reinhart Fuchs* in 1834. His first contribution to mythology was the first volume of an edition of the Eddaic songs, undertaken conjointly with his brother, published in 1815, which, however, was not followed by any more. The first edition of his *Deutsche Mythologie* appeared in 1835. This great work covers the whole range of the subject, tracing the mythology and superstitions of the old Teutons back to the very dawn of direct evidence, and following their decay and loss down to the popular traditions, tales, and expressions in which they still linger.

Although by the introduction of the Code Napoléon into Westphalia Grimm's legal studies were made practically barren, he never lost his interest in the scientific study of law and national institutions, as the truest exponents of the life and character of a people. By the publication (in 1828) of his *Rechtsalterthümer* he laid the foundations of that historical study of the old Teutonic laws and constitutions which has been continued with brilliant success by Maurer and others. In this work Grimm showed the importance of a linguistic study of the old laws, and the light that can be thrown on many a dark passage in them by a comparison of the corresponding words and expressions in the other old cognate dialects. He also knew how—and this is perhaps the most original and valuable part of his work—to trace the spirit of the laws in countless allusions and sayings which occur in the old poems and sagas, or even survive in modern colloquialisms.

Of all his more general works the boldest and most far-reaching is unquestionably his *Geschichte der deutschen Sprache*, where at the same time the linguistic element is most distinctly brought forward. The subject of the work is, indeed, nothing less than the history which lies hidden in the words of the German language—the oldest national history of the Teutonic tribes determined by means of language. For this purpose he laboriously collects the scattered words and allusions to be found in classical writers, and endeavours to determine the relations in which the German language stood to those of the Getæ, Thracians, Scythians, and many other nations whose languages are known to us only by doubtfully identified, often extremely corrupted remains preserved by Greek and Latin authors. It need hardly be said that Grimm's results have been greatly modified by the wider range of comparison and improved methods of investigation which now characterize linguistic science, while, on the other hand, many of the questions raised by him will probably for ever remain obscure, but his book will always be one of the most fruitful and suggestive that have been ever written.

We now come to his purely philological work, of which his famous *Deutsche Grammatik* was the outcome. We have already seen how slowly and with what difficulty he attained a sound method of etymological and grammatical investigation. Nevertheless the time was a favourable one for his work. The persevering labours of past generations—from the humanists onwards—had collected an enormous mass of materials in the shape of text editions, dictionaries, and grammars, although most of it was uncritical and often untrustworthy. Something had even been done in the way of comparison and the determination of general laws, and the conception of a comparative Teutonic grammar had been clearly grasped by the illustrious Englishman Hickes, at the beginning of the last century, and partly carried out by him in his *Thesaurus*. Ten Kate in Holland had afterwards made valuable contributions to the history and comparison of the Teutonic languages. Even Grimm himself did not at first intend to include all the languages in his grammar; but he soon found that Old High German postulated Gothic, that the later stages of German could not be understood without the help of the Low German dialects, including English, and that the rich literature of Scandinavia could as little be ignored. The first edition of the first part of the *Grammar*, which appeared in 1819, and is now extremely rare, treated of the inflexions of all these languages, together with a general introduction, in which he vindicated the importance of a historical study of the German language against the *a priori*, quasi-philosophical methods then in vogue.

In 1822 this volume appeared in a second edition—really a totally new work, for, as Grimm himself says in the preface, it cost him little reflexion to mow down the first crop to the ground. The wide distance between the two stages of Grimm's development in these two editions is significantly shown by the fact that while the first edition gives only the inflexions, in the second volume phonology takes up no less than 600 pages, more than half of the whole volume. Grimm had, at last, awakened to the full conviction that all sound philology must be based on rigorous adhesion to the laws of sound-change, and he never afterwards swerved from this principle, which gave to all his investigations, even in their boldest flights, that iron-bound consistency, and that force of conviction which distinguishes science from dilettanteism; up to Grimm's time philology was—as it still is in England—nothing but a more or less laborious and conscientious dilettanteism, with occasional flashes of scientific inspiration; he made it into a science. His advance must be attributed mainly to the influence of his contemporary Rask. Rask was born two years later than Grimm, but his remarkable precocity gave him somewhat the start. Even in his first edition Grimm's Icelandic paradigms are based entirely on Rask's grammar, and in his second edition he has relied almost entirely on Rask for Old English. His debt to Rask can only be estimated at its true value by comparing his treatment of Old English in the two editions; the difference is very great. Thus in the first edition he declines *dæg*, *dæges*, plural *dægas*, not having observed the law of vowel-change pointed out by Rask. There can be little doubt that the appearance of Rask's Old English grammar was a main inducement for him to recast his work from the beginning. To Rask also belongs the merit of having first distinctly formulated the laws of sound correspondence in the different languages, especially in the vowels, those more fleeting elements of speech which had hitherto been ignored by etymologists.

This leads us to a question which has been the subject of much controversy,—Who discovered Grimm's law? The law of the correspondence of consonants in the older Indo-germanic, Low, and High German languages respectively was first fully stated by Grimm in the second edition of the first part of his grammar. The correspondence of single consonants had been more or less clearly recognized by several of his predecessors; but the one who came nearest to the discovery of the complete law was the Swede Ihre, who established a considerable number of "literarum permutationes," such as *b* to *f*, with the examples *bæra ferre*, *bryta frangere*. Rask, in his essay on the origin of the Icelandic language, gives the same comparisons, with a few additions and corrections, and even the very same examples in most cases. As Grimm in the preface to his first edition expressly mentions this essay of Rask, there is every probability that it gave the first impulse to his own investigations. But there is a wide difference between the isolated permutations of his predecessors and the comprehensive generalizations under which he himself ranged them. The extension of the law to High German is also entirely his own. The only fact that can be adduced in support of the assertion that Grimm wished to deprive Rask of his claims to priority is that he does not expressly mention Rask's results in his second edition. But this is part of the plan of his work, made absolutely necessary by its enormous extent, viz., to refrain from all controversy or reference to the works of others, leaving his readers to assign to each investigator his due. In his first edition he expressly calls attention to Rask's essay, and praises it most ungrudgingly. Rask himself refers as little to Ihre, merely alluding in a general way to Ihre's permutations, although his own debt to Ihre is infinitely greater than that of Grimm to Rask or any one else. It is true that a certain bitterness of feeling afterwards sprang up between Grimm and Rask, but this was the fault of the latter, who, impatient of contradiction and irritable in controversy, refused to acknowledge the value of Grimm's views when they involved modification of his own. The importance of Grimm's generalization in the history of philology cannot be overestimated, and even the mystic completeness and symmetry of its formulation, although it has proved a hindrance to the correct explanation of the causes of the changes, was well calculated to strike the popular mind, and give it a vivid idea of the paramount importance of law, and the necessity of disregarding mere superficial resemblance. Even the lawless English etymologist bows down to the authority of Grimm's law, though it must be confessed he honours it almost as much in the breach as in the observance.

The grammar was continued in three volumes, treating principally of derivation, composition, and syntax, which last was left unfinished. Grimm then began a third edition, of which only one part, comprising the vowels, appeared in 1840, his time being afterwards taken up mainly by the dictionary. Of the grammar as a whole we can only say that it stands quite alone in the annals of science for comprehensiveness, method, and fulness of detail. Every law, every letter, every syllable of inflexion in the different languages, is illustrated by an almost exhaustive mass of material, drawn from every period and every dialect. It has served as a model for all succeeding investigators. Diez's grammar of the Romance languages is founded entirely on its methods, which have also exerted a profound influence on the wider study of the Indo-Germanic languages in general.

In the great German dictionary Grimm undertook a task for which he was hardly suited. His exclusively historical tendencies made it impossible for him to do justice to the individuality of a living language; and the disconnected statement of the facts of language in an ordinary alphabetical dictionary fatally mars its scientific character. It was also undertaken on so large a scale as to make it impossible for him and his brother to complete it themselves. We may describe the dictionary, as far as it was worked out by Grimm himself, as a collection of disconnected antiquarian essays of, it need hardly be remarked, high value.

In summing up Grimm's scientific character we are struck by its combination of breadth and unity. He was as far removed from the narrowness of the specialist who has no ideas, no sympathies beyond some one author, period, or narrow corner of science, as from the shallow dabbler who feverishly attempts to master the details of half a dozen discordant pursuits, which have no central point of interest round which to rally. Even within his own special studies there is the same wise concentration; no Mezzofanti-like parrot display of useless polyglottism. The very foundations of his nature were harmonious; his patriotism and love of historical investigation received their fullest satisfaction in the study of the language, traditions, mythology, laws, and literature of his own countrymen and their nearest kindred. But from this centre his investigations were pursued in every direction as far as his unerring instinct of healthy limitation would allow. He was equally fortunate in the harmony that subsisted between his intellectual and moral nature. He made cheerfully the heavy sacrifices that science demands from its disciples, without feeling any of that envy and bitterness which often torment weaker natures; and although he lived apart from his fellow men, he was full of human sympathies, and no man has ever exercised a profounder influence on the destinies of mankind than he has—an influence which is still only in its infancy. His was the very ideal of the noblest type of German character.

The following is a complete list of his separately published works, those which he published in common with his brother being marked with a star. For a list of his essays in periodicals, &c., see vol. v. of his *Kleinere Schriften*, from which the present list is taken. His life is best studied in his own "Selbstbiographie," in vol. i. of the *Kleinere Schriften*. There is also a brief memoir by Dr Godeke in *Göttinger Professoren*, Gotha (Perthes), 1872.

Ueber den altdeutschen Meistergesang, Göttingen, 1811; **Kinder- und Haus-Märchen*, Berlin, 1812-15 (many editions); **Das Lied von Hildebrand und das Weissenbrunner Gebet*, Cassel, 1812; *Altdeutsche Wälder*, Cassel, Frankfort, 1813-16, 3 vols.; **Der arme Heinrich von Hartmann von der Aue*, Berlin, 1815; *Irmenstrasse und Irmensäule*, Vienna, 1815; **Die Lieder der alten Edda*, Berlin, 1815; *Silva de romances viejos*, Vienna, 1815; **Deutsche Sagen*, Berlin, 1816-18, 2d ed., Berlin, 1865-66; *Deutsche Grammatik*, Göttingen, 1819, 2d ed., Göttingen, 1822-40, reprinted 1870 by W. Scherer, Berlin; *Wuk Stephanowitsch's Kleine serbische Grammatik, verdeutscht mit einer Vorrede*, Leipsic and Berlin, 1824; *Zur Recension der deutschen Grammatik*, Cassel, 1826; **Irische Elfenmärchen, aus dem englischen*, Leipsic, 1826; *Deutsche Rechtsalterthümer*, Göttingen, 1828, 2d ed., 1854; *Hymnorum veteris ecclesiae XXVI interpretatio Theodisca*, Göttingen, 1830; *Reinhart Fuchs*, Berlin, 1834; *Deutsche Mythologie*, Göttingen, 1835, 3d ed., 1854, 2 vols.; *Taciti Germania edidit*, Göttingen, 1835; *Ueber meine Entlassung*, Basel, 1838; (together with Schmeller) *Lateinische Gedichte des X. und XI. Jahrhunderts*, Göttingen, 1838; *Sendschreiben an Karl Lachmann über Reinhart Fuchs*, Berlin, 1840; *Weisthümer*, th. i., Göttingen, 1840 (continued, partly by others, in 5 parts, 1840-69); *Andreas und Elene*, Cassel, 1840; *Frau Aventiure*, Berlin, 1842; *Geschichte der deutschen Sprache*, Leipsic, 1848, 3d ed., 1868, 2 vols.; *Das Wort des Besitzes*, Berlin, 1850; **Deutsches Wörterbuch*, bd. i., Leipsic, 1854 (still in progress); *Rede auf Wilhelm Grimm und Rede über das Alter*, Berlin, 1868, 3d ed., 1865; *Kleinere Schriften*, Berlin, 1864-70, 5 vols. (H. SW.)

GRIMM, WILHELM CARL (1786–1859). The chief events in the life of Wilhelm Grimm have been narrated in last article. The two brothers were indeed so intimately associated both in their lives and in their works that a separate biography of the younger is almost superfluous. As Jacob himself said in his celebrated address to the Berlin Academy on the death of his brother, the whole of their lives were passed together. In their school-days they had one bed and one table in common, as students they had two beds and two tables in the same room, and they always lived under one roof, and had their books and property in common. Nor did Wilhelm's marriage in any way disturb their harmony. As Cleasby said ("Life of Cleasby," prefixed to his *Icelandic Dictionary*, p. lxix.), "they both live in the same house, and in such harmony and community that one might almost imagine the children were common property." Wilhelm's character was a complete contrast to that of his brother. As a boy he was strong and healthy, but as he grew up he was attacked by a long and severe illness, which left him weak all his life. His was a less comprehensive and energetic mind than that of his brother, and he had less of the spirit of investigation in him, preferring to confine himself to some limited and definitely bounded field of work; he utilized everything that bore directly on his own studies, and ignored the rest. These studies were almost always of a literary nature, and the majority of his works, including those he carried on in common with his brother, are concerned either with literary problems, or popular traditions, or else are text-editions. It is characteristic of his more æsthetic nature that he took great delight in music, for which his brother had but a moderate liking, and had a remarkable gift of story-telling. Cleasby, in the account of his visit to the brothers, quoted above, tells that

'Wilhelm read a sort of farce written in the Frankfort dialect, depicting the 'malheurs' of a rich Frankfort tradesman on a holiday jaunt on Sunday. It was very droll, and he read it admirably." Cleasby describes him as "an uncommonly animated, jovial fellow." He was, accordingly, much sought in society, which he frequented much more than his brother.

His first work was a spirited translation of the Danish *Kæmpeviser* (Altdanische Heldenlieder), published in 1811-13, which attracted great attention, and made his name at first more widely known than that of his brother. The most important of his text-editions are—*Ruolandsliet*, Göttingen, 1838; *Konrad von Würzburg's Goldene Schmiede*, Berlin, 1840; *Grave Ruodolf*, Göttingen, 1844 (2d ed.); *Athis und Prophilias*, Berlin, 1846; *Altdeutsche Gespräche*, Berlin, 1851; *Freidank*, Göttingen, 1860 (2d ed.). Of his other works the most important is *Deutsche Heldensage*, Berlin, 1868 (2d ed.). His *Deutsche Runen* (Göttingen, 1821) has now only an historical interest. (H. SW.)

GRIMMA, a town in the circle of Leipsic, Saxony, is situated on the left bank of the Mulde, 19 miles S.E. of Leipsic. In the Middle Ages it was an important commercial town, but agriculture is now its principal industry, although its manufactures have for some time been increasing. Besides large flour-mills, there are yarn-bleaching and dyeing works, and outside the town are the Golzermühle, which include an iron foundry and manufactories of paper and machinery. The principal buildings are the old castle, founded in the 12th century, in which the margraves of Meissen and the electors of Saxony often held court; the town-house, dating from 1442; the two normal seminaries; the real school of the second order; and the famous *Fürstenschule* (*Illustre Moldanum*) erected by the elector Maurice on the site of the former Augustine monastery and consecrated in 1550, having provision for 104 free scholars and 22 boarders, and a library now numbering 10,000 volumes. In the immediate neighbourhood are the Cistercian monastery in which Catherine von Bora lived, and the village of Doben, with an old castle in which Albert the Proud kept his father Otto the Rich prisoner. Grimma is of Sorbian origin, and came into the possession of Germany through the emperor Henry I. The population in 1875 was 7273.

GRIMSBY, GREAT, a municipal and parliamentary borough and seaport town of England, county of Lincoln, is situated on the south side of the estuary of the Humber nearly opposite Spurn Head, and 17 miles E.S.E. of Hull. Since the opening in 1852, under the auspices of the Manchester, Sheffield, and Lincolnshire Railway Company, of extensive docks occupying a space of 140 acres reclaimed from the sea, the shipping trade of Grimsby has largely increased. A new dock connecting the royal dock with the old dock was opened by the Prince of Wales July 22, 1879. A dock of 26 acres in extent for the accommodation of the coal and timber trade is in course of construction; and it is proposed still to supply additional dock accommodation by reclaiming 200 more acres from the Humber. In 1877 the number of British vessels that entered the port was 2837, with a tonnage of 355,218; of foreign vessels 847, with a tonnage of 258,243; the number of British vessels that cleared 2642, with a tonnage of 342,727; of foreign vessels 743, with a tonnage of 235,186. Steamers ply regularly between Grimsby and the most important Baltic ports. Until 1858 no fishing trawlers had their headquarters at Grimsby, but since that period they have so increased that in 1877 the fishing craft numbered 665, with a tonnage of 29,921; and Grimsby has now become one of the largest fishing ports in the kingdom. For the use of the fishing vessels a special dock of 12 acres in extent was constructed; and another of 11 acres has lately been finished, as well as a graving dock capable of holding ten vessels at a time. Ice companies have also been established, with steamers of their own for conveying ice from Norway for the use of the fisheries. Further particulars regarding the fishing trade of Grimsby will be found under the article FISHERIES, vol. ix. pp. 249, 250. The principal other industries are shipbuilding, iron and brass founding, brewing, and tanning. The chief buildings, besides the large warehouses extending along the docks, are the fine old parish church restored in 1859, the free grammar school, the custom-house, the mechanics' institute, the hospital, the corn exchange, and the town-hall. A statue of the Prince Consort was unveiled 22d July 1879. The population of the municipal borough in 1861 was 11,067, and of the parliamentary borough 15,060; in 1871 the numbers were 20,244 and 26,982. The area of the former is 1737, and of the latter 16,330 acres.

Grimsby is supposed to have been the spot where the Danes landed on their first invasion of Britain. It is a borough by prescription, and one of the most ancient in the kingdom. In the reign of Edward III. it was a considerable seaport, and in 1346 it furnished that monarch with 11 ships and 170 mariners for the siege of Calais. After that period its trade fell into decay through the gradual blocking up of the harbour by the accumulation of mud and sand, until the erection of new docks about the beginning of the present century. By the Act of 23d Edward I. the town obtained the privilege of returning two members to parliament, but since the Reform Act of 1832 it has returned only one.

GRINDAL, EDMUND (c. 1519-1583), archbishop of Canterbury, was born at Hensingham in the parish of St Bees, Cumberland, about 1519. He was educated at Cambridge, where he became fellow of Pembroke Hall in 1538, and president in 1549. In the following year he was appointed chaplain to Bishop Ridley, in August 1551 precentor of St Paul's, in November chaplain to Edward VI., and in July 1552 prebendary of Westminster. On the accession of Mary in 1553 he took refuge on the Continent, staying chiefly at Strasburg, where he acquired a competent knowledge of German, and occupied himself also in collecting the "writings and stories of the learned and pious sufferers in England,"—the result of his inquiries being afterwards communicated to John Foxe, and incorporated by him in his *Book of Martyrs*. Returning to England under the new regime in 1558, he assisted in the preparation of the new liturgy, and was also one of the eight Protestant divines chosen to hold public disputes with the popish prelates. In 1559 he was appointed to the mastership of Pembroke Hall, and in the same year he succeeded Bonner as bishop of London, in which capacity he, along with Archbishop Parker, shared in 1565 in the responsibility of suspending those of the London clergy who refused to submit to the Act of Uniformity, on which account an indignant mob of clergymen's wives appeared before his house at St Paul's, and were with difficulty persuaded by one of the suspended clergymen to go away quietly. In 1570 Grindal was appointed to the see of York, from which he was translated to Canterbury in February 1576. Having in the same year incurred the royal displeasure by refusing to suppress the meetings held among the clergy for "the exercise of prophesying," he was ultimately, in June 1577, by order of the Star Chamber confined to his house and sequestered for six months. As in November he refused to make a formal submission to the queen, his suspension was continued for several years; but though a petition for his restoration, which was drawn up by convocation in 1580, was not immediately granted, it would appear that in 1582 he had resumed, at least partially, the exercise of his ecclesiastical functions. About the end of this year the queen, on account of his blindness, requested him to retire on a pension, but the negotiations connected with his resignation were not completed till April 1583, and it was only after his death at Croydon, July 6th of the same year, that Whitgift, who had been nominated his successor, entered upon the see. Though

Grindal yielded to the peremptory orders of Elizabeth in regard to the clergy who refused to sign the Act of Uniformity, he seems on all other occasions, while conducting himself with great moderation and manifesting unvarying courtesy and an earnest desire to avoid every cause of offence, to have strenuously upheld the spiritual independence of his office. His aims were on the whole noble and unselfish, and he was zealous in his endeavours to reform the abuses of his predecessor, to improve the moral and intellectual status of the clergy, and as far as possible to conciliate and reclaim the Puritans. He was sincerely attached to Protestantism, and laid much stress on the function of preaching, a "gift" in which he himself is said to have excelled. Grindal is alluded to (as Algrind) in the seventh "æglogue" of Spenser's *Shepheards Calender*.

His literary remains, which are unimportant, have been published by the Parker Society, with a biographical notice by the Rev. Wm. Nicholson, 1843. See also Strype's *Life of Grindal*, London, 1710, Oxford, 1821; *A Brief and True Account of Edmund Grindal*, 1710; *M*[illegible], &c., supposed by some to have been written by Sacheverell, 1710; Fuller's *Worthies*; and Hook's *Lives of the Archbishops of Canterbury*, vol. viii.

GRINDSTONE. Sandstones which possess the property of abrading steel and other hard substances are extensively used in arts and manufactures under the name of grindstones. In its simplest form a grindstone consists of a stone disc, more or less circular, mounted on a horizontal iron spindle carried on the tops of two wooden posts fixed in the ground. A winch handle, or occasionally a rude crank with treadle, provides the means of giving a slow rotation to the stone, against the cylindrical face of which the steel or other substance which is to be ground is held. Such grindstones—possessing neither truth of figure nor the means of obtaining it—are unsuitable for any but the roughest purposes; and although by mounting them in a frame to which a rest can be attached it is possible to keep them true and tolerably efficient, they are always slow in their action.

Cutlers employ grindstones which are roughly mounted but which act well, being driven at a much higher speed by a strap from a large wheel or pulley, and they carefully preserve the truth of the cylindrical face. And in many manufacturing processes the surface speed of the face is still further increased by employing very large stones, and giving them the greatest number of revolutions per minute that is compatible with safety,—this limit even being sometimes exceeded, when the centrifugal force overcomes the rather slight cohesive strength of the stones, and breaks them up into fragments which fly to great distances with disastrous results. Sandstone suitable for grindstones of various degrees of hardness and fineness is found in the coal districts of the north of England, and also in those of the midland counties. A favourite stone for tool-grinding at a low speed is quarried at Bilston in Staffordshire. The neighbourhood of Sheffield also affords some useful qualities of grindstone.

Artificial grindstones closely resembling the natural stones, but of perfectly uniform texture, which the natural ones frequently are not, were made a few years ago by Mr Ransome's ingenious process. Their manufacture has been discontinued, but artificial grindstones of another kind, made with emery instead of sand, are now effecting a complete revolution in the art of the machinist. By means of these emery grinders, to which great variety of size and form can be given so as to suit the particular purposes for which they are intended, the operation of trueing up metal surfaces by hand, whether they are large or small, curved or flat, can in very many kinds of work be entirely dispensed with,—the results being superior in truth of figure, uniform in all cases, and obtained in a mere fraction of the time which the most skilful workman would require. The extensive use of these grinders in America (where the importance of labour-saving machines is properly appreciated) renders it certain that the system will gradually make its way also in England, and that hand filing will thus to a large extent be superseded,—files being costly instruments in themselves, and many times more costly in their use, owing to the skill which they demand on the part of the workman who handles them.

Artificial wheels made with emery are by no means a new invention. In India and China they have been used for centuries; but, being made with lac and similar fusible materials, such wheels are not capable of being run at the high rate of speed which is a first essential to their efficiency. Others, however, which were not liable to these objections were made and patented in England more than thirty years ago; and it is surprising that these have not been more generally used. The chief advantage of those now made,—some of which are manufactured in the United States, some on the continent of Europe, and some in England,—is that they can be obtained of large size—up to about 3 feet in diameter—and that they are strong enough to be driven at a very high speed without breaking. At a surface speed of 5000 or 6000 feet per minute these wheels cut tempered steel readily, when used either wet or dry, and by their means it can be shaped, if necessary, in its hardest condition, with a facility previously unattainable. As in the case of common grindstones, truth of form is most important to their efficient working, and it is therefore desirable that the work under treatment should be held perfectly rigid, by means of some form of sliding rest, or otherwise. When so used the wear of the emery wheel, which is exceedingly slow, keeps it constantly true without attention. If from any cause this truth of figure be lost, or if it be desired to alter the form of the face, recourse must be had to turning it up with a diamond, nothing else in nature being sufficiently hard for the purpose.

GRINGOIRE, or GRINGON, PIERRE (*c.* 1480–1544), was the last of the mediæval poets. He lived to see the old methods which he was taught to believe unchangeable entirely superseded. He was born about the time when King René, the last of the princely *trouvères*, died; he finished his career when Marot had already introduced a new and natural *genre* which he could not understand, and when Ronsard and Baif were beginning those studies which would interpose a barrier between the old language and the new. It was not to be expected that he should ever fall in with the new movements, or that he should understand the enormous value of the changes which were destined to consign his own works to oblivion.

The place of his birth is uncertain. Perhaps it was Lorraine, perhaps Normandy. His real name was Gringon, which he changed to Gringoire, for the poetical reason that it sounded better. His early history is almost entirely unknown; at the age of nineteen or twenty he produced his first poem, *Le Chateau de Labour*, in which he is supposed to have narrated his own experiences. Most probably he did. René, Charles of Orleans, Froissart, Deschamps, all the poets whose works he would study, began with a poetical exposition of their own experiences. There are, in Gringoire's poem, the personages common to all mediæval allegories, *Raison*, *Bonne Volonté*, *Talent de beau faire*, for friends, and *Souci*, *Tromperie*, and the rest, for enemies. Finding that the trade in allegorical poems was ruined for want of demand, and discovering an opening in the direction of mysteries, Gringoire began to produce those dramas, and joined the "Enfants de Sans Souci." The fraternity advanced him to the dignity of "Mère Sotte," and afterwards to the highest honour of the guild, that of "Prince des Sots." For twenty years Gringoire seems to have been at the head of this illustrious *confrérie*, writing for them farces, *soties*, and satires. In this capacity of dramatist he exercised an extraordinary influence. At no time was the stage, rude and coarse as it was, more popular as a true exponent of the popular mind. Gringoire's success lay in the fact that he followed, but did not attempt to lead; on his stage the people saw exhibited their passions, their judgments of the moment, their jealousies, their hatreds, and their ambitions. Brotherhoods of the kind existed all over France. In Paris there were the "Enfans Sans Souci," the "Basochiens," the "Confrerie de la Passion," and the "Souverain Empire de Galilée"; at Dijon there were the "Mere Folle" and her family; in Flanders the "Société des Arbaletriers" played comedies; at Rouen the "Cornards" or "Conards" yielded to none in vigour and fearlessness of satire. There is every reason, therefore, to believe that Gringoire enjoyed considerable distinction as the leading spirit among the satirists of the capital. He adopted for his device, *Tout par Raison, Raison par Tout, Par tout Raison*. He has been called the "Aristophanes des Halles." In one respect at least he resembles Aristophanes. He is serious in his merriment; there is purpose behind his extravagancies. Among his principal works are *Les Folles Enterprises* and *Les Abus du Monde*,—poems in which everything under the sun is criticized,—certain political pieces, such as *La Chasse du Cerf des Cerfs* (*Serf des Serfs, i.e., servus servorum*), under which title that of the pope is thinly veiled, and *La Mère Sotte*, with all her literary offspring. During the last twenty years of a long life he became orthodox, and contributed the *Blason des Hereticques* to orthodox literature. It was during this period also that he wrote the work by which he is best known, the *Mystère de la Vie de Saint Louis*, of which an analysis may be found in M. Leroy's *Etudes sur les Mystères*. After more than 300 years of oblivion this poet has been republished, not so much on account of his own merits as because of the position which he occupies in the history of dramatic literature.

GRIQUALAND WEST, a province in South Africa, comprising the territory formerly belonging to the western division of the Griqua people, which was annexed to the British empire October 27, 1871. The extent of the province is 17,800 square miles. It is bounded on the S. by the Orange River (which separates it from the Cape Colony), on the N. and N.E. by territory occupied by the Bechuana tribes and the Transvaal settlement, and on the E. by the Orange Free State. The general elevation of the country is about 3000 feet above sea-level; its characteristic features are undulating grassy plains, alternating with low ranges of rocky hills and sandy downs. The Vaal river flows through the principal districts, receiving in its course the Hart River and Modder River, with its affluent the Riet River, before its junction with the Orange River. A portion of the territory is adapted for sheep-farming, and the river basins contain fertile lands suitable for agricultural purposes. But the great wealth of the country is in its diamond mines. Since the first discovery of diamonds, in 1867, the total value of the gems exported from the province up to the close of the year 1878 is estimated at £20,000,000. Digging operations were at first confined to the alluvial deposits on the banks of the Vaal River, but in 1871 mines were opened in the locality known as the "dry diggings," which have since received the names of Kimberley, De Beer's, Du Toit's Pan, and Bultfontein, all situated within a radius of a few miles. The area of the diamond-producing ground at each of these places is distinctly defined. At Kimberley the mine covers only 9 acres, at De Beer's 14 acres, at Du Toit's Pan 41 acres, and at Bultfontein 22 acres. These circular areas appear to be "throats" or "pipes" through which the volcanic and serpentinous matter containing the sparkling gems have been erupted; the surrounding rock consists of sandstones and shales entirely barren of diamonds. Kimberley, the chief centre of the mining industry, is the capital of the province and the seat of government. There is a resident lieutenant-governor or administrator, who is assisted by an executive council, and a legislative council composed of members partly elective and partly nominated by the crown. There is also a high court of justice presided over by a resident recorder. The other towns are Du Toit's Pan (including Bultfontein), Barkly, and Griqua Town. The villages and native locations are Hebron, Likatlong, Boetsap, Campbell, and Douglas. Among the river diggings or encampments are Pniel, Waldek's Plant, Sifonell, and Setlacomie's. A census taken in 1877 showed the total population of Griqualand West at that time to be 45,277, of whom 12,347 were Europeans.

GRISONS (German, *Graubünden*) is the largest and easternmost of the Swiss cantons. It is 80 miles in length from E.N.E. to W.S.W., and 45 in breadth, and has an area of 2963 square miles. On the N.E. and E. it abuts against the little principality of Liechtenstein, and the Austrian provinces of Tyrol and Vorarlberg, on the S. on the Italian provinces of Val Tellina and Como, and on the W. and N. on the Swiss cantons of Ticino, Uri, Glarus, and St Gall.

The whole canton is mountainous, and, with the exception of the Rhine valley below Reichenau and the Italian valleys, which still form part of it, has a severe alpine climate and vegetation. One-tenth of the surface is covered by glaciers. The five principal glacier groups are those of the Todi, N.; the Medelser Gebirge and the Rheinwald or Adula Gebirge, containing the chief source of the Rhine, S.W.; the Bernina group, the largest and loftiest, S.E.; and the Silvretta Gebirge, E. The principal valleys are the Vorder and Hinter Rheinthäler, with their side-valleys the Valserthal, Averserthal, Oberhalbstein, and Prätigau, forming together the upper basin of the Rhine. Besides these, the canton includes the long narrow trough of the upper Inn, and the Italian valleys of Misocco, Bregaglia, and Poschiavo, whose streams join the Ticino or the Adda. The high average elevation of the country, with the absence of any large lake, renders the scenery more severe than that of central Switzerland, and the mountain summits less imposing. The most fertile valleys are the Prätigau and Rheinthal below Ilanz. The lower chains are rent by many great gorges. The Via Mala, the Rofla, and the Schyn are the best known, but those of the Zage, the Averserthal, Medelserthal, and Valserthal are almost equal to them in grandeur. In the Rheinthal below Chur the vine flourishes and good wine is produced, and the Cisalpine territory bears the usual products of the southern slope of the Alps, maize and chestnuts. At Poschiavo tobacco is cultivated to some extent. The inner valleys are the highest of Central Europe, containing several villages at an elevation of about 6000 feet (St Moritz, Engadine, 6080; Bivio, Oberhalbstein, 5827; Cresta, in the Averserthal, 6394; snow lies there for six or seven months in the year, and corn will not ripen. The hay harvest is the great agricultural event of the year, and is so large that great numbers of Italian labourers are annually employed in it. The forests and pasturages are the chief source of wealth. The lower Alps maintain a fine breed of cows; the upper are let to Bergamasque shepherds, who drive yearly immense flocks of sheep from North Italy for the summer pasturage. There are many mineral springs in the country; the most frequented are at Alveneu, Fideris, Le Prese, and San Bernardino, besides those in the Engadine (see ENGADINE).

The Grisons is sparely peopled. The population in 1870 amounted to 91,782,—39,843 Protestants and 51,877

Catholics. 36,000 speak German and 12,000 Italian. The remainder use the Romansch or the Ladin dialect, probably corrupt descendants of the old "lingua rustica" of the Roman empire. The former is dying out in some districts on the Tyrolese frontier, and German is now everywhere taught in the schools. A large portion of the population find occupation and profit in the summer in attending to the wants of the numerous visitors attracted by the scenery or the mineral waters. There is a considerable transport trade with Italy, particularly in Val Tellina wines. Many of the young men seek their fortunes abroad as confectioners and coffee-house keepers.

Since Roman times the passes of the Grisons have been among the most frequented routes across the Alps. The Julier and Bernina, the Septimer, Splugen, and Lukmanier, were the most used in the Middle Ages. In 1818-23 the great road of the San Bernardino was made, and it was soon rivalled by the Splugen. The internal communications of the canton have been greatly developed in the last twenty years. The following are the principal carriage roads:—(1) the Ober Alp, Vorderrheinthal to Uri; (2) the Valserberg, Ilanz to Hinterrhein; (3) the Schyn, Julier, Albula, and Fluela Passes, connecting the Rhine valley and Davos district with the Engadine; (4) the Maloya and Bernina Passes, connecting the Upper Engadine with Chiavenna and Val Tellina respectively; (5) the Ofen Pass and the road following the gorge of the Inn to Finstermuntz, leading into Tyrol.

Two districts, the Upper Engadine and Davos, have lately acquired European fame as health resorts. Davos now receives every winter over 1000 consumptive patients. Statistics show that diseases of the lungs are very rare in high mountain districts, and local doctors observed that inhabitants who had contracted them in the plain recovered speedily on their return home. Davos is singularly well situated for a sanatarium for these diseases. The climate, owing to its distance from the warm currents rising from the Italian plain, is, though severe, singularly dry and equable in winter, and the valley is open and sunny. Many good hotels offer every comfort to invalids.

History.—The Rhæti, the original inhabitants of the region now known as Graubünden, who were conquered under Augustus by the Romans, are reputed to have been an Etruscan race who had emigrated thither 550 years B.C. The Romans established numerous roads through the country, and held it in subjection until the downfall of their empire. In 496 A.D. Theodoric the Great settled some Alemanni in Rhætia. In 807 the district was incorporated by Charles the Great in his empire, and placed under a temporal count. In the middle of the 11th century, in the confusion consequent on the fall of the duchy of Alemannia, the bishop of Chur regained part of the temporal authority some of his predecessors had already held before 807, and in the early Middle Ages he appears as the most powerful among the petty rulers who disputed among themselves the right of oppressing the peasantry. Towards the end of the 14th century, the bishop of Chur supported the league formed by the neighbouring districts to resist the encroachment of the lay nobles. This was known as the Gotteshausbund, and had Chur (see COIRE) as its chief town. In 1424 the Oberbund, sometimes called, perhaps from the grey coats of the delegates who assembled at Trons to confirm it, the Grauebund, was formed with the aid of the abbot of Dissentis and a party among the nobles in the Vorder Rheinthal. In 1436 the districts bordering on Tyrol, which had been vassals of the counts of Toggenburg (till the extinction of the line in that year), concluded, in imitation of their neighbours, a league known as the Zehngerichtenbund, with Davos for its centre. In 1450 the Zehngerichte formed an alliance with the Gotteshausbund, in 1471 with the Grauebund; but of the so-called "perpetual alliance" at Vazerol near Tiefenkasten there exists no authentic evidence in the oldest chronicles. It is certain, however, that several diets were held at Vazerol. Unhappily for the whole Grisons, nearly all the possessions of the Toggenburg family had fallen by 1489 to the house of Austria, to which an excuse was thus given for interference in the country. In 1497 the Grauebund and in 1498 the Gotteshausbund entered into alliance with the seven Swiss cantons. In 1499 the contest with Austria broke out. The memorable victory of the Malserheide or Calven, in which the imperial troops were defeated with a loss of 5000 men, coupled with other disasters to his arms in North Switzerland weakened the authority of Maximilian, but the rights of Austria in the Zehngerichtenbund were only extinguished by purchase in 1652. In 1512 the Grisons took advantage of the war in Italy to lay hands on Val Tellina, Bormio, Chiavenna, and Val Misocco.

These acquisitions attracted, a hundred years later, the cupidity of the Spanish governor of Milan. The Grisons, torn between the French and the Spanish, the Reformed and Catholic parties, offered a favourable field for his intrigues. In 1620 the Protestants of Val Tellina were cruelly massacred, the Spaniards gained the district, and an Austrian force occupied the greater part of the Grisons. The Austrians were expelled in 1635 by the French, but the Grisons did not recover their full authority over their Italian possessions till 1639. They finally lost them when Napoleon annexed these districts to his Cisalpine republic, a measure confirmed by the congress of Vienna.

The obscure quarrels of the Planta and De Salis factions, dating from the 17th century, were put an end to by the Napoleonic wars and the appearance of great armies—French, Austrian, and Russian—upon the mountains. The incursion of the French was marked by the wanton destruction of the great convent of Dissentis, in which perished the chronicle of Dissentis, dating from the 7th century, and many of the MSS. of Placidus a Spescha, one of the first systematic explorers of his native Alps. In 1803 the Grisons, by virtue of Napoleon's act of mediation, became a member of the Swiss Confederation, retaining its internal government. This consists of a great council elected by universal suffrage, and meeting every year. Three citizens, elected yearly, form the executive government. A committee of 12 members assist them in weighty matters and in preparing bills for the chamber. Large powers of self-government are left to the separate communities. The constitution was last completely revised in 1853, but a further reform in an extreme democratic sense is now (1879) under debate.

For a list of ancient works on the Graubünden, see Roder & Tscharner's *Graubunden*, Bern, 1838, and Georg of Basel's *Bibliotheca Alpina Tertia*, 1878. See also Theobald's *Bundner Oberland* and *Naturbilder aus den Rhatischen Alpen*; Berlepsch's *Graubunden*, Leipsic, 1858; Leonhardi's *Das Poschiavino Thal*, Leipsic, 1859; Lechner *Das Thal Bergell*, Leipsic, 1865; Coxe's *Travels in Switzerland*, 1780; Mrs H. Freshfield's *Summer Tour in the Grisons*, 1862; Conradin von Moor's *Geschichte von Currätien*, Chur, 1870-74; P. C. Planta's *Das alte Rätien*, Berlin, 1872; *Davos by one who knows it*, 1878; *Fortnightly Review*, July 1878, Nov. 1879; Ball's *Alpine Guide*; and articles ALPS and ENGADINE. (D. W. F.)

GRIVEGNÉE, a town of Belgium in the arrondissement and province of Liége, is situated on the Ourthe about a mile and a half S.W. of Liége. There are coal-mines in the neighbourhood, and the town posesses iron foundries and manufactories of brass-wire, nails, and iron boats. The population is about 6000.

GROCYN, WILLIAM, an English scholar of the 15th century, was born at Bristol about 1442. Designed by his parents for the church, he was sent to Winchester College, and there he remained till his twenty-second year, when he was elected to a scholarship at New College, Oxford. In 1467 he became a fellow, and though in 1479 he accepted the rectory of Newton Longville in Buckinghamshire, he continued to reside in the university city. Having been chosen reader in divinity in Magdalen College in 1483, it fell to his lot to maintain a disputation with John Taylor, professor of divinity, in presence of King Richard III., and so well did he carry himself in the matter that the king sent him a buck and five marks. About 1488 Grocyn left England for Italy, and before his return in 1492 he had visited Florence, Rome, and Padua, and studied Greek and Latin under Demetrius Chalchondyles and Politian. As lecturer in Exeter College he found an opportunity of indoctrinating his countrymen in the new learning, and had the honour of teaching Greek not only to Sir Thomas More but to Erasmus himself, who was indebted to him also for an introduction to Archbishop Warham. When, some time afterwards, Grocyn removed to London, he was chosen by Dean Colet to deliver lectures in St Paul's; and in connexion with this engagement he gave a singular proof of his honesty. Having at first denounced all who impugned the authenticity of the *Hierarchia Ecclesiastica* ascribed to Dionysius the Areopagite, he was led to modify his views as he advanced in his investigation of the subject, and at length openly declared that he had been completely mistaken. About this time he was evidently in straitened circumstances, and though in 1506 he was appointed on Archbishop Warham's recommendation master or warden of All Hallow's College at Maidstone in Kent, we find him still obliged to borrow from his friends, and even to pledge his plate as a security. He died probably in 1519, and was buried in the collegiate church at Maidstone. With the exception of a few lines of Latin verse, and a letter to Aldus Manutius at the head of Linacre's translation of Proclus's *Sphæra* (Venice, 1499), Grocyn has left no literary proof of his scholarship or abilities. He was a great admirer of Aristotle, but his proposal to execute a translation of the philosopher in company with Linacre and Latimer was never carried out. By Erasmus he has been described as "vir severissimæ castissimæ vitæ, ecclesiasticarum constitutionum observantissimus pene usque ad superstitionem, scholasticæ theologiæ ad unguem doctus ac natura etiam acerrimi judicii, demum in omni disciplinarum genere exacte versatus" (*Declarationes ad Censuras Facultatis Theologiæ Parisianæ*, 1522).

See John Noble Johnson, *Life of Thomas Linacre*, London, 1835; Wood's *Athenæ Oxonienses*; Cunningham, *Lives of Eminent Englishmen*, vol. ii., 1835; Knight, *Life of Erasmus*.

GRODNO, a western province or government of Russia in Europe, lying between 52° and 54° N. lat., 23° and 26° E. long., and bounded N. by Vilna, E. by Minsk, S. by Volhynia, and W. by the former kingdom of Poland; area 14,961 square miles. The country is a wide plain, in some parts very swampy and covered with large pine forests. Of these that of Bieloviecza in the district of Prushana, comprising a circuit of over 100 miles, deserves notice, for here bisons are preserved. The navigable rivers are the Niemen, Bug, Narev, and Bobra. There are also several canals, among which those of Augustow and Oginsky are the most important. The soil, being chiefly alluvial deposit intermixed with sand, is favourable for agriculture and the rearing of cattle and bees. The atmosphere is damp and misty, and the climate in winter is cold. Large quantities of rye, barley, oats, hops, hemp, and flax are raised, but the amount of fruit and vegetables grown is small. The mineral products are insignificant. The manufactures consist of woollen cloths, hats, leather, paper, and spirits; there is also a good export trade in grain, wool, cattle, and timber. Some forty fairs are held annually in the province. Grodno is divided into nine districts, viz., Grodno, Brest, Bielostock, Bielsk, Volkovysk, Kobryn, Prushana, Slonim, and Sokolka. The administration of the whole province is in the hands of a governor appointed by the crown. In 1870 the population was 1,008,521, comprising Lithuanians, Russians, Poles, Tartars, and a few German colonists.

GRODNO, capital of the province of the same name, stands on the right bank of the Niemen in 53° 40′ N. lat., 23° 50′ E. long., and is connected by railway with St Petersburg, Moscow, and Warsaw. It is the seat of the provincial government, and contains eight Roman Catholic, a Greek Eastern and two United Greek Catholic churches, a Lutheran chapel, and two Jewish synagogues. The Government office is a splendid edifice. There are two fine palaces erected respectively by Stephen Batory, who died here in 1586, and Augustus III., kings of Poland. Among the other buildings are a public library, a school of medicine, a gymnasium, and several seminaries. The inhabitants (24,7[illegible]) are engaged in the manufacture of woollens, silks, hats, paper, and the preparation of wax. Three fairs are held annually. Grodno was built in the 12th century, and at the commencement of the 13th was annexed to Poland. The Polish diet held there in 1793 ratified the second partition of Poland. Two years later Stanislaus Augustus, the last king, signed his abdication there.

GROEN VAN PRINSTERER, WILHELM (1801-1876), Dutch statesman, historian, and publicist, was born at Voorburg, on August 21, 1801, received his grammar school education at the Hague, and studied law, philosophy, and history at the university of Leyden. At the age of twenty-five he published a volume of miscellaneous essays (*Verspreide Geschriften*, 1826), and in 1827 he was appointed private secretary to King William I. From this post he retired in 1833, in order that he might devote himself with less interruption to the historical researches which resulted in the gradual publication of his *Archives ou Correspondance inédite de la Maison d'Orange-Nassau*, in fifteen volumes (Leyden, 1835–64). An ardent conservative on all the ecclesiastical and political questions of the day, he entered the chamber of representatives in 1840, and took part with both tongue and pen in all the more important discussions of the years that followed, especially in those of 1848 and 1849. Between 1849 and 1865 he frequently sat in the second chamber, and from 1850 to 1855 the anti-liberal newspaper *Nederlander* was managed by him. The mortification which European events in 1864 and 1866 had caused him found expression in the occasional writings entitled *La Prusse et les Pays-Bas*, *A mes amis à Berlin*, and *L'Empire Prussien et L'Apocalypse* (1867). Shortly afterwards he withdrew entirely from public affairs, but continued his literary pursuits, his latest production *Maurice et Barnevelt*, an able vindication of the Calvinistic prince as against the Arminian statesman, having been completed (1875) only a short time before his death, which occurred 19th May 1876. Among other works of this author may be mentioned a *Handboek der Geschiedenis van het Vaterland* (1835), and an essay entitled *Ongeloof en Revolutie* (1847); but his sole claim to European celebrity rests upon the *Archives*, with their able if one-sided *Prolegomena*. The letters and documents comprised in the series are of extraordinary interest and value for the whole of the important period which elapsed between the outbreak of the revolution in the Netherlands and the establishment of the commercial oligarchy upon the death of William II.

GRONINGEN, a town of the Netherlands, in the province of the same name, is situated on the Hunse at the influx of the Aa, 45½ miles in an eastward direction from Harlingen. The central and more ancient part of the town is still surrounded by the old ditch, and communication is maintained with the outer portions by eighteen bridges. In the centre of the old town lies a group of open places, of which the greatest, the Breedemarkt, is one of the most spacious in the Netherlands. Five of the principal streets bear the name of as many ancient families—the Beterings, the Ebbings, the Gelkings, the Huddings, and the Felkings. Among the public buildings of Groningen the town house (Radhuis) is one of the finest. It was built between 1793 and 1810 according to the plans of Jacob Otten Husley, and was extended in 1873. The administrative offices of the province of Groningen also occupy a fine building, which received a splendid front in 1870–1871. The provincial court of justice, transformed in the middle of the 18th century; the corn exchange, dating from 1825; and the weigh-house, completed in 1874; the so called *Ommelanderhuis*, or house formerly devoted to the administration of the surrounding district; the civil and military prison; and the arsenal, are also all worthy of mention. There are twelve churches in Groningen, including two for the Roman Catholics, and five for the Reformed Church of the Netherlands, as well as a Jewish synagogue. St Martin's, the Aa Church, and the New Church (all Reformed) are the principal. Of these the first is a Gothic building founded in 1253, and the last dates from the 17th century. The university of Groningen was founded in 1614, and its buildings were erected in 1847–1850. According to the *Annales Academici* (Leyden, 1877), the number of the students in 1874 was only 173, the strongest faculty being that of the physical sciences with 57. It has a library, an observatory, botanical gardens, an antiquarian museum, and a hospital among its auxiliary establishments. A fine deaf and dumb institution, founded by Henri Daniel Guyet, a gymnasium, a normal college, a school of navigation, a school of design, and a musical school are among the secondary educational establishments. A society *pro excolendo jure patrio* has been in existence since 1761; an academy of fine arts was formed in 1830 by the incorporation of two older societies of similar character; and the same year saw the formal establishment of the society for the advancement of natural science, which may be traced back to the association started by Van Swinderen in 1801. Groningen maintains a considerable trade, and engages in a variety of industries. It manufactures salt, beer, vinegar, soap, earthenware, and ropes, weaves cotton and woollen stuffs, spins flax, makes brushes, furniture, mirrors, organs, and pianos, and has numerous goldsmiths and silversmiths. In 1840 the town and the suburbs comprised a population of 31,782. In 1870 the number of people in the commune, including 1248 on shipboard, was 37,894, and four years later it had increased to 39,284.

Mention is made of the Villa Cruoninga in a deed of gift from Henry III to the church of Utrecht in 1040. In 1110 the town was surrounded with walls, but the bishop of Utrecht caused them to be destroyed in 1112, and it was not till 1255 that the defences began to be restored. The compass of the town, which at this time was about 13,000 feet, received considerable extension in 1469, when the walls were strengthened with six massive towers, and a ditch was dug. A further increase of defensive capabilities was effected in the course of the Gueldres war of 1514–36, and again under William Louis of Nassau between 1608 and 1624. The early history of Groningen consists mainly of struggles with the bishops of Utrecht. In the course of the 13th century there is evidence that the commercial activity of its population was finding outlet in various directions, and in the 14th it attained to no small political influence as the chief city of Friesland. Maximilian I. assigned the seigniory to Albert of Saxony, but the citizens preferred to accept the protection of the bishop of Utrecht; and when Albert's son George attempted in 1505 to seize the town, they recognized the lordship of Edzart of East Frisia. On George's renewal of hostilities they transferred their allegiance to Duke Charles of Guelderland, and his position was sanctioned in 1515 by the emperor Charles V. In the course of the great wars of the 16th century the city had an eventful history, passing from hand to hand, and suffering all the miseries of siege and military occupation; but at length, in 1594, it was finally secured for the United Netherlands by Prince Maurice of Nassau. The dissensions between the citizens proper and the inhabitants of the "Ommelanden" continued, however, in spite of the decree of the states in 1597, which was intended to set them at rest. In 1672 the town was besieged by the bishop of Münster, but it was successfully defended, and in 1698 its fortifications were improved under Coehorn's direction. The French revolutionists planted their tree of liberty in the Great Market on February 14, 1795, and they continued in authority till 16th November 1814. The fortifications of the city were doomed to destruction by the law of 18th April 1874. Among the numerous men of mark who have been natives of Groningen it is enough to mention J. D. Bernoulli the mathematician, Surenhusius and Schultens the Orientalists, and Hemsterhuis the philologist.

See *Beschryving en Gedachten van Groningen uyt het Latyn vertaald*, door H. V. R., Leyden, 1724; *Kronyk van Groningen ende Ommelanden, tot op het Jaare* 1743, Groningen, 1743; E. J. D. Lorgion, *Geschiedkundige Beschrijving der Stad Groningen*, Groningen, 1852–57; *Album der Stad Groningen*, Groningen, 1860; Wynne, *Handel en Ontwikkeling van Stad en Provincie Groningen*, Groningen, 1865; Theodor Wenzelburger, in Ersch and Gruber's *Encyclopädie*, *sub voce*, 1872; Witkamp, *Aardrijkskundig Woordenboek*, 1877.

GRONOVIUS, or GRONOV, Jakob (1645–1716), one of the very great scholars of the 17th century, was born 20th October 1645 at Deventer, where his father, J. F. Gronovius (*q.v.*), was at that time professor of rhetoric and history. On the completion of his studies at Leyden, where he had early distinguished himself by his powers of intellectual acquisition, he in 1698 visited England, where he became acquainted with Pocock, Pearson, and Mery Casaubon, and where he devoted several months to the collation of rare manuscripts at Oxford and Cambridge. His edition of Polybius published at Leyden in 1670, in addition to his own and variorum notes, contained those which Casaubon on his deathbed had bequeathed to him. Declining an invitation to a chair at Deventer, he in 1671 visited France, and was brought into intimate relations with D'Herbelot, Thevenot, and other distinguished scholars; and after another brief interval at Leyden he in 1672 travelled in Spain, whence he passed into Italy. There he accepted from the grand duke of Tuscany a chair at the university of Pisa, which, however, he resigned at the end of two years. Having returned to Deventer by way of Germany, he had settled down with the purpose of working uninterruptedly at an edition of Livy, when in 1679 he was invited by the curators of the university of Leyden to occupy a professorial chair. Here, untempted by several pressing invitations to various foreign universities, he spent the remaining years of his life, in which the calmness which normally characterizes even the most ardent scholarly research was unfortunately too often broken by literary quarrels conducted on his part with excessive violence and scurrility. He died 21st October 1716.

The most celebrated as well as the most important of the works of J. Gronovius is the *Thesaurus Antiquitatum Græcarum* (Leyden, 1698–1702, in 13 vols. fol., and Venice 1732–1737, also in 13 vols. fol.) For this invaluable collection he adopted the plan traced out by Grævius in the *Thesaurus Antiquitatum Romanarum*. Gronovius published new editions of several authors commented on by his father, such as Seneca, Phædrus, and others; and he also edited Macrobius, Polybius, Tacitus, Cicero, Ammianus Marcellinus, Quintus Curtius, Suetonius, Arrian, Minutius Felix, Herodotus, Celsus, and some ancient geographers; the poem of Manetho, on the stars; the *Dactyliotheca* of Gorlæus; the *Lexicon* of Harpocration, &c. The other productions of Gronovius consist of theses, discourses, and diatribes, of which a list will be found in the *Dictionnaire* of Chauffepié.

GRONOVIUS, or GRONOV, Johann Friedrich (1613–1671), scholar and critic, was born at Hamburg, 20th September 1613. He went through his early studies with great distinction at Bremen, and afterwards attended the universities of Leipsic, Jena, and Altorf, whence he extended his travels into France and Italy. In 1643 he was appointed professor of rhetoric and history at Deventer, and in 1658 he succeeded Daniel Heinsius in the Greek chair at Leyden, where he died on the 28th of December 1671.

Besides editing, with notes, Statius, Plautus, Livy, Pliny, Tacitus, Aulus Gellius, and Seneca's tragedies, he was the author of numerous works which have been exhaustively catalogued by Chauffepié and others. They include *De Sestertiis, sive subsecivorum Pecuniæ veteris Græcæ et Romanæ Libri IV* (1643), and notes upon Seneca, Phædrus, &c., which were subsequently utilized by his son Jacobus Gronovius in his editions of those authors.

GROOT, Gerhard (1340–1384), in Latin *Gerardus Magnus*, founder of the society of "Brethren of the Common Life," was born in October, 1340, at Deventer, where his father held a good civic position. Other forms of the family name are Groote, Groet, and Groete. At the close of his school education, received partly at Deventer and partly at Aix-la-Chapelle and Cologne, Gerhard ("Gerrit" or "Geert") in his fifteenth year entered the university of Paris, where he became firmly attached to the nominalism then in vogue, and where he made distinguished progress in almost all the branches of learning then cultivated,—canon law, medicine, astrology, and even magic being added to the theology and philosophy of the schoolmen. Shortly after his graduation in 1358, he returned to his father's house at Deventer, where, however, his stay was comparatively brief. We next hear of him as learning and teaching in Cologne; according to one account he studied also at Prague; and in 1366 he visited, on public business it is presumed, the papal court at Avignon. About this time he was appointed to a couple of canonries at Utrecht and Aix-la-Chapelle respectively, and the life of the brilliant young scholar was rapidly becoming luxurious, secular, and selfish, when a great spiritual change passed over him which resulted in a final renunciation of every worldly enjoyment. This conversion, which took place in 1374, appears to have been due partly to the effects of a dangerous illness, and partly to the influence of the learned and pious prior of the Carthusian monastery at Munnikhuizen near Arnheim, who had seriously remonstrated with him on the vanity of his life. During the next five years he devoted a considerable portion of his time to repeated and prolonged visits to the monastery of the Augustinian canons regular at Viridis Vallis (Groenendael near Brussels), whose prior, Johann Ruysbroeck, a man of deep though somewhat mystical piety and of considerable literary power, could not fail to impress those who came in contact with him, and many of whose special views are unmistakably reproduced in the writings of Groot and his "fratres devoti." Between 1374 and 1379 Gerhard had also spent some three years in all at Munnikhuizen in study and prayer; and in the course of the last-mentioned year he left the privacy of the cloister, and having received ordination as a deacon, became a missionary preacher within the diocese of Utrecht. The success which followed his labours, not only in the town of Utrecht itself, but also in Zwolle, Kampen, Leyden, Delft, Gouda, Amsterdam, and many other places, was immense; according to Thomas a Kempis, the people left their business and their meals to hear his sermons, so that the churches could not hold the crowds that flocked wherever he came. The impartiality of the censures, however, which he directed, not only against the prevailing sins of the laity, but also against the heresy, simony, avarice, and impurity of the secular and regular clergy, soon provoked the uncompromising hostility of the entire body of the latter; and accusations of heterodoxy speedily began to be brought against him. It was in vain that Groot emitted a *Publica Protestatio*, in which he declared that Jesus Christ was the great subject of his discourses, that in all of them he believed himself to be in harmony with the Catholic doctrine, and that he willingly subjected them to the candid judgment of the Roman Church. By a skilfully framed episcopal edict of 1383, which excluded from the pulpit all who had not received priest's orders, his public preaching was brought abruptly to an end; an appeal to Urban VI. was made in vain. Compelled thus to search for some other field of usefulness, Groot, in conjunction with his friend Florentius, a canon of Utrecht, began to superintend the labours of certain young men who employed themselves in transcribing manuscripts of church fathers and other authors; from time to time as they met to receive payment for their work, he sought to edify them with religious exhortation. Ultimately the idea suggested itself that the little band might throw their earnings into a common fund and live together according to a fixed rule. The house of Florentius forthwith became a cloister of "fratres vitæ communis," who were speedily joined by many new members, both clerical and lay, practised in a considerable variety of handicrafts; the general rule of the Augustinian order was adopted; it was also agreed that their daily bread should be shared in common, and that it should be earned, not begged. Groot's private estate sufficed for the establishment on like principles of a sisterhood who supported themselves by spinning, weaving, and needlework. After a comparatively brief life of singular energy, patience, and self-denial, Groot fell a victim to the plague at Deventer on the 20th of August 1384. Within fifty years of his death the "Brethren of the Common Life," also called "Fratres bonæ voluntatis" or "Fratres Collationarii," numbered seventeen collegiate churches in the Netherlands, and contributed somewhat extensively to theological literature. Thomas a Kempis, who wrote a *Vita Gerhardi Magni*, was trained under Gerhard himself at Deventer. The order disappeared at the time of the Reformation.

For a very clear and full account of the life of Groot, with an analytic and exhaustive catalogue of his extant works, reference may be made to the article on the "Brethren of the Common Life," by Hirsche, in Herzog's *Real Encyklopädie*, ii. 679-696 (1878). The principal original authority is the work of Thomas a Kempis already referred to. See also Ullmann's *Reformers before the Reformation*, whose somewhat *ex parte* exposition of Groot's theological views, however, must be taken with reservations.

GROS, Antoine Jean, Baron (1771-1835), the pupil of David and the forerunner of Géricault, occupies a peculiar position between the classic and romantic schools which divided opinion at the beginning of the present century. He was born at Paris in 1771. His father, who was a miniature painter, began seriously to teach him to draw at the early age of six, and showed himself from the first an exacting master. Towards the close of 1785 Gros, by his own choice, entered the studio of David, which he frequented assiduously, continuing at the same time to follow the classes of the Collége Mazarin. The death of his father, whose circumstances had been embarrassed by the Revolution, threw Gros, in 1791, upon his own resources. He now devoted himself wholly to his profession, and competed in 1792 for the *grand prix*, but unsuccessfully. About this time he was, however, on the recommendation of the École des Beaux Arts, employed on the execution of portraits of the members of the Convention, and when—disturbed by the development of the Revolution—Gros in 1793 left France for Italy, he supported himself at Genoa by the same means, producing a great quantity of miniatures and *fixés*. He visited Florence, but returning to Genoa made the acquaintance of Josephine, and followed her to Milan, where he was well received by her husband. On November 15, 1796, Gros was present with the army near Arcola when Bonaparte planted the tricolor on the bridge. Gros seized on this incident, and showed by his treatment of it that he had found his vocation. Bonaparte at once gave him the post of "inspecteur aux revues," which enabled him to follow the army, and in 1797 nominated him on the commission charged to select the spoils which should enrich the Louvre. In 1799, having escaped from the besieged city of Genoa, Gros made his way to Paris, and in the beginning of 1801 took up his quarters in the Capucins. His "esquisse" (Musée de Nantes) of the Battle of Nazareth gained the prize offered in 1802 by the consuls, but was not carried out, owing it is said to the jealousy of Junot felt by Napoleon; but he indemnified Gros by commissioning him to paint his own visit to the pest-house of Jaffa. Les Pestiférés de Jaffa (Louvre) was followed by the Battle of Aboukir 1806 (Versailles), and the Battle of Eylau, 1808 (Louvre). These three subjects—the popular leader facing the pestilence unmoved, challenging the splendid instant of victory, heart-sick with the bitter cost of a hard-won field—gave to Gros his chief titles to fame. As long as the military element remained bound up with French national life, Gros received from it a fresh and energetic inspiration which carried him to the very heart of the events which he depicted; but as the army and its general separated from the people, Gros, called on to illustrate episodes representative only of the fulfilment of personal ambition, ceased to find the nourishment necessary to his genius, and the defect of his artistic position became evident. Trained in the sect of the Classicists, he was shackled by their rules, even when—by his naturalistic treatment of types, and appeal to picturesque effect in colour and tone—he seemed to run counter to them. In 1810 his Madrid and Napoleon at the Pyramids (Versailles) show that his star had deserted him. His Francis I. and Charles V., 1812 (Louvre), had considerable success; but the decoration of the dome of St Geneviève (begun in 1811 and completed in 1824) is the only work of Gros's later years which shows his early force and vigour, as well as his skill. The Departure of Louis XVIII. (Versailles), the Embarkation of Madame d'Angoulême (Bordeaux), the plafond of the Egyptian room in the Louvre, and finally his Hercules and Diomedes, exhibited in 1835, testify only that Gros's efforts—in accordance with the frequent counsels of his old master David—to stem the rising tide of Romanticism served but to damage his once brilliant reputation. Exasperated by criticism and the consciousness of failure, Gros sought refuge in the grosser pleasures of life, but suddenly his vital forces failed him, and on the 26th June 1835 he was found drowned on the shores of the Seine near Sevres. From a paper which he had placed in his hat it became known that "las de la vie, et trahi par les dernières facultés qui la lui rendaient supportable, il avait resolu de s'en défaire." The number of Gros's pupils was very great, and was considerably augmented when, in 1815, David quitting Paris made over his own classes to him. Gros was decorated and named baron of the empire by Napoleon, after the Salon of 1808, at which he had exhibited the Battle of Eylau. Under the Restoration, he became a member of the Institute, professor at the École des Beaux Arts, and was named chevalier of the order of St Michel.

M. Delestre has given a brief notice of his life in *Gros et ses Ouvrages*, and Jules Meyer's *Geschichte der modernen französischen Malerei* contains an excellent criticism on his works.

GROSBEAK (French *Grosbec*), a name very indefinitely applied to many birds belonging to the families *Fringillidæ* and *Ploceidæ* of modern ornithologists, and perhaps to some members of the *Emberizidæ* and *Tanagridæ*, but always to birds distinguished by the great size of their bill. Taken alone it is commonly a synonym of HAWFINCH (*q.v.*), but a prefix is most usually added to indicate the species, as Pine-Grosbeak, Cardinal Grosbeak, and the like. By earlier writers the word was generally given as an equivalent of the Linnæan *Loxia*, but that genus, as first established, has been found to include many forms which, according to more recent notions, cannot possibly be placed in the same Family.

The PINE-GROSBEAK (*Pinicola enucleator*) is, with the exception of the Hawfinch just mentioned, the best known species to which the name is applied. It inhabits the conifer-zone of both the Old and the New Worlds, seeking, in Europe and probably elsewhere, a lower latitude as winter approaches—often journeying in large flocks; and stragglers have occasionally reached the British Islands, though the records of not more than half a dozen such occurrences can be wholly trusted (Yarrell, *Br. Birds*, ed. 4, ii. pp. 177–179). In structure and some of its habits much resembling a Bullfinch (see FINCH, vol. ix. p. 192), but much exceeding that bird in size, it has the plumage of a Crossbill (vol. vi. p. 614), and appears to undergo exactly the same changes as do the members of the restricted genus *Loxia*,—the young being of a dull greenish-grey streaked with brownish black, the adult hens tinged with golden-green, and the cocks glowing with crimson-red on nearly all the body feathers, this last colour being replaced after moulting in confinement by bright yellow. Nests of this species were found in 1821 by Zetterstedt near Juckasjärwi in Swedish Lapland, but little was really known with certainty concerning its nidification until 1855, when the late Mr Wolley, after two years' ineffectual search, succeeded in obtaining in the not very distant district of Muonioniska well-authenticated specimens with the eggs, both of which are like exaggerated Bullfinches'. The food of this species seems to consist of the seeds and buds of many sorts of trees, though the staple may very possibly be those of some kind of pine. The cock has a clear and pleasing song, which makes him in many countries a favourite cage-bird; and the notes of the hen may even be deemed to qualify her as a musician of no small merit.

Allied to the Pine-Grosbeak are a number of species of smaller size, but its equals in beauty of plumage.[1] These have been referred to several genera, such as *Carpodacus*, *Propasser*, *Bycanetes*, *Uragus*, and others; but possibly *Carpodacus* is sufficient to contain all. Most of them are natives of the Old World, and chiefly of its eastern division, but several inhabit the western portion of North America, and one, *C. githagineus* (of which there seem to be at least two local races), is an especial native of the deserts, or their borders, of Arabia and North Africa, extending even to some of the Canary Islands—a singular modification in the *habitat* of a form which one would be apt to associate exclusively with forest trees, and especially conifers.

The VIRGINIAN GROSBEAK, or Virginian Nightingale of many writers, *Cardinalis virginianus*, next claims notice here, though doubts may be entertained as to the family to which it really belongs. No less remarkable for its bright carmine attire, and the additional embellishment of an elongated crest of the same colour, than for its fine song, it has been an object of attraction almost ever since the settlement of its native country by Europeans. All American ornithologists speak of its easy capture and its ready adaptation to confinement, which for nearly three centuries have helped to make it a popular cage-bird on both sides of the Atlantic. The vocal powers possessed by the cock are to some extent shared by the hen, though she is denied the vivid hues of her partner, and her plumage, with exception of the wings and tail, which are of a dull red, is light olive above and brownish-yellow beneath. This species inhabits the eastern parts of the United States southward of 40° N. lat., and also occurs in the Bermudas. It is represented in the south-west of North America by other forms that by some writers are deemed species, and in the northern parts of South America by the *C. phœniceus*, which would really seem entitled to distinction. Another kindred bird, placed from its short and broad bill in a different genus, and known as *Pyrrhuloxia sinuata* or the Texan Cardinal, is found on the southern borders of the United States and in Mexico; while among North American "Grosbeaks" must also be named the birds belonging to the genera *Guiraca* and *Hedymeles*—the former especially exemplified by the beautiful blue *G. cærulea*, and the latter by the brilliant rose-breasted *H. ludovicianus*, which last extends its range into Canada.

The species of the Old World which, though commonly called "Grosbeaks," certainly belong to the family *Ploceidæ*, may be in this work more conveniently treated under the title of WEAVER-BIRDS (*q.v.*). (A. N.)

GROSE, FRANCIS (*c.* 1730–1791), a celebrated English antiquary, son of a wealthy Swiss jeweller settled in England, was born at Greenford in Middlesex, about the year 1730. The bias of his mind towards heraldry and antiquities showed itself early; and his father, indulging it, procured him a position in the Herald's College. In 1763, being then Richmond Herald, he sold his tabard, and shortly afterwards became adjutant and paymaster of the Hampshire militia, where, as he himself humorously observed, the only account-books he kept were his right and left pockets, into the one of which he received, and from the other of which he paid. This carelessness exposed him to serious losses; and after a vain attempt to repair them by accepting a captaincy in the Surrey militia, the competency left him by his father being squandered, he began to turn to account his excellent education and his powers as a draughts man. In 1757 he had been elected fellow of the Society of Antiquaries. In 1773 he began to publish his *Antiquities of England and Wales*, a work which brought him money as well as fame. This, with its supplementary parts relating to the Channel Islands, was not completed till 1787. In 1789 he set out on an antiquarian tour through Scotland, and in the course of this journey met Burns, who composed in his honour the famous song beginning "Ken ye aught o' Captain Grose," and in that other poem, still more famous, "Hear, land o' cakes, and brither Scots," warned all Scotchmen of this "chield amang them taking notes." In 1790 he began to publish the results of what Burns called "his peregrinations through Scotland;" but he had not finished the work when he bethought himself of going over to Ireland and doing for that country what he had already done for Great Britain. About a month after his arrival, however, while in Dublin at the table of his friend Hone, he was seized with an apoplectic fit, and died in a moment, June 12, 1791.

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[1] Many of them are described and beautifully figured in the *Monographie des Loxiens* of the late Prince C. L. Bonaparte and Professor Schlegel (Leyden and Dusseldorf, 1850), a work which includes, however, all the Crossbills, Redpolls, and Linnets then known to the authors, while it excludes many birds that an English writer would have to call "Grosbeaks."

Grose was a sort of antiquarian Falstaff,—at least he possessed in a striking degree the knight's physical peculiarities; but he was a man of true honour and charity, a valuable friend, "overlooking little faults and seeking out greater virtues," and an inimitable boon companion. His professional merits were far from contemptible; he was a clever draughtsman, and had considerable power of pictorial composition. While most of his writings concern only the learned, others exhibit strong satiric power. But he showed to greatest advantage as a social being; his humour, his varied knowledge, and his good nature were all eminently calculated to make him a favourite in society. As Burns says of him—

> But wad ye see him in his glee,
> For meikle glee and fun has he,
> Then set him down, and twa or three
> Gude fellows wi' him;
> And *port, O port!* shine thou a wee,
> And THEN ye'll see him!"

Grose published *The Antiquities of England and Wales*, 6 vols. fol., 1773-87. In 1782 appeared *Advice to the Officers of the British Army*, a satire in the manner of Swift's *Directions to Servants*, which is very confidently attributed to Grose; in 1783, *A Guide to Health, Beauty, Riches, and Honour*, a collection of advertisements of the period, with characteristic satiric preface; in 1785, *A Classical Dictionary of the Vulgar Tongue*, 8vo, 1785-89, *A Treatise on Ancient Armour and Weapons*; in 1786, Darrell's *History of Dover*; 1786-88, *Military Antiquities*, 2 vols. 4to; 1787, *A Provincial Glossary*; 1788, *Rules for Drawing Caricatures*, 8vo; 1789-91, *The Antiquities of Scotland*, 2 vols. 4to; 1791, *Antiquities of Ireland*, 2 vols. 4to, edited and partly written by Ledwich. *The Grumbler*, sixteen clever humorous essays by Grose appeared in 1791 after his death; and in 1793 *The Olio*, a collection of essays, [illegible], and small pieces of poetry, highly characteristic of Grose, though certainly not all by him, was put together from his papers by his publisher, who was also his executor. A good full-length portrait of Grose by Dance is in the first volume of the *Antiquities of England and Wales*, and another is among Kay's *Portraits*. [illegible] *Gentleman's Magazine*, [illegible]. See *Gentleman's Magazine*, vol. lxi. [illegible]; Nichols's *Hist. of the County of* [illegible].

GROSSENHAIN, a town in the circle of Dresden, Saxony, is situated on the Röder, an affluent of the Elbe, 20 miles N.W. of Dresden. It has manufactures of woollen and cotton stuffs, buckskin, silk thread, and waxcloth. The principal buildings are the church of Our Lady completed in 1748, the real school of the second order, the new town-house completed in 1876, the infirmary, and the penitentiary. The population in 1875, including the garrison, was 10,6[illegible].

[illegible] and obtained the rank of a town in the [illegible] century. It was for a time possessed by the Bohemians, by whom it was strongly fortified. It afterwards came into the possession of the margraves of Meissen, from whom it was taken in 1312 by the margraves Waldemar and John of Brandenburg. It suffered severely in all the great German wars, and in 1744 was nearly destroyed by fire.

GROSSETESTE, ROBERT (*c.* 1175-1253), in some respects the most distinguished of all the English mediæval prelates as regards his personal influence both over the men of his time and on its literature, was born of humble parents at Stradbrook in Suffolk about the year 1175. All that is known of his early years is (from his own account) that he studied the characters of the best men in the Scriptures, and endeavoured to conform his actions to theirs. He was sent by his friends to Oxford, where he studied law and medicine, and seems to have finished his education at Paris, where he probably laid the foundation of his knowledge of Greek and Hebrew. His first patron was William de Vere, bishop of Hereford, to whom he was introduced by Giraldus Cambrensis, but who died in 1199, and thus had little opportunity of assisting the young scholar. From Paris he returned to Oxford, graduated in divinity, and became master of the schools (*rector scholarum*) or chancellor. He also became the first rector of the Franciscans at Oxford. Here he probably wrote his commentaries on Aristotle, and laid the foundations of his fame as a preacher. His earliest preferment of which we can speak with certainty was the archdeaconry of Wilts, which he held in 1214 and 1220; he was archdeacon of Northampton in 1221, holding at the same time the prebend of Empingham, which belonged to the archdeaconry. This he exchanged for the archdeaconry of Leicester, which he probably held till 1232. In May 1225 he was collated by Hugh de Wells, bishop of Lincoln, to the church of Abbotsley, Hunts, and at one time he held the rectory of St Margaret's, Leicester. In 1231 he probably wrote his treatise *De Cessatione Legalium* with the view of converting the Jews, for whose benefit the *Domus conversorum* was established in London this year. A fever in November 1232 induced him to resign all his preferments excepting his Lincoln prebend, and the leisure he thus obtained was spent at Oxford, and probably employed in writing his mathematical treatises and his theological *Dicta*. On the death of Bishop Hugh de Wells in February 1235, the chapter of Lincoln elected Grosseteste to the see; the election took place on March 27, and he was consecrated at Reading on June 17. His administration of his diocese, then the most extensive in the country, was characterized by great vigour. Within a year of his consecration he visited the monasteries, removing seven abbots and four priors; and in 1238 he issued his constitutions, embodying the points discussed at the great council of the Church of England held in London in 1237, concerning which he had already written to his archdeacons; at the same time, as diocesan of Oxford, he exercised a watchful supervision over the university, protecting the scholars who were in trouble for their attack on the legate Otho in 1238, and even entering into such matters of detail as the place where the university chest should be kept. His energy in his visitations did not pass without opposition; an attempt on his life by poison was made in 1237, from which he recovered with difficulty through the help of John de S. Giles; and in 1239 began the quarrel with the chapter of Lincoln, which lasted six years, and was only quieted by the decision of the pope himself. They claimed exemption from episcopal visitation and spoke of the bishop's demanding what had never from the earliest times been the custom. He would not tolerate an *imperium in imperio*, a body of men bound by common interests, who declined to submit to his jurisdiction, and who might be in need of visitation and correction as much as any other. Full details are given in the bishop's letters of the progress of the quarrel; appeals to Canterbury and the Roman court were followed by excommunications on both sides, the chapter even condescending to exhibit a forged paper as to the history of the church and see of Lincoln. The question was at length settled by a personal appeal to Pope Innocent IV. at Lyons. In a bull of August 25, 1245, he decided almost all the points at issue in favour of the bishop, who lost no time in putting his powers into execution. Of his own view of the matter a very curious exemplification is given in the letter or pamphlet sent to the chapter (epist. 127), where his right to visit them is proved by all kinds of mystical arguments and scriptural examples. In 1242, with the help of one Nicholas a Greek, clerk of the abbey of St Alban's, he translated the *Testamenta XII Patriarcharum*, which had been brought from Athens by John of Basingstoke. In 1243 occurred the serious quarrel with the chapter of Canterbury (the see being practically vacant, as Boniface was not yet consecrated) respecting the abbey of Bardney, the bishop deposing the abbot in spite of his appeal to Canterbury, and the monks in an especially solemn manner excommunicating the bishop. On receiving the letters from the convent, he threw them on the ground, in spite of the seal containing the effigy of St Thomas, and paid no attention whatever to the sentence. Both parties appealed to the pope, and an arrangement was made between them. In 1244, being one of a committee of twelve chosen to determine what answer should be given to the king's demand of a subsidy, his influence kept the members from being separately won over by the king's endeavours to make parties among them; and the council broke up without giving way to the royal demands. The same year his examination of Robert Passelew, who through the king's influence had been elected bishop of Chichester, though utterly unfit, caused the election to be annulled. On returning from Lyons we find Grosseteste executing various commissions with which he was entrusted by the pope; urging on the archbishop of York the claims of the bishop of Cervia; endorsing and sending round the papal letter allowing Archbishop Boniface the revenues of all benefices in his province that should fall vacant within the next seven years till 10,000 marks should be collected, in order to free the see from its debts; and insisting on the bishops paying the subsidy demanded by the pope, in spite of the king's opposition. In this year (1245) he obtained a bull to prevent any of the Oxford scholars graduating in arts without passing through the usual examinations *secundum morem Parisiensem*, and without having been approved by the bishop himself or one appointed by him. In 1247 he delivered an address vindicating the genuineness of the relic (a portion of our Lord's blood) presented by the king to Westminster. His visitation of his diocese, especially of the monasteries in it, and his superintendence of the studies of Oxford, which went on without interruption during these years, while inducing others of the bishops to follow his example, were not accomplished without serious troubles, embroiling him even with the king. Thus, in 1250, his visitation having proved that many of the religious houses had converted to their own uses certain possessions which belonged to the parishes, which were thus impoverished and left without resident priests, he procured a papal letter authorizing him to revoke what they had thus obtained, citing all the beneficed monks in his diocese to hear the letter. Those who had exemptions appealed to the pope, and Grosseteste again crossed the sea to lay the case before him. But the gold of the religious orders had been at Lyons before him, and the pope sent him away from his presence in confusion, hopelessly exclaiming against the power of money at the Roman court. He was not, however, dismissed, but busied himself in other affairs, and delivered before the pope and certain cardinals his celebrated sermon on the abuses of the papal court. Here he stayed till the end of September, and then returned in sad plight to England, almost thinking of resigning his see in despair. But he soon recovered from this, and pursued his visitation of the monasteries with still greater vigour, so as to be accused by Matthew Paris of tyranny such as to make him be thought, "not severe, but rather austere and inhuman." In 1251 he was suspended by the pope in consequence of his refusing to admit an Italian ignorant of English to a rich benefice in his diocese. The suspension was short, as he officiated at Hales this year, on the dedication of the church founded by Richard of Cornwall, his position among the bishops being shown by his celebrating mass at the high altar. In 1252 he obtained a papal letter authorizing the appointment of vicars, and their payment out of the revenues of their livings; and in the same year his influence kept the bishops together in their resistance to the royal demands of a tenth of church revenues for three years granted by the pope, nominally for the king's necessities on his intended crusade. He had also this year a calculation made of the revenues of the foreigners in England, which amounted to more than 70,000 marks. In 1253 the pope ordered him to induct by provision his nephew Frederick di Lavagna into a canonry at Lincoln; the bishop's answer to the requisition sent to the papal commissioners (the archdeacon of Canterbury, and Innocent, the pope's notary), though of less importance than many of his other letters, has done more to make his fame popular and permanent than any of his works. He is very decided in refusing to institute the candidate from his unfitness, at the same time that he expresses the utmost reverence for the pope and the Roman see. The letter made the pope very angry, and he was only quieted by the advice of the cardinals, who spoke in the highest terms of the bishop's character and position. Grosseteste was present at the parliament in May, when the violators of Magna Charta were again excommunicated; not content with this, he had the sentence read in every parish in the diocese of Lincoln. In October he fell ill at his manor of Buckden, where he died on October 9th. He was buried on October 13th in Lincoln Cathedral, the archbishop performing the service and many other bishops assisting. Bells were said to have been heard in the air on the night of his death, and miracles to have taken place at his tomb. The pope is said to have expressed joy at his death, and to have desired to have his bones cast out of the church. The story of the pope's dream, that the bishop appeared to him and struck him in such a manner as to cause his death, shows what the popular estimation of the two was. It is perhaps not to be wondered at that the attempt to procure the canonization of the bishop in 1307 failed.

How great the personal influence of Bishop Grosseteste was may be chiefly learnt from his letters: he was the instructor of the king (*e.g.*, in one of his letters on the value of the royal anointing), the friend of the queen, the tutor of Simon de Montfort's sons, his warner and consoler at different times, the correspondent of Adam de Marisco, the referee of many as to spiritual difficulties. Of those who speak of him, one is especially struck by his courage, another by his universal knowledge, a third by his subtlety in interpreting scripture, a fourth by his frequent preaching. Even Matthew Paris, no favourable judge, warms into admiration in speaking of his character (*Chron. Maj.* v. p. 408). The popularity of Grosseteste as an author is proved by the number of manuscripts remaining of his works, and from the fact that very few writers for the two centuries following his death do not contain quotations from *Lincolniensis*. His determination to root out all abuses is seen in his opposition to unjust demands of the king or the archbishop, to unfit nominees of the pope, indeed to the whole system of papal provisions. That he was of a hasty temper, and harsh and severe at times, is true; but no one ever more thoroughly tried to do his duty, probably few have effected more.

The chief sources for the facts of his life are his own letters, those of Adam de Marisco, the History of Matthew Paris, and the Annals of Dunstable. Of his works, a fragment of the *De Cessatione Legalium* was printed in London, 1658; a selection of his letters was printed by E. Brown in the *Appendix* to his *Fasciculus Rerum Expetendarum et Fugiendarum*, 1690, and a complete edition in the Rolls series of chronicles and memorials, 1861, by H. R. Luard. Brown printed also some of his sermons. The tract *De [illegible]* was printed by W. de Worde, and that "De physicis lineis, angulis, et figuris per quas omnes actiones naturales complentur" at Nuremberg, 1503, and others of his mathematical treatises are in print. His French poem *Le Chasteau d'Amour*, and an English version called *The Castel of Love*, have been printed for the Caxton and Philological Societies. Separate lives of him have been written by Samuel Pegge, 1793, and G. G. Perry, 1871. Complete lists of his works are given by Oudin, Tanner, Fabricius, &c. In Pegge's life, the list fills 23 quarto pages. (H. R. L.)

GROSSETO, a town of Italy, at the head of the province of the same name, is situated in the Maremma district, near the right bank of the Ombrone-Senese, with a station on the railway between Florence and Rome. It is well built and surrounded with solid walls about 2 miles in circuit, and among its public edifices is a spacious cathedral with a marble façade; but the principal interest of the place results from the great hydraulic labours by which the surrounding swamp—the Lacus Prelius of Cicero—has gradually been drained and rendered capable of tillage. Drinking water, of which the town was formerly almost destitute, has been supplied by an artesian well of enormous depth, bored since 1833. About 3½ miles to the N.E. lie the sulphurous baths of Roselle (*Aquæ Rusellarum*), and about 2 miles further off are the ruins of the ancient Etruscan city of Rusellæ, the walls of which are about 2 miles in circumference. Roselle continued to be inhabited till the close of the 13th century, but its unhealthiness gradually constrained the inhabitants to remove to Grosseto, which is first distinctly mentioned in 830 in a document of Louis I., and became a bishop's see in 1138. For some time Grosseto was under the sway of the Aldobrandini family, and it was afterwards subject to the republic of Siena, which treated it badly. Francis I. furnished it with a fortress and walls, and Ferdinand I. made it a regular place of arms. At present the climate is so unhealthy in summer that the provincial authorities remove to Scansano. The population of Grosseto in 1871 was 3290 in the town proper, 4151 including the suburbs, and 6316 in the commune.

GROSSI, TOMMASO (1791–1853), Lombard poet and novelist, was born at Bellano, on the Lake of Como, January 20, 1791. He took his degree in law at Pavia in 1810, and proceeded thence to Milan to exercise his profession; but the Austrian Government, suspecting the young barrister's loyalty, interfered with his prospects, and thus it happened that Grossi was a simple notary all his life. That the suspicion was well grounded he soon showed by writing in the Milanese dialect the battle poem *La Prineide*, in which he described with vivid colours the tragical death of Prina, chief treasurer during the empire, whom the people of Milan, instigated by Austrian agitators, had torn to pieces and dragged through the streets of the town (1814). The poem, being anonymous, was first attributed to the celebrated Porta, but Grossi of his own accord acknowledged himself the author. In 1816 he published other two poems, written likewise in Milanese—*The Golden Rain* (La Pioggia d'Oro) and *The Fugitive* (La Fuggitiva). These compositions secured him the friendship of Porta and Manzoni, and the three poets came to form a sort of romantic literary triumvirate. Grossi took advantage of the popularity of his Milanese poems to try Italian verse, into which he sought to introduce the moving realism which had given such satisfaction in his earliest compositions; and in this he was entirely successful with his poem *Ildegonda* (1814). He next set about writing an epic poem, entitled *The Lombards in the First Crusade*, a work of which Manzoni makes honourable mention in his *Betrothed*. This composition, which was published by subscription (1826), attained a success that has not been equalled by that of any other Italian poem within the century. The example of Manzoni, who had meanwhile published *The Betrothed* (1827), induced his friend Grossi to enter the same arena with an historical novel entitled *Marco Visconti* (1834)—a work which contains passages of fine description and deep pathos. A little later Grossi published a tale in verse, *Ulrico and Lida*, but with this publication his poetical activity ceased. After his marriage in 1838 he continued to employ himself as a notary in Milan till his death on December 10, 1853.

GROSSWARDEIN (Hungarian, *Nagy-Várad*), a royal free city, and capital of the county of Bihar in the Trans-Tibiscan circle, Hungary, is situated in a beautiful plain on the banks of the river Sebeskörös, 47° 3' N. lat., 21° 53' E. long. It is the seat of a Roman Catholic and of a Greek (Old-United) bishopric, of a royal court of justice, of the county assizes, and of a board of assessment, and is the headquarters of the divisional regiments and militia (*honvéd*). The town consists of Nagy-Várad proper, with Várad-Olaszi, Várad-Velencze, and Várad-Váralja. The streets and squares are well laid out, and adorned with many fine public and private buildings. Among these are sixteen Roman Catholic churches, of which the most striking is the cathedral; two Calvinist, one Lutheran, one Old-United and two Orthodox Greek churches, and a Jews' synagogue. The other noteworthy edifices comprise the county and town halls, two episcopal palaces, chapter and clergy houses, hospitals, cloisters belonging to the Compassionate Brothers, and a convent for Ursula nuns, several manufactories, a large and handsome railway station, a prison, and barracks. Among the educational establishments are the royal law academy, a Roman Catholic gymnasium and seminary for the education of priests, a Calvinist school, and a gymnasium for adherents of the Old-United or Catholic Greek confession, two institutes for training teachers, a military academy, a real-school, and an orphan asylum. The inhabitants are chiefly employed in industrial and commercial pursuits; and the neighbourhood yields a good supply of wine, fruit, and agricultural produce. The great fairs periodically held in the town attract strangers from a considerable distance. Grosswardein is the point of junction of the Alföld-Fiume, Tibiscan, and Hungarian Eastern railroads. Not far from the town are the much-frequented warm springs of Püspökfürdö (Bishop's-bath). In 1870 the population was 28,700, of whom the majority were native Magyars, the rest chiefly Germans and Wallachs.

Grosswardein is one of the oldest towns in Hungary. Its Roman Catholic bishopric was founded by St Stephen of Hungary at the commencement of the 11th century. It was there that peace was concluded on 24th February 1538, between Ferdinand I of Austria and his rival John Zapolya, waywode of Transylvania. In 1557 it passed into the possession of Transylvania, but afterwards reverted to Austria. In 1598 the fortress was unsuccessfully besieged by the Turks; in 1660, however, it fell into their hands, and was ceded to them by the treaty of Vasvar (Eisenburg), 10th August, 1664. In 1692 it was recovered by the Austrians. The Greek Old-United or Catholic bishopric was founded in 1776. From its vicinity to Debreczin, the temporary seat of the Hungarian revolutionary government during the early part of the year 1849, Grosswardein became for a time invested with additional importance, as the depository of the state archives, bank-note press, and arms manufactory.

GROTE, GEORGE (1794–1871), the historian of Greece, eminent also as a philosopher, a politician, and a labourer in the advancement of university education, was born on the 17th of November 1794, at Clay Hill, near Beckenham in Kent. He drew his lineage from a Dutch, or, more strictly speaking, a Low German family. The name (Groot, equivalent to "great,") is the same as that of Hugo Grotius, with whom the Grotes would gladly have traced a relationship, but the evidence was wanting. George Grote's grandfather, Andreas (born in 1710), a merchant of Bremen, removed to England, and after some years of successful business joined Mr George Prescott in founding the banking-house of "Grote, Prescott, & Company" (January 1, 1766). He was married twice. His eldest son by his second marriage, George (born in 1762), was married (in 1793) to Selina, daughter of the Rev. Dr Peckwell, one of the Countess of Huntingdon's chaplains, whose portrait is preserved in the vestry of the chapel at Chichester, where he ministered. Dr Peckwell was descended on the mother's side from the French Protestant family of De Blosset, who had left Touraine in consequence of the revocation of the edict of Nantes; and thus the historian, who was the son of George Grote and Selina Peckwell, had a share of that Huguenot blood which has been a rich source of intellectual as well as industrial life in England.

Like many other eminent men, George Grote owed much of his future intellectual greatness to his mother's careful training. Having a strong desire to see her son excel in learning, she taught him reading and writing herself, and even grounded him in the elements of Latin before he was sent to the grammar school at Sevenoaks, in his sixth year (1800). The four years spent there gave an earnest of his whole future life. In the language of his biographer, who has lately attained the end of a life inseparably interwoven with his, "he evinced a decided aptitude for study, being rarely found behindhand with his tasks, and ranking habitually above boys of his age in the class to which he belonged." In his tenth year he was removed to the Charter-house, the headmaster of which, Dr Raine, had the honour of training, along with George Grote, Connop Thirlwall, Dean Waddington and his brother Horace, Sir Cresswell Cresswell, Sir Henry Havelock, and other men of future distinction. Grote was not allowed to share the course of most of his schoolfellows at a university; but this great privation was turned into a pre-eminent distinction by the resolution with which his own strong will and untiring industry supplied the loss. The supposed advantage of an early application to business led the father to take George into the bank at the age of sixteen. But his six years at the Charter-house had not only imbued him with a strong taste for classical learning, but had supplied him with that motive to high culture, which forms the most convincing argument in its favour, and to which he remained faithful through a half century of educational disputes and heresies. It was not as an alternative to a life of business, but as its proper complement, that he chose and advocated ancient learning. "Looking forward," says his biographer, "to a commercial course of life, certain to prove uninteresting in itself, he resolved to provide for himself the higher resources of intellectual occupation." Engaged in the bank throughout the day, he devoted his early mornings and evenings to a systematic course of reading, of which the chief subjects were the ancient classics, history, metaphysics, and political economy, to the last of which he was attracted by the writings of David Ricardo, whose personal acquaintance he formed in 1817. To these studies he added the learning of German by the aid of a Lutheran clergyman, which, together with his knowledge of French and Italian, placed the stores of Continental scholarship within his reach. His chief recreation was music, and he learned to play the violoncello, to accompany his mother, who was a fine musician. Arrived at the age of manhood (in the winter of 1814–1815), he formed the acquaintance of the young lady who afterwards became his wife, devoted to and worthy of him, the very complement of his life, intellectual as well as social, and finally his biographer in a spirit of loving but not indiscriminate admiration. This was Miss Harriet Lewin, the daughter of Mr Thomas Lewin, of Bexley, in Kent, a gentleman of old family and independent fortune. She was born at Southampton, July 1, 1792, and was consequently nearly two years older than Grote. From causes which need not be related here their intimacy was suspended for three years, during which Grote's studies made steady progress. To this period belongs his earliest literary composition, an essay on his favourite Lucretius, which still exists in MS. His letters also record the careful study of Aristotle, his final estimate of whom formed his last unfinished work. But the most interesting light is thrown on the method and course of his studies in the diary which he kept for Miss Lewin's information. This record bears witness, not only to the wide diversity of his studies in ancient and modern literature, philosophy, and political economy, but also to the fact that he read the authors themselves whom he wished to know,—read them as a whole, instead of merely reading what others had written about them.

An epoch, perhaps the most critical turning-point of Grote's intellectual life, was formed by his introduction, through David Ricardo, to James Mill, who was then composing his metaphysical work entitled *An Analysis of the Human Mind*. Already attracted to this study, Grote became Mill's admiring disciple in mental and political philosophy. From this time he adopted the fixed principles, from which he never receded, of experience as the source of all knowledge, and utility as the foundation of morals. The views derived from Mill were confirmed by the teaching of Jeremy Bentham, and by intercourse with a band of young disciples, over whom the two philosophers wielded an unbounded influence. Among these John Stuart Mill began now to make his appearance as a boy of twelve years old. It is important to note the influence which the study of metaphysics exercised upon the development of Grote's intellectual character. To the general public he is chiefly known as an historian; but he was equally distinguished as a metaphysical philosopher. To the teaching of James Mill may also be traced his democratic principles and his zeal for freedom of thought, hardening into intolerance of all religious systems and their ministers. But, however they may have determined his course upon certain occasions, these antipathies never struck their root down into the real soil of his gentle and courteous nature.

In 1820, at the age of twenty-four, he was married to Miss Harriet Lewin. They lived at first at the banking-house in Threadneedle Street. The confined situation soon told on Mrs Grote's health, and the death of her only child, a week after its birth, was followed by a dangerous illness. It was at her bedside at Hampstead, during her slow recovery, that Grote composed the first work he published, an *Essay on Parliamentary Reform*, in reply to an article by Sir James Mackintosh in the *Edinburgh Review*, No. 61 (1821). The pamphlet is a vigorous assertion of the broadest principles of popular representation, in opposition to a scheme of class representation sketched by the reviewer. It proclaimed Grote's adherence to those political views held by the party afterwards called the "philosophic radicals," and it strongly pleaded for the vote by ballot, of which he afterwards became the parliamentary advocate. The most important parts of this pamphlet were embodied in his later essay on the *Essentials of Parliamentary Reform* (1831), reprinted in his *Minor Works*.

In April 1822 Grote sent a vigorous letter to the *Morning Chronicle* in reply to Canning's speech against Lord John Russell's motion for reform. In the same year he spent much time upon some MSS. of Jeremy Bentham, which the aged philosopher entrusted to his young disciple to put into a readable form. After carefully digesting and arranging them, he published them anonymously in a small 8vo volume, entitled *Analysis of the Influence of Natural Religion on the Temporal Happiness of Mankind, by Philip Beauchamp.* Meanwhile the quiet course of life went on in Threadneedle Street. The scanty leisure of each day was devoted to the joint studies of husband and wife, for "Mrs George Grote was habitually studious, after her fashion, under the direction of her husband, who laid great stress upon her cultivating the ratiocinative vein of instruction—above all, logic, metaphysics, and politics; and she accordingly strove to master these subjects, out of deference to his wish, and in order to qualify herself to be associated with his intellectual tastes and labours as time wore on." Their pleasures were likewise in common: the wife, who was an accomplished musician, learnt the violoncello to accompany her husband; but he dropped his music in 1830. A circle of congenial minds frequented the house in Threadneedle Street from 1822 to 1830. Within that choice society there was a narrower circle of students, who met there twice a week at half-past eight in the morning for an hour or two's reading. Among others were John Stuart Mill, Charles Buller, and John Arthur Roebuck. They read the most recent works on metaphysics and kindred subjects in the light of their adored teachers, Bentham and James Mill, beyond whom they believed all to be in Cimmerian darkness.

The year 1823 marks the epoch of the first conception of Grote's great work; and an extant letter shows the spirit in which he approached it. On January 14th he writes:—"I am at present engaged in the fabulous ages of Greece, which I find will be required to be illustrated by bringing together a large mass of analogical matter from other early histories, in order to show the entire uncertainty and worthlessness of tales to which early associations have so long familiarized all classical minds. I am quite amazed to discover the extraordinary greediness and facility with which men assert, believe, re-assert, and are believed. The weakness appears to be next to universal, and I really think that one ought to write on the walls of one's dressing-room the caution of the poet Epicharmus:—

Νῆφε, καὶ μέμνησ' ἀπιστεῖν, ἄρθρα ταῦτα τῶν φρενῶν.

The subject ever present to his thoughts came up so often in the discussions with his friends as to suggest to his wife's sympathy and ambition for his fame the definite work of his future life. One day she said to him—"You are always studying the ancient authors whenever you have a moment's leisure, now here would be a fine subject for you to treat. Suppose you try your hand!" "The idea" (she adds) "proved acceptable to the young student, and, after reflecting for some time, he came to the resolution of entering upon the work." Henceforth this definite aim prevailed amidst the still wide range of reading which threw new light from all quarters upon the central object, and the mass of notes and extracts still preserved attest the diligence with which he prepared for it. Happily for himself and for the world, he was diverted from the work till he could resume it, not only with that clearer mental perspective in which a long meditated object appears when we return to it afresh, but with the enlarged experience of nearly twenty years occupied in practical politics and converse with statesmen, abroad as well as at home. Meanwhile he gave the world an earnest of his work in an exhaustive review of Mitford's *History of Greece* in the *Westminster Review* for April 1826,—one result of which was a letter from Niebuhr, clearly designating Grote as the historian of Greece, and inviting him to a visit which events never permitted him to pay.

From 1825 to 1827 Grote took part in the scheme of founding the "University of London" in Gower Street, with the management of which institution he became afterwards intimately connected. As the political crisis of 1830 approached, public and private events conspired to draw Grote into the vortex of politics. The failure of his father's health gave him a new position in the bank; and in the spring of 1830 he was able to arrange for a visit to the Continent, which brought him into connexion with the liberal politicians of Paris on the eve of the revolution. An interesting record of the state of affairs and of the impressions of this visit are preserved in Mrs Grote's *Life of Ary Scheffer*, published in 1860. The travellers were recalled in June by the illness of Grote's father, who died before their arrival, at the age of 70.

Thus, in his 36th year, George Grote, now the head of the family, found himself master of his own affairs, and of about £40,000 personal property, besides the family estates in Lincolnshire and Oxfordshire. His business and studies alike led him to fix his residence in London; and the first use he made of his wealth was to subscribe £500 to the revolutionary committee of the Hôtel de Ville, with an offer to come himself to Paris if his presence would be of any use. The pressure of business as his father's executor kept him, in spite of strong solicitations, out of any active part in the agitation for reform, but did not prevent the steady progress of the *History*, which Mrs Grote writes (February 1, 1831), "*must* be given to the public before he can embark in any active scheme of a political kind." He refused an invitation to stand for the city in 1831; but he made an able contribution to the argument in a statement of the *Essentials of Parliamentary Reform*, published this year, to which reference has already been made. His reluctance to enter parliament was overcome after the passing of the Reform Act in 1832; and, being returned at the head of the poll, he appeared as one of the members for the city of London in the first reformed parliament, which met on February 4, 1833. He at once gave notice of a motion for the vote by ballot in parliamentary elections, which he brought before the house on the 25th of April following. His speech on that occasion was prepared with great care, and displayed that cogent reason and calm earnest eloquence which marked all his efforts in debate. The substance of the argument, and a notice of his principal speeches in parliament, will be found in Professor Bain's sketch of his character and writings prefixed to his "minor works." Earnest as were his political convictions, and faithfully as he discharged the duties which he had undertaken, Grote's parliamentary career forms only an episode in his life, but an episode which contributed to enrich and qualify him for his main work. He sat in three successive parliaments, from 1833 to 1841, witnessing the gradual passage from the first triumphs of reform to the Conservative reaction under Sir Robert Peel, and the steady decay of his own sect of philosophic radicalism, which never had a root in popular opinion. He was returned the last time by a bare majority of six, and his party numbered just the same figure. Charles Buller said to him one evening—"I see what we are coming to, Grote; in no very long time from this, you and I shall be left to 'tell' Molesworth."

During the eight years and a half of his parliamentary life, Grote kept up his varied reading and formed a growing desire for a knowledge of physical science. But the staff of his mental diet, and his refuge from all weaker phases of thought, was still the same. In the weary intervals of attendance on parliament a Tauchnitz copy of Plato was ready in his pocket, and when shut up in the country during the vacation he writes—"A Greek book is the only refuge." His hospitalities expanded with his social position, and among his new friendships the one he most valued was that formed in 1838 with Mr (afterwards Sir) George Cornewall Lewis, the letters exchanged with whom on various points in classics and philosophy enrich the narrative of his *Life*. Among the other objects of his literary interest at that time was Sir William Molesworth's collected edition of the works of Hobbes, dedicated to Grote, whose review of the first two volumes in the *Spectator* (1839) is reprinted among the *Minor Works*.

During the whole period of Whig decay, and especially from the beginning of the present reign, Grote felt a declining interest in politics, and accordingly, on the dissolution in June 1841, he determined to retire from parliament. Thus at the age of forty-six he was set free to spend the remaining thirty years of his life in the work long prepared and contemplated. In half that period the *History of Greece* was finished; the remaining half was devoted to the two works on Plato and Aristotle, which made up the Hellenic "trilogy" of his life-long studies.

After a six months' holiday (1841-1842) for the long desired purpose of visiting Italy and studying the antiquities of Rome upon the spot, he returned to his business at the bank, and set vigorously to work on the new plan for the first two volumes of his *History*—reperusing the authorities, revising his notes, and rewriting the whole. The greater part of these two volumes was occupied with the first division of his subject, which was now for the first time severed from actual history, and placed in its proper mythical light, under the title of "Legendary Greece." The closing months of 1842 were employed in sending forth a sort of "pilot vessel" in the form of a review of Niebuhr's *Griechische Heroen-Geschichte*, which appeared in the *Westminster Review* (May 1843) under the title of "Grecian Legends and Early History," and is reprinted in the *Minor Works*. His biographer states that, "this article, wherein the collected store of Grote's long and assiduous studies on the subject found a vent, was written with uncommon zest, and he anticipated with lively curiosity the effect it would produce over the learned world." It was received as a striking promise of the new light in which he was about to place the primeval ages of Grecian history. It is important to record an incidental remark, which shows that, amidst his uncompromising severance of legend from real history, Grote adhered to the great principle avowed alike by Herodotus and by Bede: "An historian is bound to produce the materials upon which he builds, be they never so fantastic, absurd, or incredible."

With the beginning of 1843, exactly ten years after the interruption caused by his entrance into parliament, the composition of the first volume for the press was vigorously begun; and at midsummer he further cleared his path by retiring from the banking-house of Prescott, Grote, & Company. While still at work upon the *History*, he published in the *Classical Museum* (1843) an important essay on ancient weights and measures, reviewing Boeckh's *Metrologische Untersuchungen*, which is reprinted among his *Minor Works*.

The first two volumes of the *History* were completed early in 1845, and published in March 1846. Their reception is well known; and the effect of their success upon Grote himself was thoroughly characteristic of the man:—"From all sides congratulation and eulogy flowed in upon the author, insomuch that he himself now began to feel something like confidence in the success of his long-cherished work. Thus I became" (writes Mrs Grote) "*for once* witness of a state of feeling on his part approaching to gratified self-love, which at times would pierce through that imperturbable veil of modesty habitually present with him." The first volume and nearly half of the second are occupied with "Legendary Greece"; the latter half of the second volume begins "Historical Greece," and consequently contains only a small portion of the real history. These volumes were reviewed with great praise by John Stuart Mill in the *Edinburgh Review*, and by Dean Milman in the *Quarterly Review*.

The success of the first two volumes incited Grote to prosecute the work with redoubled ardour; and such progress had been already made that the third and fourth volumes, bringing the narrative down to the battle of Marathon, and containing an account of Grecian poetry and philosophy in its earlier stages, appeared in the following year (1847). Two more volumes, the fifth and sixth, coming down to the eleventh year of the Peloponnesian war, were published in 1849. These two volumes, together with the two preceding ones, were reviewed in the *Edinburgh Review* by Sir George Cornewall Lewis. The seventh and eighth volumes, which brought the Peloponnesian war to the end, and which contained the striking and original view of the Sophists and of Socrates, appeared in 1850. Two articles in the *Quarterly Review* upon this portion of the work, one upon the history, and the other upon Socrates and the Sophists, were written by Dean Stanley. The ninth and tenth volumes were published in 1852, the eleventh in 1853, and the last and twelfth in 1856, just ten years after the appearance of the first two volumes. The work closes with the generation contemporary with Alexander the Great, "an epoch," the historian observes, "from whence dates not only the extinction of Grecian political freedom and self-action, but also the decay of productive genius, and the debasement of that consummate literary and rhetorical excellence which the 4th century B.C. had seen exhibited in Plato and Demosthenes."

The peculiar merits of Grote as an historian are discussed at length by the writer of the present notice in a review of the whole work in the *Quarterly Review* in 1856. It is sufficient to state here that the quality in which he surpassed all his predecessors in Grecian history, and which achieved for him a success that can never be undone or superseded, lies in his placing his whole subject in the full light of historic truth apart from partial judgments, looking at the actions of men from their own points of view and not only from ours, and having constant regard to those ethical principles of human nature which his twofold training as a philosopher and politician qualified him to estimate. Many of his details may be disproved and his judgments reversed, but his work will last for ever. The opinion of scholars may be summed up in Bishop Thirlwall's "hearty congratulations on the completion of this glorious monument of learning, genius, and thought, to which I believe no other literature can exhibit a parallel."

An episode during the progress of the *History* is characteristic of the wide range of political observation which Grote brought to bear upon his work. In the Swiss dissensions during 1847, which led to the war of the "Sonderbund," he saw so close a resemblance to the conflicts of the Greek republics that he resolved to study the question on the spot. His *Letters* on the subject, which originally appeared in the *Spectator* newspaper, were collected into a volume, which was reprinted in 1876 by Mrs Grote, with the addition of a letter written by him to M. de Tocqueville after the termination of the war.

On the completion of the *History*, Grote contributed to the *Edinburgh Review* (1856) a criticism of Sir George Cornewall Lewis's *Enquiry into the Credibility of the early Roman History*, which is reprinted in his *Minor Works*, a most interesting study of the points in which the two scholars agreed and differed, Grote stopping short of his friend's scepticism in some cases.

After a well-earned holiday on the Continent in the summer of 1856, Grote set steadily to work upon his *Plato*, which occupied him nine years, and appeared in 1865 in three volumes 8vo, under the title of *Plato and the other Companions of Sokrates*. when the author had completed his seventieth year. This work, he remarks, was "intended as a sequel and supplement to his *History of Greece*." After giving an exhaustive review of early Greek philosophy, from Thales to Democritus, and an account of the life of Plato, of the Platonic Canon, and of Platonic compositions generally, he analyses at great length each of the dialogues, with illustrative remarks, unfolding a number of his own philosophical views. The work concludes with two chapters, one on the "Other Companions of Sokrates," and another on "Xenophon."

On the completion of this work, Grote wrote in the *Westminster Review* (1866) an elaborate criticism of John Stuart Mill's *Examination of Sir William Hamilton's Philosophy*." At the same time, though in his seventy-first year, he set to work upon Aristotle, hopeful in the continuance of those powers which he thus described three years later:—"My power of doing work is sadly diminished as to *quantity*, as my physical powers in walking are; but as to *quality* (both perspicacity, memory, and suggestive association bringing up new communications), I am sure that my intellect is as good as it ever was," and all who knew him well can attest the accuracy of this judgment. But he did not live to complete the third portion of his "trilogy," though he had been studying the Aristotelian treatises from his earliest manhood. The fragment of his Aristotelian labours was published in 1872, the year after his death, in two volumes, edited by Professors Bain and Robertson. Besides the life of Aristotle and the canon of his works, these volumes are chiefly occupied with an examination of the logical treatises of the great philosopher; but the editors have been able to give, from the MSS. of the author and from the contributions which he made to Professor Bain's *Manual of Mental and Moral Science*, some account of Aristotle's other works. There are also two valuable essays on the ethics and politics of Aristotle, found among the author's MSS after the publication of Aristotle, which were printed in 1876 in the *Fragments on Ethical Subjects by the late George Grote*.

During the composition of the Plato and the Aristotle Grote resided in London, at 12 Savile Row, and in two country houses, which he occupied in succession, first at Barrow Green in Kent from 1859 to 1863 (where Jeremy Bentham had once lived), and afterwards at Shiere among the Surrey hills, in which place, his day was divided between regular work, exercise as regular, and the society of congenial friends. Many a work of social duty and benevolence found prompt performance; and he paid unremitting attention to the business of his three favourite institutions—the University of London, University College, and the British Museum, of which last he became a trustee on the death of Henry Hallam in 1859. But his connexion with the two former bodies was so close, and he made their administration so completely the chief business of his life after his literary works, that a few words upon the subject are necessary.

It has been already mentioned that he took an active part in the foundation of the university of London in Gower Street. He was a member of the original council of that institution from 1827 to 1831, from which he retired upon entering parliament. This institution exchanged its name for that of "University College" before the foundation in 1836 of the "University of London," which now conducts its business in Burlington House. Grote joined again the council of University College in 1849, and from that time till his death he took a leading part in the administration of its affairs. He became treasurer in 1860, and president in 1868, on the death of Lord Brougham. Grote was one of the seven new members added by the crown to the senate of the "University of London" in 1850. From 1862, when he was elected vice-chancellor, on the resignation of Sir John Shaw Lefevre, he became the leading spirit of the university.

In both University College and the university of London he was the constant advocate of the threefold cord of knowledge—literature, philosophy, science,—which he held to be ruined by tampering with any one of them,—earnestly upholding what he regarded as sound metaphysics, supporting the establishment of degrees in science, and opposing, to the last of his life and strength, the omission of Greek from the examination for matriculation. He left his library to the university; and he showed his attachment to the college and to metaphysical studies by bequeathing to it a sum of £6000 for the endowment of a professorship of mental philosophy. He continued to labour in the discharge of his duties to these institutions, even when far gone in the malady which appeared in 1870, and carried him off on the 18th of June 1871, in his seventy-seventh year. He found his fit resting-place in Westminster Abbey, just beneath Camden's monument, and near Macaulay's grave. His portrait by Mr Millais, taken the year before his death, is preserved in the senate-room of the university of London.

Grote's great literary merits received due and fitting acknowledgment from his contemporaries. He was elected a fellow of the Royal Society, received from the university of Oxford the honorary degree of D.C.L., and from that of Cambridge the honorary degree of LL.D., was made a foreign member of the French Institute in the place of Macaulay, and lastly was offered a peerage by Mr Gladstone in 1869, an honour which he declined. His personal character cannot be better described than in the words of his friend Professor Bain:—"In the depths of his character there was a fund of sympathy, generosity, and self-denial rarely equalled among men; on the exterior, his courtesy, affability, and delicate consideration for the feelings of others were indelibly impressed upon every beholder; yet this amiability of demeanour was never used to mislead, and in no case relaxed his determination for what he thought right. Punctual and exact in his engagements, he inspired a degree of confidence and respect which acted most beneficially on all the institutions and trusts that he took a share in administering; and his loss to them was a positive calamity."

The authorities for Grote's life are—*The Personal Life of George Grote*, by Mrs Grote, 1873, and the *Critical Remarks on his Intellect and Character, Writings, and Speeches* (170 pages), by Professor Bain, prefixed to Grote's *Minor Works*, 1873.

The following is a list of Grote's works, most of which have been noticed in the course of the preceding memoir:—*A History of Greece*, in 12 vols. 8vo, 1846-1856, reprinted in 1862 in 8 vols. 8vo, in 1869 in 12 vols. 12mo, and lastly in 1871 in 10 vols. 8vo; *Plato and the other Companions of Sokrates*, in 3 vols. 8vo, 1865, reprinted in the same form in 1867, and a third time in 1874; *Aristotle*, edited by Alexander Bain and G. Croom Robertson, 2 vols. 8vo, 1872; *The Minor Works of George Grote*, edited by Professor Bain, 1873, containing—(1) "Essentials of Parliamentary Reform;" (2) "Notice of Sir William Molesworth's edition of the Works of Hobbes;" (3) "Grecian Legends and Early History;" (4) "Review of Boeckh on Ancient Weights, Coins, and Measures;" (5) "Presidential Address, in commemoration of the twenty-first Anniversary of the London [illegible] Institution;" (6) "Address on delivering the prizes at University College;" (7) "Review of Sir G. C. Lewis on the Credibility of Early Roman History;" (8) "Plato's Doctrine respecting the Rotation of the Earth, and Aristotle's Comment upon that Doctrine;" (9) "Review of John Stuart Mill on the Philosophy of Sir William Hamilton;" (10) "Papers on Philosophy;" *Seven Letters concerning the Politics of Switzerland, pending the outbreak of the Civil War in 1847*, 1847, reprinted in 1876, with the addition of an unpublished letter written by the author to M. de Tocqueville shortly after the termination of the war; *Fragments on Ethical Subjects*, 1876 (a selection from his posthumous papers).

Mrs Grote survived her husband upwards of seven years, and died on the 29th of December 1878, at her residence in Shiere. She was one of the most remarkable

Englishwomen of the present century. Endowed in youth with great personal beauty, which matured into a grand expression and noble presence in advanced age, she possessed intellectual powers of the highest order, combined with a lofty sense of duty and the strictest regard to truth. The chief events of her life have been already related in the preceding notice of her husband. Her own writings, besides the biography of Mr Grote, are *A Memoir of the Life of Ary Scheffer* (1860), and *Collected Papers (original and reprinted) in Prose and Verse* (1862), of which the most important are a "Review of M. Lavergne's Essay on the Rural Economy of England," "Case of the Poor against the Rich fairly stated," a "Review of Thomas Moore's Life and Works," and the "History of East Burnham." But though she wrote lucidly and powerfully, it has been well observed by one of her friends that "her writings fail to give a just idea of the irresistible fascination of her conversation. *That* she never succeeded in fully transmitting to paper, and it remains a thing of unapproachable excellence and tender memory, only understood by those to whom it afforded the highest mental enjoyment." (W. SM.)

GROTEFEND, Georg Friedrich (1775–1853), to whose patience and ingenuity the decipherment of the cuneiform inscriptions was originally due, was born at Münden in Hanover, June 9, 1775. He was educated partly in his native town, partly at Ilfeld, where he remained till 1795, when he entered the university of Göttingen, and there became the friend of Heyne, Tychsen, and Heeren. Heyne's recommendation procured for him an assistant mastership in the Göttingen gymnasium in 1797. While there he published his work *De Pasigraphia sive Scriptura Universali* (1799), which first brought him into notice, and led to his appointment in 1803 as prorector of the gymnasium of Frankfort-on-the-Main, and shortly afterwards as conrector. Grotefend was best known during his lifetime as a Latin and Italian philologist, though the attention he paid to his own language is shown by his *Anfangsgründe der deutschen Poesie*, published in 1815, and his foundation of a society for investigating the German tongue in 1817. In 1821 he became director of the gymnasium at Hanover, a post which he retained till his retirement in 1849, four years before his death. In 1823–4 appeared his revised edition of Wenck's Latin grammar, in two volumes, followed by a smaller grammar for the use of schools in 1826; in 1835–8 a systematic attempt to explain the fragmentary remains of the Umbrian dialect, entitled *Rudimenta Linguæ Umbricæ ex Inscriptionibus antiquis enodata* (in eight parts); and in 1839 a work of similar character upon Oscan (*Rudimenta Linguæ Oscæ*). In the same year he published an important memoir on the coins of Bactria, under the name of *Die Münzen der griechischen, parthischen, und indoskythischen Könige von Bactrien und den Ländern am Indus*. He soon, however, returned to his favourite subject, and brought out a work in five parts, *Zur Geographie und Geschichte von Altitalien* (1840–2). Previously, in 1836, he had written a preface to Wagenfeld's translation of the spurious *Sanchoniathon* of Philo Byblius, which professed to have been discovered in the preceding year in the Portuguese convent of Santa Maria de Merinhao. But it was in the East rather than in the West that Grotefend did the work which has given him a lasting name. The mysterious cuneiform inscriptions of Persia had for some time been attracting attention in Europe; exact copies of them had been published by the elder Niebuhr, who lost his eyesight over the work; and Grotefend's friend, Tychsen of Rostock, believed that he had ascertained the characters in the column now known to be Persian to be alphabetic. At this point Grotefend took the matter up. His first discovery was communicated to the Royal Society of Göttingen in 1800, and reviewed by Tychsen two years afterwards. In 1815 he gave an account of it in Heeren's great work on ancient history, and in 1837 published his *Neue Beiträge zur Erläuterung der persepolitanischen Keilschrift*. Three years later appeared his *Neue Beiträge zur Erläuterung der babylonischen Keilschrift*. His discovery may be summed up as follows:—(1) that the Persian inscriptions contain three different forms of cuneiform writing, so that the decipherment of the one would give the key to the decipherment of the others; (2) that the characters of the Persian column are alphabetic and not syllabic; (3) that they must be read from left to right; (4) that the alphabet consists of forty letters, including signs for long and short vowels; and (5) that the Persepolitan inscriptions are written in Zend (which, however, is not the case), and must be ascribed to the age of the Achæmenian princes. The process whereby Grotefend arrived at these conclusions is a prominent illustration of persevering genius. History made it clear that the monuments to which the inscriptions were attached belonged to Cyrus and his successors, whose names ought accordingly to be found in them. By a comparison of texts Grotefend determined the groups of characters by which these names were expressed, and by further observing what characters were common to the several groups, and of how many characters each group consisted, he was able to assign the conjectural values of D-A-R-H-E-U-SCH or Darius to the letters of a frequently recurring one. The native pronunciation of Darius was furnished by Strabo and the Old Testament. The names of Xerxes and Artaxerxes were next deciphered, and the phonetic powers of a good many characters were thus ascertained. The correctness of the decipherment was verified, not only by the fact that the right letters were always found in the right places in each name, but also by the discovery that the word which invariably followed each name, and therefore presumably meant "king," when read by the new alphabet, presented the same form as the Zend term for "monarch." It was clear that a solid basis had been laid for the interpretation of the Persian inscriptions, and all that remained was to work out the results of Grotefend's brilliant discovery, a task ably performed by Burnouf, Lassen, and Rawlinson. Grotefend died the 15th of December 1853.

GROTIUS, Hugo (1583–1645), in his native country Huig van Groot, but known to the rest of Europe by the Latinized form of the name, was one of the famous men of the 17th century, almost equally eminent for public services and as a writer. He was born at Delft on Easter day, 10th April 1583. The Groots were a branch of a family of distinction, which had been noble in France, but had removed to the Low Countries more than a century before. Their French name was De Cornets, and this cadet branch had taken the name of Groot on the marriage of Hugo's great-grandfather with a Dutch heiress. The father of Hugo was a lawyer in considerable practice, who had four times served the office of burgomaster of Leyden, and was one of the three curators of the university of that place.

In the annals of precocious genius there is no greater prodigy on record than Hugo Grotius, who was able to make good Latin verses at nine, was ripe for the university at twelve, and at fifteen edited the encyclopædic work of Marcianus Capella. At Leyden he was much noticed by J. J. Scaliger, whose habit it was to engage his young friends in the editing of some classical text, less for the sake of the book so produced than as a valuable education for themselves. At fifteen Grotius accompanied Count Justin of Nassau, and the grand pensionary Oldenbarnevelt on their special embassy to the court of France. After a year profitably spent in that country in acquiring the language and making acquaintance with the leading men, Grotius returned home. He took the degree of doctor of law at Leyden, and entered on practice as an advocate.

Notwithstanding his successes in his profession, which seemed to open the most brilliant career to his ambition, he was in secret hankering after the pleasures of literature. In 1600 he edited the remains of Aratus, with the versions of Cicero, Germanicus, and Avienus. Of the *Germanicus* Scaliger says—"A better text than that which Grotius has given, it is impossible to give;" but it is probable that Scaliger had himself been the reviser. Grotius vied with the Latinists of his day in the composition of Latin verses. Some lines on the siege of Ostend were greatly admired, and spread his fame beyond the circle of the learned. He wrote three dramas in Latin:—*Christus Patiens*; *Sophompaneas*, on the story of Joseph and his brethren; and *Adamus Exul*, a production which is still remembered as having given hints to Milton. The *Sophompaneas* was translated into Dutch by Vondel, and into English by Francis Goldsmith (1652); the *Christus Patiens* into English by George Sandys (1640).

In 1603 the United Provinces, desiring to transmit to posterity some account of their struggle with Spain, determined to appoint a historiographer. Several candidates appeared, Dominicus Bandius of course among them. But the choice of the states fell upon Grotius, though only twenty years of age, and not having offered himself for the post.

There was some talk at this time in Paris of calling Grotius to be librarian of the royal library. But it was never meant seriously. It was a ruse of the Jesuit party, who wished to persuade the public that the opposition to the appointment of Isaac Casaubon did not proceed from theological motives, since they were ready to appoint a Protestant in the person of Grotius.

His next preferment was that of advocate-general of the fisc for the provinces of Holland and Zeeland. This was followed by his marriage, in 1608, to Mary van Reigesberg, a lady of family in Zeeland, a woman of great capacity and noble disposition, who proved every way worthy to be the wife of Grotius.

He had already passed from occupation with the classics to studies more immediately connected with his profession. In the winter of 1604 he composed a treatise entitled *De jure prædæ*. This treatise he did not publish, and the MS. of it remained unknown to all the biographers of Grotius till 1868, when it was brought to light, and printed at the Hague under the auspices of Professor Fruin. It discovers to us that the principles and the plan of the celebrated *De jure belli*, which was not composed till 1625, more than twenty years after, had already been conceived by a youth of twenty-one. It has always been a question among the biographers what it was that determined Grotius, when an exile in Paris in 1625, to that particular subject, and various explanations have been offered; among others we have been referred to a casual suggestion of Peiresc in a letter of early date. The discovery of the MS. of the *De jure prædæ* discloses to us the whole history of Grotius's ideas, and shows us that from youth upwards he had steadily read and meditated in one direction, that, namely, of which the famous *De jure belli* was the mature product. In the *De jure prædæ* of 1604 we have much more than the germ of the later treatise *De jure belli*. Its main principles, and the whole system of thought implied in the latter, are all posited in the earlier work. The arrangement even is the same. The chief difference between the two treatises is one which twenty years' experience in affairs could not but bring,—the substitution of more cautious and guarded language, less dogmatic affirmation, more allowance for exceptions and deviations. The *Jus gentium* was an addition introduced first in the later work, an insertion which is the cause of not a little of the confused arrangement which has been found fault with in the *De jure belli*.

We learn further from the *De jure prædæ* that Grotius was originally determined to this subject, not by any speculative intellectual interest, but by a special occasion presented by his professional engagements. He was retained by the Dutch East India Company as their advocate. The company had been formed for the peaceful purposes of commerce, but had found itself compelled by the aggressions of the Portuguese to repel force by force. One of their captains, Heemskirk, had captured a rich Portuguese galleon in the Straits of Malacca. The right of a private company to make prizes was hotly contested in Holland, and denied by the stricter religionists, especially the Mennonites, who considered all war unlawful. Grotius undertook to prove that Heemskirk's prize had been lawfully captured. In doing this he was led to investigate the grounds of the lawfulness of war in general. Such was the casual origin of a book which long enjoyed such celebrity that it used to be said, with some exaggeration indeed, that it had founded a new science.

A short treatise which was printed in 1609, Grotius says without his permission, under the title of *Mare Liberum*, is nothing more than a chapter—the 12th—of the *De jure prædæ*. It was necessary to Grotius's defence of Heemskirk that he should show that the Portuguese pretence that Eastern waters were their private property was untenable. Grotius maintains that the ocean is free to all, and cannot be appropriated by any one nation. The occasional character of this piece explains the fact that at the time of its appearance it made no sensation. It was not till many years afterwards that the jealousies between England and Holland gave importance to the novel doctrine broached in the tract by Grotius, a doctrine which Selden set himself to refute in his *Mare clausum*, 1632.

Equally due to the circumstances of the time was his small contribution to constitutional history entitled *De antiquitate reipublicæ Batavæ* (1610). In this he vindicates, on grounds of right, prescriptive and natural, the revolt of the United Provinces against the sovereignty of Spain.

On the death of Elias Oldenbarnevelt, Grotius, then only thirty, succeeded him as pensionary of the city of Rotterdam. Foreseeing the troubles impending from the growing theological fermentation, he made the stipulation that he should be irremovable by the municipal authorities—a stipulation certain not to be respected should it ever be wanted for his protection.

In 1613 he formed one of a deputation to the court of England, for the purpose of adjusting those differences which were already beginning to arise between the two young maritime powers, and which gave rise afterwards to a naval struggle disastrous to Holland. He was received by James with every mark of distinction due to his rising reputation. He also cultivated the acquaintance of the Anglican ecclesiastics Overal and Andrewes, and was much in the society of the celebrated scholar Isaac Casaubon, with whom he had been in correspondence by letter for many years. Though the mediating views in the great religious conflict between Catholic and Protestant, by which Grotius was afterwards known, had been arrived at by him by independent reflexion, yet it could not but be that he would be confirmed in them by finding in England a developed school of thought of the same character already in existence. How highly Casaubon esteemed Grotius appears from a letter of his to Daniel Heinsius, dated London, 15th April 1613. "I cannot say how happy I esteem myself in having seen so much of a man so truly great as Grotius. A wonderful man! This I knew him to be before I had seen him; but the rare excellence of that divine genius no one can sufficiently feel who does not see his face, and hear him speak. Probity is stamped on his features; his conversation savours of true piety and profound learning. It is not only upon me that he has made this impression; all the pious and learned to whom he has been here introduced have felt the same towards him; the king especially so."

After Grotius's return from England the exasperation of the theological parties in Holland gradually rose to such a pitch that it became clear that an appeal to force would sooner or later be made. This Grotius must have foreseen, but he could hardly have anticipated that he himself would be one of the first and principal victims. Grotius was not sufficient of a philosopher to rise above the level of a mere theological wrangle. But from a natural moderation of temper he sought to find some mean term in which the two hostile parties of Remonstrants and Anti remonstrants, or as they were subsequently called Arminians and Gomarists (see REMONSTRANTS), might agree. A form of edict drawn by Grotius was published by the states, recommending mutual toleration, and forbidding ministers in the pulpit from handling the disputed dogmas. To the orthodox Calvinists the word toleration was insupportable. They had the populace on their side. This fact determined the stadtholder, Maurice of Nassau, to support the orthodox party—a party to which he inclined the more readily that Oldenbarnevelt, the grand pensionary, the man whose uprightness and abilities he most dreaded, sided with the Remonstrants.

In 1618 Prince Maurice set out on a sort of pacific campaign, disbanding the civic guards in the various cities of Guelders, Holland, and Zeeland, and occupying the places with troops on whom he could rely. The states of Holland sent a commission, of which Grotius was chairman, to Utrecht, with the view of strengthening the hands of their friends, the Remonstrant party, in that city. Feeble plans were formed, but not carried into effect, for shutting the gates upon the stadtholder, who entered the city with troops on the night of 26th July 1618. There were conferences in which Grotius met Prince Maurice face to face, and taught him that Oldenbarnevelt was not the only man of capacity in the ranks of the Remonstrants whom he had to fear. On the early morning of 31st July the prince's *coup d'état* against the liberties of Utrecht and of Holland was carried out: the civic guard was disarmed,—Grotius and his colleagues saving themselves by a precipitate flight. But it was only a reprieve. The grand pensionary, Oldenbarnevelt, the leader of the Remonstrant party, Grotius, and Hoogeoberz were arrested by order of the stadtholder, brought to trial, and condemned,—Oldenbarnevelt to death, and Grotius to imprisonment for life and confiscation of his property. In June 1619 he was immured in the fortress of Lovestein near Gorcum. His confinement was rigorous, but after a time his wife obtained permission to share his captivity, on the condition that if she came out, she should not be suffered to return.

Grotius had now before him, at thirty-six, no prospect but that of a lifelong captivity. He did not abandon himself to despair, but sought refuge in returning to the classical pursuits of his youth. Several of his translations (into Latin) from the Greek tragedians and other writers, made at this time, have been printed. They are without any philological value, and only prove his taste and facility in the classical languages. "The Muses," he writes to Voss, "were now his consolation, and appeared more amiable than ever."

The address and ingenuity of Madame Grotius at length devised a mode of escape. It had grown into a custom to send, at stated intervals, the books which he had done with, in a chest, along with his linen to be washed at Gorcum. For many months the warders of the fortress were very exact in searching the chest. But never finding anything but books and linen they grew careless, and began to let the chest pass without opening it. Madame Grotius, perceiving this, prevailed on her husband to allow himself to be shut up in it at the usual time. The two soldiers who carried the chest out complained that it was so heavy "there must be an Arminian in it." "There are indeed," said Madame Grotius, "Arminian books in it." The chest was carried by canal to Gorcum. When it came there they wanted to put it on a sledge; but the maid telling the boatmen there were some brittle things in it, it was put on a horse, and so carried to the house of a friend, where it was opened, and Grotius released. He was then dressed up like a mason with hod and trowel, and so conveyed in disguise over the frontier. His first place of refuge was Antwerp, from which he proceeded to Paris, where he arrived in April 1621. In October he was joined by his wife. There he was presented to the king, Louis XIII., and a pension of 3000 livres conferred upon him. French pensions were easily granted, all the more so as they were never paid. Grotius was now reduced to great straits. He had not the means of procuring the bare necessaries of life. His family was a growing one, and it was with difficulty that he procured them clothes. His relations in Holland sent him occasionally small remittances in money, clothes, or Dutch butter. He looked about for any opening through which he might earn a living. There was talk of something in Denmark; or he would settle in Spire, and practise in the court there. Some little relief he got through the intervention of D'Aligre, the new chancellor, who procured a royal mandate which enabled Grotius to draw, not all, but a large part of his pension. In 1623 the president Henri de Même lent him his chateau of Balagni near Senlis (dep. Oise), and there Grotius passed the spring and summer of that year. De Thou gave him facilities to borrow books from the superb library formed by his father.

Under these circumstances the *De jure belli et pacis* was composed. The biographers are naturally astonished by the fact that a work of such immense reading, consisting in great part of quotation, could have been written in little more than a year. The achievement would have been, not wonderful, but impossible, but for the fact above mentioned that Grotius had with him the first draft of the work made in 1604. He had also got his brother William, when he was reading his classics, to mark down all the passages which touched upon law, public or private. In March 1625 the printing of the *De jure belli*, which had taken four months, was completed, and the edition despatched to the fair at Frankfort. His own honorarium as author consisted of 200 copies, of which, however, he had to give away many to friends, to the king, the principal courtiers, the papal nuncio, &c. What remained he sold for his own profit, at the price of a crown each, but the sale did not recoup him his outlay. But though his book brought him no profit it brought him reputation, so widely spread, and of such long endurance, as no other legal treatise has ever enjoyed.

Grotius naturally hoped that his fame would soften the hostility of his foes, and that his country would recall him to her service. In this he was disappointed. Theological rancour prevailed over all other sentiments. After some fruitless attempts to re-establish himself in Holland, Grotius was fain to accept service under the crown of Sweden, in the capacity of ambassador to the court of France. He was not very successful in negotiating the treaty on behalf of the Protestant interest in Germany, Richelieu having a special dislike to him. He never enjoyed the confidence of the court to which he was accredited, and frittered away his influence in disputes about precedence, which seem little worthy of his reputation.

In 1645 he demanded and obtained his recall. He was received at Stockholm with all the honours due to him. But neither the climate nor the tone of the court suited him, and he demanded permission to leave. He was driven by a storm on the coast near Dantzic. He got as far as Rostock, where he found himself very ill. Stockman, a Scotch physician who was sent for, thought it was only weakness, and that rest would restore the patient. But Grotius sank rapidly, and died on 29th August 1645.

Grotius was a man of varied interests and accomplishments, combining a wide circle of general knowledge with a profound study of one branch of law. History, theology, jurisprudence, politics, classics, poetry,—all these fields he cultivated, and has left numerous works in each kind.

His commentaries on the Scriptures were the first application on an extensive scale of the principle affirmed by Scaliger, that, namely, of interpretation by the rules of grammar without dogmatic assumptions. Grotius's philological skill, however, was not sufficient to enable him to work up to this ideal.

As in many other points Grotius inevitably recalls to us Erasmus, so he does in his attitude towards the great schism. Grotius was indeed a man of profound religious sentiment, which Erasmus was not; but he had an indifference to dogma equal to that of Erasmus, although his disregard sprang from another source. Erasmus felt the contempt of a man of letters for the barbarous dissonance of the monkish wrangle. Grotius was animated by an ardent desire for peace and concord. He thought that a basis for reconciliation of Protestant and Catholic might be found in a common piety, combined with reticence upon discrepancies of doctrinal statement. His *De veritate religionis Christianæ* (1627), a presentment of the evidences, is so written as to form a code of common Christianity, irrespective of sect. The little treatise diffused itself rapidly over Christendom, gaining rather than losing popularity in the 18th century. It became the classical manual of apologetics in Protestant colleges, and was translated for missionary purposes into Arabic (by Pococke, 1660), Persian, Chinese, &c. His *Via et votum ad pacem ecclesiasticam* (1642) was a detailed proposal of a scheme of accommodation. Of course, like all men of moderate and mediating views, he was charged by both sides with vacillation. An Amsterdam minister, James Laurent, published his *Grotius papizans* (1642), and it was continually being announced from Paris that Grotius had "gone over." Hallam, who has collected all the passages from Grotius's letters in which the prejudices and narrow tenets of the Reformed clergy are condemned, thought he had a "bias towards popery" (*Lit. of Europe*, ii. 312). The true interpretation of Grotius's mind appears to be an indifference to dogmatic propositions, produced by a profound sentiment of piety. He rose above the separatist bigotry of the vulgar theologian, but did not ascend into that philosophical region in which dogma is transcended and dissolved. He approached parties as a statesman approaches them, as facts which have to be dealt with, and governed, not suppressed in the interests of some one of their number.

His editions and translations of the classics were either juvenile exercises prescribed by Scaliger, or "lusus poetici," the amusement of vacant hours. Grotius read the classics as a humanist, for the sake of their contents, not as a professional scholar.

His *Annals of the Low Countries* was begun as an official duty while he held the appointment of historiographer, and was being continued and retouched by him to the last. It was not published till 1657, by his sons Peter and Cornelius.

But the high reputation which Grotius attained in his lifetime, though it rests in part, like that of Erasmus, on the diversity of his accomplishments and the comprehensiveness of his literary view, had also a scientific basis in a professional specialty. Grotius was a great jurist, and his *De jure belli et pacis* (Paris, 1625), though not by any means the first attempt in modern times to ascertain the principles of jurisprudence, went far more fundamentally into the discussion than anyone had done before him. The title of the work was so far misleading that the *jus belli* was a very small part of his comprehensive scheme. In his treatment of this narrower question he had the works of Albericus Gentilis (1588) and Ayala (1597) before him, and has acknowledged his obligations to them. But it is in the larger questions to which he opened the way that the merit of Grotius consists. His was the first attempt to obtain a principle of right, and a basis for society and government, outside the church or the Bible. The distinction between religion on the one hand and law and morality on the other is not indeed clearly conceived by Grotius, but he wrestles with it in such a way as to make it easy for those who followed him to seize it. The law of nature is unalterable; God Himself cannot alter it any more than He can alter a mathematical axiom. This law has its source in the nature of man as a social being; it would be valid even were there no God, or if God did not interfere in the government of the world. These positions, though Grotius's religious temper did not allow him to rely unreservedly upon them, yet, even in the partial application they find in his book, entitle him to the honour of being held the founder of the modern science of the law of nature and nations. The *De jure* exerted little influence on the practice of belligerents, yet its publication was an epoch in the science. "The elegance of his diction," says Bluntschli, "the pearls from classical antiquity with which he adorned his pages, the temper of humanity which pervaded his argument, his effort to mitigate the horrors of the Thirty Years' War in the midst of which he wrote, and the warmth of his general sympathy for a moral as opposed to a material order, enlisted men's hearts on the side of his reasoning, while the deficiencies of his doctrine were not as yet detected." These defects are probably now, at 250 years' distance of time, more palpable than the merits of the work. But only in the heat and impertinence of irresponsible periodical criticism could it be said, as De Quincey has said, that the book is equally divided between "empty truisms and time serving Dutch falsehoods." For a saner judgment and a brief abstract of the contents of the *De jure*, the reader is referred to Bluntschli, *Geschichte des allgemeinen Staatsrechts* (Munich, 1864). A fuller analysis, and some notice of the predecessors of Grotius, will be found in Hely, *Étude sur le droit de la guerre de Grotius* (Paris, 1875). The writer, however, with the usual unacquaintance of Frenchmen with everything which goes on outside France, has never heard of the *De jure prædæ*, published in 1868. Hallam, *Lit. of Europe*, ii. p. 543, has an abstract done with his usual conscientious pains. Dugald Stewart (*Collected Works*, i. 370) has dwelt upon the confusion and defects of Grotius's theory. Mackintosh (*Miscell. Works*, p. 166) has defended Grotius, affirming that his work "is perhaps the most complete that the world has yet owed, at so early a stage in the progress of any science, to the genius and learning of one man."

The chief writings of Grotius have been named in the course of this article. For a complete bibliography of his works, published and unpublished, the reader is referred to [illegible] [illegible], 1727, which [illegible] a full [illegible] of the letters [illegible] published a [illegible] [illegible] Other [illegible] Brandt, [illegible] 18[illegible] Luden, *Hugo Grotius nach seinen* [illegible] und

Schriften dargestellt, 8vo, Berlin, 1806; *Life of Hugo Grotius*, by Charles Butler of Lincoln's Inn, 8vo, London, 1826. The work of the Abbé Hely already mentioned contains a life of Grotius. Grotius's theological works were collected in 3 vols. fol. at Amsterdam, 1644–46; reprinted London, 1660, Amsterdam, 1679, and again Amsterdam, 1698. His letters were printed first in a selection, *Epistolæ ad Gallos*, 12mo, Leyden, 1648, abounding, though an Elzevir, in errors of press. They were collected in *H. Grotii Epistolæ quotquot reperiri potuerunt*, fol., Amsterdam, 1687. A few may be found scattered in other collections of *Epistolæ*. Supplements to the large collection of 1687 were published at Harlem, 1806; Leyden, 1809; and Haarlem, 1829. The *De jure belli* was translated into English by Whewell, 3 vols. 8vo, Camb., 1853; into French by Barbeyrac, 2 vols. 4to, Amst., 1724; into German in Kirchmann's *Philosophische Bibliothek*, 3 vols. 12mo, Leipsic, 1872. (M. P.)

GROTON, a post town of New London county, Connecticut, U.S., is situated on the rivers Mystic and Pequonnock, opposite New London, and on the east side of the river Thames at its junction with Long Island Sound. There are granite quarries in the neighbourhood, and the town possesses manufactures of cotton goods, britannia ware, carriages, and sashes and blinds, and brass and iron foundries. There is also a considerable coasting trade, and shipping and fishing are carried on to a small extent. On the heights behind the town stands Fort Griswold, which surrendered to the British troops, September 6, 1781. The majority of its defenders, including the commander Colonel Ledyard, were put to death after they had surrendered; and a granite monument was erected in the town to their memory in 1830. The population in 1870 was 5124.

GROTTAGLIE, a small city of Italy, in the province of Lecce and circondario of Taranto, about 14 miles N.E. of Taranto. It probably occupies the site of Rudiæ, the birthplace of the Latin poet Ennius, afterwards known as Castel Rodelle. The name Grottaglie is due to the number of caves in the vicinity. In modern times the place is worthy of note mainly because it has given birth to several men of considerable national eminence, as is set forth in detail in Pignatelli's history of the town. An excellent red clay for the manufacture of earthenware is found at Grottaglie. The inhabitants numbered 8747 in 1871.

GROUND NUT (synonyms, Earth Nut, Pistache de Terre, Monkey Nut, Pea Nut, Manilla Nut), a nut or pod the produce of the *Arachis hypogæa*, L. (Nat. Ord. *Leguminosæ*). The plant is an annual of diffuse habit, with hairy stem, with two-paired, abruptly pinnate leaflets. The flowers above ground are sterile, and the pods or legumes are stalked, oblong, cylindrical, about 1 inch in length, the thin reticulated shell containing one or two irregularly ovoid seeds. After the flower withers, the stalk of the ovary has the peculiarity of elongating and bending down, forcing the young pod under ground, and thus the seeds become matured at some distance below the surface. Hence the specific and vernacular names of the plant. Two varieties are recognized in Malacca and Java, a white and a brown, and the seeds are known as *minyak katjang* (oil bean). Of the history of this plant much has been written. Monardes in 1596 writes of having seen it largely used about the river Marañon in Brazil, and Marcgraf in 1648 gave a description and figure of it. To M. Jaubert, however, a colonist at Gorée near Cape Verd, seems to belong the honour of first recommending it as of commercial value. As to its native country the opinions of botanists are divided between Africa and America. It is extensively cultivated in all tropical and subtropical countries, especially in America, Africa, India, the Malayan Archipelago, and China. The plant affects a light sandy soil, and is very prolific, yielding in some instances 30 to 38 bushels of nuts per acre. The pods when ripe are dug up and dried. The seeds when fresh are largely eaten in tropical countries, and in taste are almost equal to almonds; when roasted they are used as a substitute for chocolate. Even in England large quantities of these "monkey nuts" are consumed by the poorer children. By expression the seeds yield a large quantity of oil, which is used by natives for lamps, as a fish or curry oil, and for medicinal purposes. The leaves form an excellent food for cattle, being very like clover.

Large quantities of seeds are imported to Europe, chiefly to Marseilles, London, Hamburg, and Berlin, for the sake of their contained oil. The seeds yield from 42 to 50 per cent. of oil by cold expression, but a larger quantity is obtained by heat, although of an inferior quality. The seeds being soft facilitate mechanical expression, and where bisulphide of carbon or other solvent is used, a very pure oil is obtained.

The expressed oil is limpid, of a light yellowish or straw colour, having a faint smell and bland taste; it forms an excellent substitute for olive oil, although in a slight degree more prone to rancidity than the latter. Its specific gravity is 0·916 to 0·918; it becomes turbid at 3° C., concretes at + 3° to − 4° C., and hardens at + 7° C. It is a non-drying oil. Ground nut oil consists of (1) oleic acid ($C_{18}H_{34}O_2$); (2) hypogæic acid ($C_{16}H_{30}O_2$), by some supposed to be identical with a fatty acid found in whale oil; (3) palmitic acid ($C_{16}H_{32}O_2$); and (4) arachic acid ($C_{20}H_{40}O_2$). The oil is officinal in the Indian pharmacopœia, replacing olive oil, and it is also used in the adulteration of gingelly oil. In 1874 about 145 million ℔ of ground nuts, valued at £1,040,000, were exported from the west coast of Africa, chiefly to Marseilles, London, Hamburg, and Berlin.

GROUNDSEL (German, *Kreuzkraut*; French, *Seneçon*), *Senecio vulgaris*, Linn., is an annual, glabrous or more or less woolly plant of the natural order *Compositæ*, series *Tubulifloreæ* and tribe *Senecionideæ*, having a branched succulent stem 6 to 15 inches in height; pinnatifid and irregularly and coarsely-toothed leaves; flowers in separate corymbs, with involucres of about 20 equal and several external and smaller bracts, and florets yellow and tubular, rarely ligulate in the marginal row; and ribbed and silky fruit. The plant is indigenous to Europe, whence it has been introduced into all temperate climates. It is a troublesome weed, flowering throughout the year, and propagating itself rapidly by means of its light feathery fruits; it has its use, however, as a food for cage-birds. *Senecio sylvaticus* and *S. viscosus* are known respectively as mountain groundsel and stinking groundsel. Many species of the genus are handsome florists' plants. The groundsel tree, *Baccharis halimifolia*, Linn., a native of the North American sea-coast from Massachusetts southward, is a Composite shrub, attaining 6 to 12 feet in height, and having angular branches, obovate or oblong-cuneate, somewhat scurfy leaves, and flowers larger than but similar to those of common groundsel. The long white pappus of the female plant renders it a conspicuous object in autumn. The groundsel tree has been cultivated in British gardens since 1683.

See London, *Arboretum*, vol. ii., 1838; Syme, *Sowerby's English Botany*, vol. v., 3d ed., 1866.

GROUSE, a word of uncertain origin,[1] now used generally by ornithologists to include all the "rough-footed" Gallinaceous birds, but in common speech applied almost exclusively, when used alone, to the *Tetrao scoticus* of Linnæus, the *Lagopus scoticus* of modern systematists—more particularly called in English the Red Grouse, but not a century ago almost invariably spoken of as the Moor-fowl or Moor-game. The effect which this species is supposed to have on the British legislature, and therefore on history, is well known, for it is the common belief that parliament in these days always rises when the season for Grouse-shooting begins; but even of old time it seems to have excited on one occasion a curious kind of influence, for we may read in the *Orkneyinga Saga* (ed. Jonæus, p. 356; ed. Anderson, p. 150) that events of some importance in the annals of North Britain followed from its pursuit in Caithness in the year 1157. The Red Grouse is found on moors from Monmouthshire and Derbyshire northward to the Orkneys, as well as in most of the Hebrides. It likewise inhabits similar situations throughout Wales and Ireland, but it does not naturally occur beyond the limits of the British Islands,[1] and is the only species among birds peculiar to them. The word "species" may in this case be used advisedly (since the Red Grouse invariably "breeds true," it admits of an easy *diagnosis*, and it has a definite geographical range); but scarcely any zoologist who looks further into the matter can doubt of its common origin with the Willow Grouse, *Lagopus albus* (*L. subalpinus* or *L. saliceti* of some authors), that inhabits a subarctic zone from Norway across the whole continent of Europe and Asia, as well as North America from the Aleutian Islands to Newfoundland. The Red Grouse indeed is rarely or never found away from the heather on which chiefly it subsists, and with which in most men's minds it is associated; while the Willow Grouse in many parts of the Old World seems to prefer the shrubby growth of berry-bearing plants (*Vaccinium* and others) that, often thickly interspersed with willows and birches, clothes the higher levels or the lower mountain-slopes, and it contrives to flourish in the New World where heather scarcely exists, and a "heath" in its strict sense is unknown. It is true likewise that the Willow Grouse always becomes white in winter, which the Red Grouse never does, but then we find that in summer there is a considerable resemblance between the two species, the cock Willow Grouse having his head, neck, and breast of nearly the same rich chestnut-brown as his British representative, and, though his back be lighter in colour, as is also the whole plumage of his mate, than is found in the Red Grouse, in other respects than those named above the two species are precisely alike. No distinction can be discovered in their voice, their eggs, their build, nor in their anatomical details, so far as these have been investigated and compared.[2] In connexion too with this matter it should not be overlooked that the Red Grouse, restricted as is its range, varies in colour not inconsiderably according to locality, so that game-dealers of experience are able to pronounce at sight the native district of almost any bird that comes to their hands.

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[1] It seems first to occur (*fide* O. Salusbury Brereton, *Archæologia*, iii. p. 157) as "grows" in an ordinance for the regulation of the royal household dated "apud Eltham, mens. Jan. 22 Hen. VIII.," *i.e.*, 1531, and considering the locality must refer to Black game. It is found in an Act of Parliament 1 Jac. I. cap. 27, § 2, *i.e.*, 1603, and, as reprinted in the *Statutes at Large*, stands as now commonly spelt, but by many writers or printers the final *e* is now omitted. In 1611 Cotgrave had "Poule griesche. A Moore henne; the henne of the *Grice* [in ed. 1673 "Griece"] or Moore game" (*Dictionarie of the French and English Tongues*, sub voce *Poule*). The most likely derivation seems to be from the old French word *Griesche*, *Greoche*, or *Greais* (meaning speckled, and cognate with *griseus*, grisly or grey), which was applied to some kind of Partridge, or according to Brunetto Latini (*Trés.*, p. 211) to a Quail, "porce que ele fu premiers trovée en Grece."

Red Grouse.

Other peculiarities of the Red Grouse—the excellence of its flesh, and its economic importance, which is perhaps greater than that of any other wild bird in the world—hardly need notice here, and there is not space to dwell upon that dire and mysterious malady to which it is from time to time subject, primarily induced, in the opinion of many, by the over-stocking of its haunts and the propagation of diseased offspring by degenerated parents.[3]

Though the Red Grouse does not, after the manner of other members of the genus *Lagopus*, become white in winter, Scotland possesses a species of the genus which does. This is the Ptarmigan,[4] *L. mutus* or *L. alpinus*, which differs far more in structure, station, and habits from the Red Grouse than that does from the Willow-Grouse, and in Scotland is far less abundant, haunting only the highest and most barren mountains. It is said to have formerly inhabited both Wales and England, but there is no evidence of its appearance in Ireland. On the continent of Europe it is found most numerously in Norway, but at an elevation far above the growth of trees, and it occurs on the Pyrenees, and on the Alps. It also inhabits northern Russia, but its eastern limit is unknown. In North America, Greenland, and Iceland it is represented by a very nearly allied form—so much so indeed that it is only at certain seasons that the slight difference between them can be detected. This form is the *L. rupestris* of authors, and it would appear to be found also in Siberia (*Ibis*, 1879, p. 148). Spitsbergen is inhabited by a large form which has received recognition as *L. hemileucurus*, and the southern end of the chain of the Rocky Mountains is tenanted by a very distinct species, the smallest and perhaps the most beautiful of the genus, *L. leucurus*, which has all the feathers of the tail white. The very curious and still hardly understood question of the moulting of the Ptarmigan could not possibly be discussed within these limits—reference has already been made to it in another article (BIRDS, vol. iii. p. 776).

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[1] It has been successfully, though with much trouble, as stated by Mr Oscar Dickson, on a tract of land near Gottenburg in Sweden (*Svenska Jägareförbundets Nya Tidskrift*, 1869, p. 11), and seems likely to maintain itself there, so long as the care hitherto bestowed upon it is continued.

[2] A very interesting subject for discussion would be whether *Lagopus scoticus* or *L. albus* has varied most from the common stock of both. We can here but briefly indicate the more salient points that might arise. Looking to the fact that the former is the only species of the genus which does not assume white clothing in winter, an evolutionist might at first deem the variation greatest in its case; but then it must be borne in mind that the species of *Lagopus* which turn white differ in that respect from all other groups of the family *Tetraonidæ*. Furthermore it must be remembered that every species of *Lagopus*, even *L. leucurus*, the whitest of all, has its first set of feathers coloured brown. These are dropped when the bird is about half-grown, and in all the species but *L. scoticus* white feathers are then produced. If therefore, as is generally held, the successive phases assumed by any animal in the course of its progress to maturity represent the phases through which the species has passed, there may have been a time when all the species of *Lagopus* were always clothed in brown, even when adult, and the white dress donned in winter has been imposed upon the wearers by causes that can be easily suggested, for it has been freely admitted by naturalists of all schools that the white plumage of the birds of this group protects them from danger during the snows of a protracted winter. On the other hand it is not at all inconceivable that the Red Grouse, instead of perpetuating directly the more ancient properties of an original *Lagopus* that underwent no great seasonal change of plumage, may derive its ancestry from the widely ranging Willow Grouse, which in an epoch comparatively recent in the geological record may have stocked Britain, and left descendants there, under conditions in which the assumption of a white garb would be almost fatal to the preservation of the species, have reverted (though doubtless with some modifications) to a comparative immutability essentially the same as that of the primal *Lagopus*.

[3] See [illegible] the papers of Prof. Young in *Proc. Nat. Hist. Soc. Glasgow*, [illegible], and Dr Farquharson, *Brit. Med. Journal*, No. [illegible], p. [illegible] [illegible].

[4] [illegible] (as quoted by Mr [illegible], [illegible]) writing [illegible] in 1617, [illegible] the word [illegible] this form it appears in one of the Scots Acts in 1621 [illegible] "water-fowl," [illegible] seems to have been the first Englishman to use the word "Ptarmigan." How the unnecessary initial letter has crept in [illegible] knows. The word is admittedly from the Gaelic *Tarmachan*, meaning, according to some, "a dweller among the hills," [illegible] thought by [illegible] to refer possibly to the [illegible] croaking flight.

Ptarmigan.

The bird, however, to which the name of Grouse in all strictness belongs is probably the *Tetrao tetrix* of Linnæus—the Blackcock and Greyhen, as the sexes are with us respectively called. It is distributed over most of the heath-country of England, except in East Anglia, where attempts to introduce it have been only partially successful. It also occurs in North Wales, and very generally throughout Scotland, though not in Orkney, Shetland, or the Outer Hebrides, nor in Ireland. On the continent of Europe it has a very wide range, and it extends into Siberia. In Georgia its place is taken by a distinct species, on which a Polish naturalist (*Proc. Zool. Society*, 1875, p. 267) has unhappily conferred the name of *T. mlokosiewiczi*. Both these birds have much in common with their larger congener the Capercally (see vol. v. p. 53) and its eastern representative.

Blackcock.

We must then notice the species of the genus *Bonasa*, of which the European *B. sylvestris* is the type. This does not inhabit the British Islands; unfortunately so, for it is perhaps the most delicate game-bird that comes to table. It is the *Gelinotte* of the French, the *Haselhuhn* of Germans, and *Hjerpe* of Scandinavians. Like its transatlantic congener *B. umbellus*, the Ruffed Grouse or Birch Partridge (of which there are two other local forms, *B. umbelloides* and *B. sabinii*), it is purely a forest bird. The same may be said of the species of *Canace*, of which two forms are found in America, *C. canadensis*, the Spruce Partridge, and *C. franklini*, and also of the Siberian *C. falcipennis*. Nearly allied to these birds is the group known as *Dendragapus*, containing three large and fine forms *D. obscurus*, *D. fuliginosus*, and *D. richardsoni* all peculiar to North America. Then we have *Centrocercus urophasianus*, the Sage-cock of the plains of Columbia and California, and *Pediocætes*, the Sharp tailed Grouse, with its two forms *P. phasianellus* and *P. columbianus*, while finally *Cupidonia*, the Prairie-hen, also with two local forms, *C. cupido* and *C. pallidicincta*, is a bird that in the United States of America possesses considerable economic value, as witness the enormous numbers that are not only consumed there, but exported to Europe. It will be seen that the great majority of Grouse belong to the northern part of the New World, and it is much to be regretted that space here fails to do justice to these beautiful and important birds, by enlarging on their interesting distinctions. They are nearly all figured in Elliot's *Monograph of the Tetraoninæ*, and an excellent account of the American species is given in Baird, Brewer, and Ridgway's *North American Birds* (iii. pp. 414–465). (A. N.)

GROVE. The almost universal occurrence, at one stage or another in the religious and social development of the races of mankind, of the practice of worshipping by preference under or among trees to which a peculiarly sacred and inviolable character is attached, is a fact too well known to require particular illustration here. Its explanation is to be sought partly in obvious considerations of physical convenience, but even more in certain psychical phenomena which may still be made matters of direct observation and experience ("Lucos, et in iis silentia ipsa adoramus," Pliny, *H.N.*, xii. 1; "Secretum luci . . . et admiratio umbræ fidem tibi numinis facit," Sen., *Ep.* xli.). It does not appear to have any necessary connexion with tree-worship, another very widely diffused practice, on which, and on its possible connexion with ancestor-worship, some suggestive remarks will be found in Spencer's *Principles of Sociology*. It has sometimes been alleged as a characteristic difference between the Semitic and the Aryan races that the former show a tendency to select single trees for sanctuaries, while the latter are generally found worshipping in groves; and this generalization, though liable to many exceptions, is really borne out at least by the familiar indications to be met with in Scripture. The word "grove" so often met with in the authorized version of the Bible, is nowhere there correctly employed. In Gen. xxi. 33 and 1 Sam. xxii. 6 (margin) it is used as a rendering of the Hebrew word אֵשֶׁל of which "tamarisk" is the proper translation. In every other instance in which it occurs (Ex. xxxiv. 13; Deut. xii. 3; xvi. 21; Judg. iii. 7; vi. 25, 28; Isa. xvii. 8; Mic. v. 14; and often in Kings and Chronicles) where the LXX. translate ἄλσος, and the Vulgate *lucus*, the

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[1] See footnote, p. 221

original is invariably Asherah (אֲשֵׁרָה), meaning a tree or post (see **Baal**, vol. iii. p. 175). The "plain" of Moreh, or Mamre also, in Gen. xii. 6 and xiii. 18, represents אֵלֹן, which all modern interpreters render "terebinth."

GRUBER, **Johann Gottfried** (1774–1851), a learned German author, was born at Naumburg on the Saale, 29th November 1774. He received his education at the town school of Naumburg and the university of Leipsic, after which he resided successively at Gottingen, Leipsic, Jena, and Weimar, occupying himself partly in teaching and partly in various literary enterprises, and enjoying in Weimar the friendship of Herder, Wieland, and Goethe. In 1811 he was appointed professor at the university of Wittenberg, and after the division of Saxony he was sent by the senate to Berlin in connexion with the negotiations for the union of the university of Wittenberg to that of Halle. After the union was effected he became in 1815 professor of philosophy at Halle. On the death of Hufeland he was associated with Ersch in the editorship of the great work *Allgemeine Encyklopädie der Wissenschaften und Künste*; and after the death of Ersch he continued the first section from vol. xviii. to vol. liv. He also succeeded Ersch in the editorship of the *Allgemeine Literaturzeitung*. He died 7th August 1851.

Gruber was the author of a large number of works, the principal of which are *Charakteristik Herders*, in conjunction with Danz, Leipsic, 1805; *Geschichte des Menschlichen Geschlechts*, 2 vols., Leipsic, 1806; *Worterbuch der Altklassischen Mythologie*, 3 vols., Weimar, 1810–15; *Wielands Leben*, 2 parts, Weimar, 1815–16; and *Klopstocks Leben*, Weimar, 1832. A completed biography of Wieland was prefixed to Gruber's edition of Wieland's *Sammtliche Werke*, Leipsic, 1818–28.

GRUN, **Anastasius** (1806–1876), pseudonym for Anton Alexander, count of Auersperg, who was born April 11, 1806, at Laibach, the capital of the Austrian duchy of Carniola. He received his university education first at Gratz and then at Vienna, where he studied jurisprudence. In 1832 the title of "Imperial Chamberlain" was conferred upon him, and in 1839 he married the daughter of Count Attems. He accepted no official post, and devoted himself chiefly to literary pursuits. When the "March Revolution" broke out in 1848 at Vienna, the count entered the political arena, and represented the district of Laibach at the National Assembly at Frankfort-on-the-Main. After a few months, however, he resigned his seat, and again retired into private life. In 1860, when a fresh impulse was given to political life in Austria, he resumed his activity as a politician, and greatly distinguished himself in the Austrian House of Lords as one of the most intrepid and influential supporters of the cause of liberalism, both in political and religious matters, until his death in 1876. Count Auersperg acquired great fame as a poet, as which he is known under the pseudonym of *Anastasius Grün*. His first publication, *Blätter der Liebe*, "Leaves of Love" (1830), showed little originality; but his second production, *Der letzte Ritter*, "The Last Knight" (1830), brought to light his eminence as a poet. It celebrates the deeds and adventures of the emperor Maximilian I. (1493–1519), and contains exquisite [illegible] tempered with playful humour. His next [illegible] production, *Spaziergänge eines Wiener Poeten*, "Walks of a Vienna Poet" (1831), and *Schutt*, "Rubbish" [illegible] the whole of Germany by the bold [illegible] conception and by their [illegible]. His [illegible] (1837) [illegible] his reputation as a poet, but not so his epics, *Die Nibelungen im Frack* (1843) and *Der Pfaff vom Kahlenberg* (1850). He also published masterly translations of the popular Slovenian songs current in Carniola (1850), and of the English poems relating to "Robin Hood" (1864). Anastasius Grün may be called the originator of the modern school of political lyric poetry in Germany. His language is sonorous and majestic, and his descriptions, though sometimes overcrowded with imagery, bear the stamp of great poetical originality. He loved to employ the stately "Nibelungen measure," which imparted considerable vigour to some of his productions. Of his shorter poems *Der letzte Dichter*, "The last Poet," is deservedly the most popular.

GRÜN, **Hans Baldung** (*c.* 1470–1545), commonly called Grün, a painter of the age of Dürer, was born about 1470 at Gmünd in Swabia, and spent the greater part of his life at Strasburg and Freiburg in Breisgau. The earliest pictures assigned to him are altarpieces with the monogram H. B. interlaced, and the date of 1496, in the monastery chapel of Lichtenthal near Baden. Another early work is a portrait of the emperor Maximilian, drawn in 1501 on a leaf of a sketch-book now in the print-room at Carlsruhe. The Martyrdom of St Sebastian and the Epiphany (Berlin Museum), fruits of his labour in 1507, were painted for the market-church of Halle in Saxony. In 1509 Grün purchased the freedom of the city of Strasburg, and resided there till 1513, when he moved to Freiburg in Breisgau. There he began a series of large compositions, which he finished in 1516, and placed on the high altar of the Freiburg cathedral. He purchased anew the freedom of Strasburg in 1517, resided in that city as his domicile, and died a member of its great town council 1545.

Though nothing is known of Grün's youth and education, it may be inferred from his style that he was no stranger to the school of which Durer was the chief. Gmund is but 50 miles distant on either side from Augsburg and Nuremberg. Grun's prints were often mistaken for those of Dürer; and Dürer himself was well acquainted with Grün's woodcuts and copper-plates, in which he traded during his trip to the Netherlands (1520). But Grün's prints, though Düreresque, are far below Dürer, and his paintings are below his prints. Without absolute correctness as a draughtsman, his conception of human form is often very unpleasant, whilst a questionable taste is shown in ornament equally profuse and "baroque." Nothing is more remarkable in his pictures than the pug-like shape of the faces, unless we except the coarseness of the extremities. No trace is apparent of any feeling for atmosphere or light and shade. Though Grün has been commonly called the Correggio of the north, his compositions are a curious medley of glaring and heterogeneous colours, in which pure black is contrasted with pale yellow, dirty grey, impure red, and glowing green. Flesh is a mere glaze under which the features are indicated by lines. No wonder that English collectors should have neglected him. There is not one of his pictures in the whole of Great Britain, unless we accept as genuine a "Youth and Old Age" in the Liverpool Institution, bought by Roscoe as a masterpiece of Antonello da Messina. Even Germans express but slight esteem for Grun; and if his works have any claims to attention at all, it is merely because of the wild and fantastic strength which some of them display. We may pass lightly over the Epiphany of 1507, the Crucifixion of 1512, or the Stoning of Stephen of 1522, in the Berlin Museum. There is some [illegible] in the Dance of Death of 1517, in the [illegible] of Basel, or the Madonna of 1530, in the Lichtenstein Gallery at Vienna. Grun's best effort is the altarpiece of Freiburg, in which the Coronation of the Virgin and the Twelve Apostles, the Annunciation, Visitation, Nativity, and Flight into Egypt, and the Crucifixion, with portraits of donors, are executed with some of that fanciful power which Martin Schön bequeathed to the Swabian school. As a portrait painter he is well known. He drew the likeness of Charles V., as well as that of Maximilian; and his bust of Margrave Philip in the Munich Gallery tells us that he was connected with the reigning family of Baden as early as 1514. At a later period he had sittings from Margrave Christopher of Baden, Ottilia his wife, and all their children, and the picture containing these portraits is still in the grand ducal gallery at Carlsruhe. Like Durer and Cranach, Gran became a hearty supporter of the Reformation. He was present at the diet of Augsburg in 1518, and one of his woodcuts represents Luther under the protection of the Holy Ghost, which hovers over him in the shape of a dove

GRUNBERG, or GRUNEBERG, a town of Prussian Silesia, chief town of a circle in the government district of Liegnitz, is beautifully situated on an affluent of the Oder, and on the railway from Breslau to Stettin by Kustrin, 36 miles N.N.W. of Glogau. It has a real school of the first order, a higher female school, and a trade school. The prosperity of the town depends chiefly on the vine culture in the neighbourhood, from which, besides the exportation of a large quantity of grapes, about 700,000 gallons of wine are manufactured annually. The wine is a kind of champagne, and is largely exported to Russia. There are also manufactures of machinery, cloth, preserved fruits, and lignite. The population of the town in 1875 was 12,200.

GRUNDTVIG, NIKOLAI FREDERIK SEVERIN (1783–1872), the Danish poet, statesman, and divine, was born at Udby on the 8th of September 1783; in 1791 he was sent to live at the house of a priest in Jutland, and studied at the free school of Aarhuus until he went up to the university of Copenhagen in 1800. At the close of his university life he made Icelandic his special study, until in 1805 he took the position of tutor in a house on the island of Langeland. The next three years were spent in the study of Shakespeare, Schiller, and Fichte. His cousin, the philosopher Henrik Steffens, had returned to Copenhagen in 1802 full of the teaching of Schelling, and his lectures and the early poetry of Oehlenschlager opened the eyes of Grundtvig to the new era in literature that was commencing. The latter began to essay writing himself, but his first work, *On the Songs in the Edda*, attracted no attention. Returning to Copenhagen in 1808, he achieved a greater success with his *Northern Mythology*, and in 1809 with his *Decline of the Heroic Life in the North*. The boldness of his theological views having provoked opposition, he retired to a country parsonage for a while, but soon returned to pursue a literary career with extraordinary earnestness. From 1812 to 1817 he published five or six works, of which the *Rhyme of Roeskilde* is the most remarkable. From 1816 to 1819 he was editor of a polemical journal entitled *Dannevirke*, and in 1818 to 1822 appeared his Danish paraphrases of Saxo Grammaticus and Snorre. During these years he was preaching to an enthusiastic congregation in Copenhagen, but he accepted in 1821 the country living of Præstö, only to return to the metropolis the year after. His theological career was, however, presently stopped, for, having in 1825 published a brochure, *The Church's Reply*, against the popular Dr Clausen, he was publicly prosecuted and fined. For seven years he was forbidden to preach, years which he spent in publishing a collection of his theological works, in paying two visits to England, and in studying Anglo-Saxon. In 1832 he obtained permission to preach again, and in 1839 he became priest of the workhouse church of Vartou Hospital, a post he continued to hold until his death. In 1837 he published *Songs for the Danish Church*, a rich collection of spiritual poems; in 1838 he brought out a selection of early Scandinavian verse; in 1840 he edited the Anglo-Saxon poem of the *Phœnix*, with a Danish translation. He visited England a third time in 1843. From 1844 until after the first German war Grundtvig took a very prominent part in politics. In 1861 he received the titular rank of bishop, but without a see. He went on writing occasional poems till 1866, and preached in the Vartou every Sunday until a month before his death. He was married thrice, the last time in his seventy-sixth year, and left children by each marriage. He died September 2, 1872. Grundtvig holds a unique position in the literature of his country; he has been styled the Danish Carlyle. He was above all things a man of action, not an artist; and the formless vehemence of his writings, which have had a great influence over his own countrymen, is hardly agreeable or intelligible to a foreigner. His spiritual poems are among the best that the North has produced, but they are apt to be too long. The writings of Grundtvig have not yet been collected in a permanent form, but the best of his poetical works were published in a selection by his eldest son, Svend Grundtvig, the eminent comparative mythologist, in 1869, with a critical memoir by the poet Hostrup, who belongs to the religious body denominated Grundtvigians.

GRUNEWALD, MATHIAS. The accounts which are given of this painter, a native of Aschaffenburg, are curiously contradictory. Between 1518 and 1530, according to statements adopted by Waagen and Passavant, he was commissioned by Albert of Brandenburg, elector and archbishop of Mainz, to produce an altarpiece for the collegiate church of St Maurice and Mary Magdalen at Halle on the Saale; and he acquitted himself of this duty with such cleverness that the prelate in after years caused the picture to be rescued from the Reformers and brought back to Aschaffenburg. From one of the churches of that city it was taken to the Pinakothek of Munich in 1836. It represents St Maurice and Mary Magdalen between four saints, and displays a style so markedly characteristic, and so like that of Lucas Cranach, that Waagen was induced to call Crunewald Cranach's master. He also traced the same hand and technical execution in the great altarpieces of Annaberg and Heilbronn, and in various panels exhibited in the museums of Mainz, Darmstadt, Aschaffenburg, Vienna, and Berlin. A later race of critics, declining to accept the statements of Waagen and Passavant, affirm that there is no documentary evidence to connect Grunewald with the pictures of Halle and Annaberg, and they quote Sandrart and Bernhard Jobin of Strasburg to show that Grunewald is the painter of pictures of a different class. They prove that he finished before 1516 the large altarpiece of Issenheim, at present in the museum of Colmar, and starting from these premises they connect the artist with Altdorfer and Dürer to the exclusion of Cranach. That a native of the Palatinate should have been asked to execute pictures for a church in Saxony can scarcely be accounted strange, since we observe that Hans Baldung was entrusted with a commission of this kind. But that a painter of Aschaffenburg should display the style of Cranach is strange and indeed incredible, unless vouched for by first class evidence. In this case documents are altogether wanting, whilst on the other hand it is beyond the possibility of doubt, even according to Waagen, that the altarpiece of Issenheim is the creation of a man whose teaching was altogether different from that of the painter of the pictures of Halle and Annaberg. At this stage the controversy now stands; and it is needless to do more than observe that the altarpiece of Issenheim is a fine and powerful work, completed as local records show before 1516 by a Swabian, whose distinguishing mark is that he followed the traditions of Martin Schongauer, and came under the influence of Altdorfer and Dürer. As a work of art the altarpiece is important, being a poliptych of eleven panels, a carved central shrine covered with a double set of wings, and two side pieces containing the Temptation of St Anthony, the hermits Anthony and Paul in converse, the Virgin adored by Angels, the Resurrection, the Annunciation, the Crucifixion, St Sebastian, St Anthony, and the Marys wailing over the dead body of Christ. The author of these compositions is also the painter of a series of monochromes described by Sandrart in the Dominican convent, and now in part in the Saalhof at Frankfort, and a Resurrection in the museum of Basel, registered in Amerbach's inventory as the work of Grunewald.

GRUTER, or GRUYTÈRE, JAN (1560–1627), a critic and scholar of Dutch parentage by his father's side and English by his mother's, was born at Antwerp, December 3, 1560. To avoid religious persecution his parents while he was still young came to England; and for some years he prosecuted his studies at Cambridge, after which he went to Leyden, where he graduated M.A. In 1586 he was appointed professor of history at Wittenberg, but as he refused to subscribe the *formula concordiae* he was unable to retain his office. From 1589 to 1592 he taught at Rostock, after which he went to Heidelberg, where in 1602 he was appointed librarian to the university. He died at Heidelberg, September 20, 1627. The chief service rendered by Gruter to classical learning was in the department of inscriptions, his principal work on which is *Inscriptiones antiquæ totius orbis Romani*, in 2 vols., Heidelberg, 1603. He also published editions of most of the Latin classics, but as his critical faculty bore little proportion to his erudition these are of small value.

GRUYERE, or GRUYÈRES (German, *Greyerz*), is a small pastoral district in the Swiss canton of Freiburg, noted for its cheese (see CHEESE and FREIBURG), which was at one time a separate countship. It forms part of the basin of the Saane. The old town of Gruyere, where the counts had their castle, had only 1097 inhabitants according to the census of 1870, while the neighbouring town of Bulle had 2274. There is no mention by that name of the counts or countship of Gruyere in any document previous to the 12th century, but the same family with the title of count of Ogo, *i.e.*, Hoch-gau, have been traced, though not without interruption, as far back as 923. The new designation was due, it would appear, to the fact that the counts of Ogo had held the post of gruyer (*gruerius*) or warden of the woods and forests to one of the later kings of Burgundy, the name of office, as in the case of the Scotch Stewarts, gradually passing into a regular family name. The counts of Gruyere were for the most part a vigorous and warlike line, and their banner, with the figure of a *grue* or crane, was not only a familiar object in the local conflicts of Savoy and Switzerland but saw good service in distant fields. Their last representative died in exile, his possessions having been seized by his creditors and sold to Bern in 1554.

The fortunes of the house are pretty fully chronicled in Hisely's Histoire du comté de Gruyère, [illegible] vols. ix., x., and xi. of the *Mémoires* [illegible] *Romande*, Lausanne, [illegible]. See also Bourquenoud, [illegible] 1782; H. Gremaud, [illegible] *Le Gruyère*, [illegible].

GRYNÆUS, or GRYNER, JOHANN JAKOB (1540–1617), a learned theologian of the period immediately succeeding the Reformation, was born, October 1, 1540, at Bern, where his father Thomas, nephew of Simon Grynæus, was at that time a teacher of theology, was educated at Basel, and in 1559 received an appointment as curate to his father who had become pastor of Röteln in Baden. In 1563 he proceeded to Tübingen for the purpose of completing his theological studies, and in 1565 he returned to Röteln as successor to his father. Here, as the result of much reading and reflexion, he felt compelled to disown the Lutheran doctrine of the Lord's Supper, and to renounce the *Formula Concordiae*. Called in 1575 to the chair of Old Testament exegesis at Basel, he became involved in unpleasant controversy with Simon Sulzer and other champions of Lutheran orthodoxy; and in 1584 he was glad to accept an invitation to Heidelberg, where two years were spent. Returning to Basel in 1586 as antistes or superintendent of the church there, he exerted for upwards of twenty-five years a very considerable influence upon both the church and the state affairs of that community, and acquired a wide reputation as a skilful theologian of the school of Zwingli. Five years before his death, which occurred August 13, 1617, he had the misfortune to become totally blind, but he continued to preach and lecture to the last.

His numerous works include commentaries on various books of the Old and New Testaments, *Theses* [illegible] [illegible] and a collection of [illegible] [illegible] [illegible] 2 vols. [illegible].

GRYNÆUS, SIMON (1493–1541), a learned theologian of the Reformation, was born in 1493 at Vehringen, in his fourteenth year went to school at Pforzheim, and subsequently studied at the university of Vienna, where he graduated as master of arts, and for some time acted as tutor. He next became rector of a school at Ofen (Buda), but as an avowed sympathizer with Reuchlin and Erasmus he was not permitted by the Dominicans to retain this post long. After an interval spent at Wittenberg with his old school friend Melanchthon, he became professor of Greek in the university of Heidelberg in 1525; with the duties of this post he from 1526 combined those also of the Latin chair. In 1529 the friendship of Œcolampadius obtained for him a call to Basel as successor of Erasmus; the completely disorganized state of the university at that time gave him abundant leisure not only for private study but also for a tour to England, where he charged himself with the task of obtaining the opinions of the Reformed theologians upon the subject of the king's divorce. On his return to Basel in 1531, the year of the death both of Zwingli and of Œcolampadius, he acted as theological professor to give exegetical lectures on the New Testament; and in 1534 he was summoned by Duke Ulrich of Würtemberg to assist in the reformation there, and especially in the reorganization of the university of Tübingen. In 1536 he took an active part in the framing of the first Helvetic confession, and also in the conferences held with the purpose of inducing the Swiss to accept the concord of Wittenberg, which had also been drawn up in that year. He was the sole representative of the Swiss churches at the conference of Worms in 1540. His death took place suddenly at Basel on August 1, 1541. In Greek philology Grynæus was one of the first scholars of his day. In theology he was more of a theoretical than of a practical turn, but his profound erudition and singularly penetrating judgment gave him great influence among the more active spirits of the time. In literature his chief contributions were translations into Latin of Plutarch, Aristotle, and Chrysostom. See Streuber's *Simonis Grynæi Epistolæ* (1847), where a full list of his works is given.

GRYPHIUS, ANDREAS (1616–1664), German poet, was born at Grossglogau, Silesia, on the 11th of October, 1616. His youth fell in the period of the Thirty Years' War, which began in 1618, when he was two years old. After spending five years at school in various towns, he returned to his native place in 1636, and became tutor in the family of Palsgrave George von Schönborn, who crowned him laureate and granted him a patent of nobility. In 1638 he went to the university of Leyden, where he spent six years, at first as a student, afterwards as a tutor. Having travelled through France and Italy in association with a young Pomeranian, and lived a year in Strasburg, he went back to Silesia, and in 1650, at the age of thirty-four, was made syndic of the principality of Glogau. This office, the duties of which he faithfully discharged, he held till his death in 1664. He was a man of deeply melancholy temperament, and his natural tendencies were fostered both by private misfortune and by the terrible public calamities of his age. Like most German writers in the first half of the 17th century, he was profoundly influenced by the critical doctrines of Opitz, on which account he is usually classed with the first Silesian school, although by some of his characteristics he is more closely allied to the second Silesian school. His best works are his comedies, one of which, *Peter Squenz*, is based on the comic episode of *A Midsummer Night's Dream*. *Die geliebte Dornrose* (The Beloved Wild-rose), which is written in a Silesian dialect, contains many touches of natural simplicity and grace, and still ranks high among the comparatively small number of genuine comedies of which German literature can boast. *Horribilicribrifax* is a rather laboured attack on pedantry. Besides these three comedies, Gryphius wrote five tragedies. In all of them his tendency is to become wild and bombastic, but he had the merit of at least attempting to work out artistically conceived plans, and there are occasional flashes both of passion and of imagination. His models seem to have been Seneca, and the great Dutch poet Vondel. He had the courage, in *Carolus Stuardus*, to deal with events of his own day; his other tragedies are *Leo Armenius*, *Katharina von Georgien*, *Cardenio und Celinde*, and *Papinianus*. The lyrics of Gryphius give utterance to his despairing views of life, and are not without power; but it is as a dramatist that he is mainly important. No German dramatic writer before him had risen to so high a level, nor had he worthy successors until about the middle of the 18th century. A selection from his lyrics will be found in W. Muller's *Bibliothek der deutschen Dichter des 17ten Jahrhunderts* (Bd. 2), and a selection from his dramatic writings in Tittmann's *Deutsche Dichter des 17ten Jahrhunderts*.

See Klopp, *Andreas Gryphius als Dramatiker* (1851); and Hermann, *Ueber Andreas Gryphius* (1851).

GUACHARO,[1] the Spanish-American name of what English writers have lately taken to calling the OIL-BIRD, the *Steatornis caripensis* of ornithologists, a very remarkable bird, first described by Alexander von Humboldt (*Voy. aux Rég. Equinoxiales*, i. p. 413, Engl. transl., iii. p. 119; *Obs. Zoologie*, ii. p. 141, pl. xliv.) from his own observation and from examples obtained by Bonpland, on the visit of those two travellers, in September 1799, to a cave near Caripé (at that time a monastery of Aragonese Capuchins) in the Venezuelan province of Cumaná on the northern coast of South America. A few years later it was discovered, says Latham (*Gen. Hist. Birds*, 1823, vii. p. 365), to inhabit Trinidad, where it appears to bear the name of *Diablotin*;[2] and much more recently, by the receipt of specimens procured at Sarayacu in Ecuador, Caxamarca in the Peruvian Andes, and Antioquia in New Grenada (*Proc. Zool. Society*, 1878, pp. 139, 140; 1879, p. 532), its range has been shown to be much greater than had been supposed. The singularity of its structure, its curious habits, and its peculiar economical value have naturally attracted no little attention, and it has formed the subject of investigation by a considerable number of zoologists both British and foreign. First referring it to the genus *Caprimulgus*, its original describer soon saw that it was no true Goatsucker. It was subsequently separated as forming a Subfamily, and has at last been regarded as the type of a distinct Family, *Steatornithidæ*—a view which, though not put forth till 1870 (*Zool. Record*, vi. p. 67), seems now to be generally deemed correct. Its systematic position, however, can scarcely be considered settled, for though on the whole its predominating alliance may be with the *Caprimulgidæ*, nearly as much affinity may be traced to the *Strigidæ*, while it possesses some characters in which it differs from both (*Proc. Zool. Society*, 1873, pp. 526-535). About as big as a Crow, its plumage exhibits the blended tints of chocolate colour and grey, barred and pencilled with dark brown or black, and spotted in places with white, that prevail in the two families just named. The beak is hard, strong, and deeply notched, the nostrils are prominent, and the gape is furnished with twelve long hairs on each side. The legs and toes are comparatively feeble, but the wings are large. In habits the Guacharo is wholly nocturnal, slumbering by day in deep and dark caverns which it frequents in vast numbers. Towards evening it arouses itself, and, with croaking and clattering which has been likened to that of castanets, it approaches the exit of its retreat, whence at nightfall it issues in search of its food, which, so far as is known, consists entirely of oily nuts or fruits, belonging especially to the genera *Achras*, *Aiphanes*, *Laurus*, and *Psichotria*, some of them sought, it would seem, at a very great distance, for M. Funck (*Bull. Acad. Sc. Bruxelles*, xi. pt. 2, pp. 371-377) states that in the stomach of one he obtained at Caripé he found the seed of a tree which he believed did not grow nearer than 80 leagues. The hard, indigestible seeds swallowed by the Guacharo are found in quantities on the floor and the ledges of the caverns it frequents, where many of them for a time vegetate, the plants thus growing being etiolated from want of light, and, according to travellers, forming a singular feature of the gloomy scene which these places present. The Guacharo is said to build a bowl-like nest of clay, in which it lays from two to four white eggs, with a smooth but lustreless surface, resembling those of some Owls. The young soon after they are hatched become a perfect mass of fat, and while yet in the nest are sought by the Indians, who at Caripé, and perhaps elsewhere, make a special business of taking them and extracting the oil they contain. This is done about midsummer, when by the aid of torches and long poles many thousands of the young birds are slaughtered, while their parents in alarm and rage hover over the destroyers' heads, uttering harsh and deafening cries. The grease is melted over fires kindled at the cavern's mouth, run into earthen pots, and preserved for use in cooking as well as for the lighting of lamps. It is said to be pure and limpid, free from any disagreeable taste or smell, and capable of being kept for a year without turning rancid. In Trinidad the young are esteemed a great delicacy for the table by many, though some persons object to their peculiar scent, which, says Léotaud (*Ois. de la Trinidad*, p. 68) resembles that of a Cockroach (*Blatta*), and consequently refuse to eat them. The old birds also, according to Mr E. C. Taylor (*Ibis*, 1864, p. 90) have a strong Crow-like odour. But one species of the genus *Steatornis* is known.

In addition to the works above quoted valuable information about this curious bird may be found under the following references:—L'Herminier, *Ann. Sc. Nat.*, 1836, p. 60, and *Nouv. Ann. Mus.*, 1838, p. 321; Hautessier, *Rev. Zool.*, 1838, p. 164; J. Muller, *Monatsb. Berl. Acad.*, 1841, p. 172, and *Archiv für Anat.*, 1862, pp. 1-11; Des Murs, *Rev. Zool.*, 1843, p. 32, and *Ool. Orn.*, pp. 260-263; Blanchard, *Ann. Mus.*, 1859, xi. pl. 4, fig. 30; Konig-Warthausen, *Journ. für Orn.*, 1868, pp. 384-387; Goering, *Vargasia*, 1869, pp. 124-128; Merie, *Ibis*, 1873, pp. 81-86. (A. N.)

GUACO, HUACO, or GUAO, also Vejuco and Bejuco, terms applied to various Central and South American and West Indian plants, in repute for alexipharmic and curative virtues. The Indians and negroes of New Granada believe the plants known to them as guaco to have been so named after a species of kite, thus designated in imitation of its cry, which they say attracts to it the snakes that serve it principally for food; they further hold the tradition that their antidotal qualities were discovered through the observation that the bird eats of their leaves, and even spreads the juice of the same on its wings, during contests with its prey. The disputes that have arisen as to what is "the true guaco" are to be attributed mainly to the fact that the names of the American Indians for all natural objects are generic, and their genera not always in coincidence with those of naturalists. Thus any twining plant with a heart-shaped leaf, white and green above and purple beneath, is called by them guaco (R. Spruce, in Howard's *Neueva Quinologia*, "Cinchona succirubra," p. 22, note). What is most commonly recognized in New Granada as guaco, or *Vejuco del guaco*, would appear to be the *Mikania Guaco* of Humboldt and Bonpland (*Pl. Équinox.*, ii. 86, pl. 105, 1809; D. C., *Prodr.*, v. 193), a climbing Composite plant of the tribe *Eupatoriaceæ*, affecting moist and shady situations, and having a much-branched and deep-growing root, variegated, serrate, opposite leaves, and dull-white flowers, in axillary corymbs. The whole plant emits a disagreeable odour. J. Fauré (*Journ. de Pharm.*, xxii. 291, 1836) obtained from leaves of a Mexican guaco, besides a wax-like matter, a substance analogous to tannin, and other bodies, a light-brown bitter resin, *guacin*, soluble in alcohol and partly so in water, and stated by Pettenkofer to possess emetic properties, and to give off an intoxicating odour when triturated with sulphuric acid (Watts, *Dict. of Chem.*, ii. 945). Guaco has been highly recommended for the treatment of bites of venomous reptiles and insects, and in cholera, chronic dysentery, gonorrhœal and syphilitic affections, atonic deafness, abscess, sciatica, sprains, gout, and other complaints. Its efficacy against poisoning by snakes, first carefully experimented on by Mutis[1] about 1787, has been frequently since attested; and in parts of New Granada much infested by those pests, a kind of inoculation with it is practised by some persons, the juice of the leaves being applied, at intervals of a fortnight during several months, to incisions in the hands, feet, and sides of the chest, two large teaspoonfuls of the same juice having beforehand been administered internally.[2] It is stated that the Indians of Central America, after having "guaconized" themselves, *i.e.*, taken guaco, catch with impunity the most dangerous snakes, which writhe in their hands as though touched by a hot iron (B. Seemann, *Hooker's Journ. of Bot.*, v. 76, 1853). The odour alone of guaco has been said to cause in snakes a state of stupor and torpidity; and Humboldt, who observed that the near approach of a rod steeped in guaco-juice was obnoxious to the venomous *Coluber corallinus*, was of opinion that inoculation with it imparts to the perspiration an odour which makes reptiles unwilling to bite.

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[1] This is said to be an obsolete Spanish word signifying one that cries, moans, or laments loudly.

[2] Not to be confounded with the bird so called in the French Antilles, which is a Petrel (*Œstrelata*).

The *huaco hembra* and *huaco macho* of Mexico are the species *Mikania* [illegible] and *M. repanda*, La Ll., respectively. Among the best remedies for snake-bites, according to Martius (*Flora*, i. 279, 1823; *Syst. Mat. Med. Brasil.*, p. 44, 1843), is the recently expressed juice of *Eupatorium Ayapana*, Ventenat (D. C., *Prodr.*, v. 169), a native of the Amazons. On the Orinoco the most esteemed guaco is an *Aristolochia*, distinguished there as *guaco de* [illegible], the [illegible], or *guaco del* [illegible], so called from their [illegible] and [illegible] "[illegible]." A similar plant, with highly aromatic root and stem, is known in the Andes as [illegible], or snake-vine. The guaco [illegible] in the Peruvian Andes [illegible] *de la* [illegible], is the [illegible] of Howard, *loc. cit.*, p. 9; D. C., *Prodr.*, xv., pt. i., 469). The tincture of the root and stem of a Mexican guaco ([illegible], 497), also an *Aristolochia*, [illegible] in hydrophobia. Among allied species [illegible] with the properties of guaco are *A. anguicida*, L., a native of Carthagena in Colombia; *A.* [illegible], Mart.; *A.* [illegible]; *A. trilobata*, L.; *A.* [illegible], L., supposed to be the plant with which the Egyptian jugglers stupefy snakes; *A. Serpentaria*, L., or Virginian snake-root; *Asarum canadense*, L., the Canada snake-root, or "wild ginger"; and *Asarum virginicum*, Willd. The guaco or *arbol* of Panama is the species *Cratæva tapioides*, D. C., called *tetlathian* by the Mexican Indians. In the West Indies and Mexico *Comocladia dentata*, Juss., is employed as guaco; *C. integrifolia*, L., the *brésillet* of some authors, resembles it in properties. According to E. Otto (*Reiseerinnerungen an Cuba*, &c., pp. 75, 76, 1843), *C. ilicifolia*, Swartz, a small tree with excessively noxious sap, is the guaco of Trinidad in Cuba, where it is used in cholera and yellow fever.

See, besides the works above quoted, P. d'Orbies y Vargas, *Tilloch's Phil. Mag.*, xii. 36, 1802; Le Guevel de la Combe, *Journ. d'Agric. . . . des Pays-Bas*, xv. 90, 1823; J. L. Alibert, *Nouv. Élém. de Thérap.*, ii. 583, 5th ed., 1826; Descourtilz, *Flore pittoresque et médicale des Antilles*, iii. 11, pl. 197, 1827, "Du Guaco," &c., *Bull. de Thérap.*, ix. 331, 1835; J. L. Chabert, *Apuntes sobre el Cholera-Morbus, y su curacion con la Mikania-huaco ó Guaco*, &c., Mexico, 1850; B. Seemann, *Die Volksnamen d. Amerik. Pflanzen*, Han., 1851; Orfila, *Traité de Toxicol.*, ii. 868, 5th ed., 1852; E. W. Pritchard, *Med. Times*, 1852, ii. 522, 651; and *Pharm. Journ.*, 2d ser., iii. 288, 1862; A. Stokes, *Med. Circular*, Dec. 15, 1852, p. 474; Lindley, *Veg. Kingd.*, p. 793, 1853; T. K. Chambers and R. Temple, *Journ. Soc. Arts*, 1856-57, p. 41; T. Redwood, *Suppl. to the Pharmacopœia*, p. 469, 1857; M. T. Parola, *Med. Times*, 1859, i. 643; É. Reclus, *Rev. des Deux Mondes*, March 15, 1860, p. 446; N. Pascal, *Du Guaco . . . dans les Maladies Vénériennes*, &c., 1863 (1st ed. 1861); and A. Bonnière, *Notice sur le Guaco*, &c., 1868. (F. H. B.)

GUADALAJARA, a province of Spain, in New Castile, bounded on the N. by the provinces of Segovia, Soria, and Saragossa, on the E. by Saragossa and Teruel, on the S. by Cuenca, and on the W. by Madrid. In the north are some of the loftiest summits of the Guadarrama range, having their culminating point in the Peña de la Bodera; the rest of the province, forming the upper basin of the Tagus, and watered by its affluents the Alblanqueja, Tajuña, Henares, and Jarama, is comparatively level. The soil varies considerably, but is generally of a good character. Pasture occupies the larger part of the surface on the higher tracts; and the mountains, though unduly denuded, still bear considerable forests of oak and cork. The plain around Tamajon is specially adapted for cereals; and the neighbourhood of Alcarria matures all kinds of crops proper to the latitude. Iron and lead are the only minerals; the former is very abundant and has been worked from the remotest periods; the latter occurs but in small quantities. The principal productions are wheat, barley, oil, wine, silk, saffron, and flax; but the chief wealth of the province consists in sheep and wool. Manufactures and trade have been declining for many years. The province is divided into nine administrative districts; but besides Guadalajara, the capital, it has no town of importance except the episcopal see of Siguenza. The area is 4869 English square miles; and in 1870 the estimated population was 208,638.

GUADALAJARA, a city of Spain, capital of the province of the same name, is situated on an elevation not far from the eastern bank of the river Henares, which is here spanned by a stone bridge built on Roman foundations in 1758. It is a station on the Madrid and Saragossa Railway, 38 miles N.E. from Madrid, and 2395 feet above the level of the sea. It has ten churches, several convents, including that of San Francisco, founded originally by Doña Berenguela for the Templars in 1200, handsome town and county buildings (*casas consistoriales*) built in 1585, and a college of engineers; besides the usual hospitals, barracks, and schools. There is also a fine palace of the ducal house del Infantado, built in 1461; and the Panteon or burying place of the dukes of Mendoza, begun in 1696 and finished in 1720 at a cost of £180,000, rivals in its richness the tombs of the Escorial. An extensive Roman aqueduct supplies public fountains; and there are four alamedas or promenades. The principal manufactures are soap, earthenware, and woollens. The cloth manufacture, which was formerly carried on in behalf of the Government, is now in private hands. The trade of the place is chiefly in grain, flax, fruit, cloth, and silk. Population, 7900. Guadalajara is the Arriaca or Caraca of the Romans; when taken by the invading Moors it was called Wadal-hajarah (the river of stones), of which its present name (sometimes in the mediæval chronicles spelt Godalfiaro) is a corruption. It was recaptured in the days of the Cid.

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[1] Mutis's plant is believed by N. Pascal to have probably been the above-mentioned Mexican *huaco*, and not, as supposed by [illegible], the *Spilanthes ciliata* of Kunth, called guaco in Central America.

[2] According to J. Hancock (*Observations on* [illegible] *Guaco*, p. 24, 1835), the operation is not of Indian origin.

GUADALAJARA, or in the older spelling GUADALAXARA, a city of Mexico, the capital of the state of Jalisco, is situated in the Atemarac valley not far from the Rio Grande de Santiago, about 280 miles W.N.W. of the city of Mexico, in 20° 41' 10" N. lat. and 103° 21' 15" W. long. Owing to its considerable elevation above the sea-level (according to the *Boletin del Ministerio de Fomento*, 1876, 1552 metres, but according to older authorities 1580 metres), Guadalajara enjoys an excellent climate. On the whole it is well laid out, and its streets are kept in tolerably good condition. All the houses, whether built of stone, brick, or adobe, are plastered and whitewashed, and hardly a dozen of them attain the height of three stories. In the outskirts of the town the buildings are of an inferior type. The Plaza Mayor is a square about 300 feet in each direction, one side of which is occupied by the cathedral, another side by the *casa de gobierno del estado* or state buildings, and the remaining sides by *portales* or arches in the shelter of which are some of the main shops of the city. The cathedral, commenced in 1571 and finished in 1618, is a rather fine structure with two steeples and a large dome between them covered with figures in coloured tiles. The interior is gloomy but impressive. No small interest attaches to the Hospital de San Miguel de Belen, which comprises, not only a hospital proper with male and female wards, but a lunatic asylum and a school for little children. Contiguous to it is the principal cemetery of the city, which is arranged in rather an unusual fashion: three sides of the area are bounded by walls and colonnades, and the inner surface of the walls is divided into six tiers of niches or *gavetas* in which the dead are deposited. Another remarkable institution is the hospicio, occupying twenty-four large blocks of building, and not only affording an asylum for foundlings and orphans, for the blind, the deaf and dumb, and the infirm of all ages, for old people unable to secure a livelihood, but also serving as a reformatory and training school. It presents a fine appearance with its dome and pillared portico. Its inmates number upwards of 1000, 700 being children, and 200 old men and women. Among the other public buildings and institutions of Guadalajara are the university (formerly the Jesuit college), eleven conventual establishments, a theological seminary, an academy for the fine arts, a mint, a theatre, and a bull-ring. The favourite promenade is the *paseo* which runs for a mile and a quarter through the city, and terminates northward in the alameda or public garden. Guadalajara is a fairly busy town, with paper-mills and woollen and cotton factories; but all the principal establishments are in the hands of Frenchmen, Germans, or Englishmen. The confectionery of the town is held in high repute, and the Indians of the neighbourhood are remarkable for the artistic ability with which they mould figures in clay or rags. The silk embroidery produced in the hospicio is also worthy of mention. Guadalajara was founded in 1531 by Nuñez Guzman, and was made a bishop's see in 1549. The population, which was only 19,500 in 1800, had increased to 46,804 by 1841, and to 70,947 by 1870. At Puente Grande in the neighbourhood, the Rio Grande forms a magnificent waterfall; and the bridge of Calderon is famous for the defeat of the insurgents under Hidalgo in June 1811. Several excellent views of Guadalajara will be found in Geiger, *A Peep at Mexico*. On the 11th of March 1875 Guadalajara was visited by a severe earthquake, which did damage to nearly every large building in the town. An account of the mint of Guadalajara, founded in 1811, is given in *Bol. Soc. de geogr. de la rep. Mexicana* for 1871. In 1877 the value of the new coin was 1,467,660 piastres or dollars, 5000 piastres being in copper and the rest in silver. New machinery driven by steam was imported from France in 1878. The total import trade of the town was reckoned at 3,280,000 piastres in 1878,—Great Britain having about 40 per cent. of the amount, France 25 per cent., the United States 10, and Germany 8. Full details on the money transactions of the city will be found in the *Preussisches Handelsarchiv*, 1879.

GUADELOUPE, an island of the Antilles in the West Indies, belonging to France, is situated 62 miles from Martinique, between 15° 59' 30" and 16° 20' 18" N. lat. and between 61° 31' 23" and 61° 50' 32" W. long. The sailing distance from Brest is 3750 nautical miles. A narrow channel, called La Rivière Salée, or Salt Stream, with a width of from 100 to 400 feet, separates the island into two portions, Guadeloupe proper or Basse Terre and Grande Terre. The former or western portion measures 28 miles from N. to S., and from 12 to 15 miles from E. to W., and its coast-line is estimated at 87 miles. The latter or eastern portion measures 22 miles from N. to S. and 34 from S.E. to N.W., and its coast-line is estimated at 106 miles. Basse Terre has a mountainous surface of volcanic origin, attaining its greatest altitude in La Soufrière, a still active volcano, 4870 feet in height; while Grande Terre is generally flat, with no elevations higher than 115 feet, and consists entirely of calcareous formations. In the rainy season the streams are subject to floods or "spates," which, according to M. Casponi (*Rev. Mar. et Coloniale*, 1871), come on so suddenly that it is hardly safe to travel in the dry beds, lest, to use the local phrase, the *galion* descend. Basse Terre, as is natural, is traversed by a considerable number of streams,—the Goyave, the Lézarde, the Moustic, the Petite Goyave, the Sainte Marie, the Trou au Chien, the Capsteire, &c.,—while Grande Terre is almost destitute of springs, and both men and cattle are dependent for their water supply on the ponds and marshes. The mean temperature of the island is 79° Fahr.,—the maximum in the shade ranging from 86° to 91°, and the minimum from 68° to 72°. July, August, and September are the hottest months. At Basse Terre, about 180 feet above the sea-level, the thermometer in July shows a mean of 80·8° Fahr., in August 82·5°, and in September 82·6°. Like the rest of the West Indian islands, Guadeloupe is subject to terrible storms. That of 1825 almost entirely destroyed the town of Basse Terre, and that of 1865 proved equally disastrous to Grand Bourg. The rainfall is very heavy, on the coast no less than 86 inches per annum.

Along with its dépendencies, the smaller islands of Marie Galante, Désirade, and Les Saintes, Guadeloupe forms a separate colonial government. The following table gives the area of the several portions:—

	Hectares.		Acres.
Guadeloupe or Basse Terre	94,631	=	233,844
Grande Terre	65,631	=	162,181
Marie Galante	14,927	=	37,067
Désirade	2,720	=	6,720
Les Saintes	1,422	=	3,514
Petite Terre	343	=	848
Saint Martin (French portion)	5,177	=	12,775
Total	184,851	=	456,949

Of the total area 85,248 acres were under cultivation in 1873; 1932 acres were battes or cattle-farms, 30,640 acres savannahs, and 106,258 acres woods and forests; while 69,689 acres were fallow. To the sugar-cane, which is the staple of the colony, 48,711 acres were devoted; to coffee, 8659 acres; to cotton, 1855 acres; to cocoa, 1146 acres;

to rocou or arnatto, 1632 acres; and to tobacco, 29½ acres. Manioc, which forms one of the principal sources of food in the colony, occupied 11,614 acres; and 11,246 acres were assigned to other articles of direct consumption. In the same year (1873) it was calculated that 43,780 people were employed in the sugar plantations, 5160 in the coffee plantations, 504 in the cotton plantations, and 1088 in the rocou plantations. The whole value of the ground is stated at about £2[illegible],000, of the buildings and plants at £1,560,000, and of the live stock at £263,200. The total produce of sugar of all kinds was 679,300 cwts.; the syrup and molasses amounted to 568,326 gallons, and the tafia or rum to 298,850 gallons. The produce of coffee, cocoa, and rocou was respectively 13,564, 2102, and 10,663 cwts. The manioc or cassava amounted to 282,412 cwts., and the other food substances, such as yams, bananas, arrow-root, &c., to 118,340 cwts. Tobacco, vanilla, and cloves were also produced in small quantity, as well as 4542 cwts. of campeachy wood. The value of the whole was estimated at £1,134,226, and the net value at £298,437. Administratively the colony is divided into three arrondissements of Basse Terre, Pointe à Pitre, and Marie Galante. The town of Basse Terre, situated in 15° 59′ 30″ N. lat. and 66° 24′ 31″ W. long., with a population of 12,000, is the capital, and the seat of the bishopric, which was founded in 1850; and Pointe à Pitre, situated in 16° 14′ 12″ N. lat. and 66° 11′ 41″ W. long., and containing a population of 16,000, is the principal port. A fine military harbour, popularly known as the Gibraltar of the Antilles, is situated in the group of Les Saintes. There is a militia, originally constituted in 1832, partly dissolved in 1851, and re-established in 1870.

During the twenty-five years from 1848 to 1872 the population of the colony remained almost stationary, the mean being only 132,000. Between 1873 and 1875 there was a notable increase, the mean for these years being 141,000. Owing probably to the influence of immigration, the masculine element is on the increase,—there being now 92 men to 100 women instead of 90 as formerly. Married people form only 20 per cent. of the population. According to Dr Charles Walther, with every 1000 European immigrants in 1864 there were introduced 25 women; for every 1000 Africans, 496 women; for every 1000 Indians, 253; and for every 1000 Chinese, 9. Between 1848 and 1872 there have been 30 births to every 1000 of the population, except during the five years from 1863 to 1867 when the ratio was only 27·6. If the non-reproductive part of the population be excluded, the births range from 41 to 46 per 1000, while in England the corresponding number is 61. It is estimated that probably 25 per cent. of the births are illegitimate. During the years from 1848 to 1852, immediately after the abolition of slavery, there were a great many marriages, especially among the liberated population—as many indeed as 2000 per annum; but, to use the words of Dr Rey, "cette belle ardeur matrimoniale" soon came to an end. In 1870, 1871, and 1872 there were only three marriages to 1000 inhabitants.

History.—Guadeloupe was discovered by Columbus in 1493, and received its name in honour of Santa Maria de Guadalupe in Estremadura in Spain. In June 1635 L'Olive and Duplessis took possession of it in the name of the French Company of the Islands of America, and after Duplessis's death [illegible] L'Olive began a war of extermination against the Caribs. [illegible] In 1674 Guadeloupe was annexed to the domain of the crown, and for a long time it remained a dependency of Martinique. Unsuccessful attacks were made by the English in [illegible], but on 21st April 1759 the inhabitants capitulated to Admiral Moore and General Barrington, and the island remained in British possession till 1763. On 18th April 17[illegible] the French under Admiral de Grasse were defeated by Rodney in the neighbourhood of the island. In 1775 Guadeloupe was finally separated from Martinique, but it remained under the common authority of the governor-general of the Windward Islands. The English under Sir John Grey and John Jervis obtained possession on 21st April 1794 but they were expelled on the 2d of June by Chrétien and Victor Hugues, commissioners of the National Convention, who were powerfully supported by the native population (see "Délivrance de la Guadeloupe en 1794" in *Rev. Mar. et Col.*, 1879). About this time the island contained [illegible] inhabitants, and the commerce was worth £1,274,[illegible]. After the peace of Amiens the first consul sent a military expedition under General Richepanse for the purpose of re-establishing slavery in Guadeloupe, but the negroes heroically defended their liberty for months. A new period of British possession was begun by the victory of February 3, 1810, and though by the treaty of March 1813 the island was made over to Sweden, and in the course of 1814 the French general Boyer de Peyreleau gained a temporary footing, in terms of the first peace of Paris, it was not till July 1816 that Britain finally withdrew her forces. Between 1816 and 1825 a special code of laws for Guadeloupe was granted. Municipal institutions were introduced into the island in 1837 (November 20).

See Moreau de Jonnès, *Histoire Physique des Antilles*; Boyer de Peyreleau, *Les Antilles françaises, particulièrement la Guadeloupe*, Paris, 1823, 3 vols.; A. Budan, *La Guadeloupe Pittoresque*, Paris, 1863, folio, a fine series of views with descriptive text; J. S. Dupuy, *Essai topographique de la Guadeloupe*; "Guadeloupe et dépendances," in *Rev. Maritime et Coloniale*, 1876 (tome 48); H. Rey, "Études sur la colonie de la Guadeloupe, topographie médicale, climatologie, démographie," in *Rev. Mar. et Col.*, 1878; "La Guadeloupe à l'exposition" in *Journal du commerce maritime*, 1878; *Annuaire de la Guadeloupe*, 1868, &c.; Gaffarel, *Les Colonies françaises*, Paris, 1880.

GUADIX, a city of Spain, in the province of Granada, situated on an elevated plateau on the northern slope of the Sierra Nevada, and above the left bank of the river Guadix. It is surrounded by ancient walls, and was formerly dominated by a Moorish castle, now in ruins. It is said to have been the first episcopal see erected in Spain; it still is a bishopric, suffragan to Granada, but the cathedral is architecturally unimportant. The town was once famous for its cutlery; but its modern manufactures (chiefly earthenware, hempen goods, and hats) are inconsiderable. It has some trade in wool, cotton, flax, corn, and liqueurs. The population is estimated at 10,150. The warm mineral springs of Graena, much frequented by Spaniards during the summer season, are situated 4½ miles to the westward. Guadix, along with Almeria and other places constituting the domain of El Zagal, was formally surrendered without a siege to Ferdinand the Catholic in December 1489.

GUADUAS, a town of Colombia, South America, state of Cundinamarca, is situated in the beautiful valley of the Magdalena, on the road between Bogota and Honda, 45 miles N.W. of the former town, and more than 3000 feet above sea-level. The name signifies in the original the bamboo cane, a plant which grows in great abundance in the neighbourhood. The town possesses a pretty church, and an old monastery now used as a prison. The staple articles of trade are sugar, coffee, cochineal, and oranges and other fruits. The population is about [illegible].

GUAIACUM, a genus of trees of the natural order *Zygophylleæ*. The guaiacum or lignum vitæ tree (Germ., *Guajakbaum*, *Franzosenholz*, *Pockenholzbaum*; Fr., *Gayac*, *Gaïac*), *G. officinale*, L., is a native of the West Indies and the north coast of South America, where it attains a height of 20 to 30 feet. Its branches are numerous, flexuous, and knotted; the leaves opposite and pinnate, with caducous stipules, and entire, glabrous, obovate or oval leaflets, arranged in 2 or, more rarely, 3 pairs; the flowers are in axillary cymes, and have 5 oval pubescent sepals, 5 distinct pale blue[1] petals three times the length of the sepals, 10 stamens, and a 2-celled superior ovary; and the fruit is about ⅝ inch long, with a leathery pericarp, and contains in each of its two cells a single seed. *G. sanctum*, L., grows in the Bahamas and Cuba, and at Key West in Florida. It may be distinguished from *G. officinale* by its smaller and narrow leaflets, which are in 4 to 7 pairs, by its shorter and glabrous sepals, and by its quinquelocular and 5-winged fruit. *G. arboreum*, DC., the guaiacum tree of Colombia, is found in the valley of the Magdalena, up to altitudes of 800 metres (2625 feet) above sea level, and reaches considerable dimensions. Its wood is of a yellow colour merging into green, and has an almost pulverulent fracture; the flowers are yellow and conspicuous; and the fruit is dry and 4-winged (J. Triana and J. E. Planchon, "Prodromus Floræ Novo-Granatensis," *Ann. des Sci. Nat.*, Bot., 5me ser., tom. xv.).

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[1] [illegible] flowers.

The *lignum vitæ* of commerce, so named on account of its high repute as a medicinal agent in past times, when also it was known as *lignum sanctum* and *lignum Indicum*, *lignum guaiacum*, or simply *guayacan*, is procured from *G. officinale*, and in smaller amount from *G. sanctum*. It is exported in large logs or blocks, generally divested of bark, and presents in transverse section very slightly marked eccentric rings of growth, and scarcely any traces of pith; with the aid of a magnifying glass the medullary rays are seen to be equidistant and very numerous. The outer wood, the sapwood or alburnum, is of a pale yellow hue, and devoid of resin; the inner, the heartwood or duramen, which is by far the larger proportion, is of a dark greenish-brown, contains in its pores 26 per cent. of resin, and has a specific gravity of 1·333, and therefore sinks in water, on which the alburnum floats. Owing to the diagonal and oblique arrangement of the successive layers of its fibres, the wood cannot be split; and on account of its hardness, density, and durability it is much valued for the manufacture of ships' pulleys, rulers, skittle-balls, mallets, and other articles.

Chips or turnings of the heartwood of *G. officinale* (*guaiaci lignum*) are employed in the preparation of the *decoctum sarsæ compositum* of British pharmacy. They may be recognized by being either yellow or greenish-brown in colour, and by turning bluish-green when treated with nitric acid, or when heated with corrosive sublimate, and green with solution of chloride of lime. They are occasionally adulterated with boxwood shavings. Lignum vitæ is imported chiefly from St Domingo, the Bahamas, and Jamaica. The foliage of guaiacum trees is stated by Dr Asa Gray to be employed in the West Indies instead of soap to scour and whiten floors. The bark was formerly used in medicine; it contains much calcium oxalate, and yields on incineration 23 per cent. of ash. Guaiacum resin, the *guaiaci resina* of pharmacopœias, is obtained from the wood as an exudation from natural fissures or from incisions; by heating billets about 3 feet in length, bored to permit of the outflow of the resin; or by boiling chips and raspings in water to which salt has been added to raise the temperature of ebullition. It occurs in rounded or oval tears, commonly coated with a greyish-green dust, and supposed to be the produce of *G. sanctum*, or in large brownish or greenish brown masses, translucent at the edges; fuses at 85° C.; is brittle, and has a vitreous fracture, a specific gravity of 1·2289 (W. Brande, *Phil. Trans.*, 1806, p. 89), and a slightly balsamic odour, increased by pulverization and by heat; and is at first tasteless when chewed, but produces subsequently a sense of heat in the throat. It is readily soluble in alcohol, ether, chloroform, creasote, oil of cloves, and solutions of caustic alkalies; and its solution gives a blue colour with gluten, raw potato parings, and the roots of horse-radish, carrot, and various other plants. The alcoholic tincture becomes green with sodium hypochlorite, and with nitric acid turns in succession green, blue, and brown. With glycerin it gives a clear solution (B. Squire, *Pharm. Journ.*, May 3, 1879, p. 894), and with nitrous ether a bluish-green gelatinous mass. It is blued by various oxidizing agents, *e.g.*, ozone, and, as Schönbein discovered, by the juice of certain fungi.

To test for blood or hæmoglobin, the tincture, which may be prepared from 1 part of the resin to 6 parts of 80 per cent. alcohol (*Med. Times*, 1878, i. p. [illegible]), is employed according to the method first suggested by Dr John Day, of Geelong, Australia. A drop of the tincture is added to a small quantity of the liquid to be examined, and with this a few drops of ozonic ether (solution of hydrogen peroxide in ether) are then shaken. The ether dissolves the resin, which, acted on by the hæmoglobin, becomes of a bright blue colour. Misleading reactions may sometimes result from the use of white bibulous paper, or from the presence of bile, when the test is applied in cases of hæmaturia (Finlayson, *Clinical Manual*, p. 391, 1878). Guaiacum resin, according to Hadelich (*Erdmann's Journ. f. prakt. Chemie*, lxxxvii., 1862, pp. 321-343), has the following percentage composition:—*guaiaconic acid*, $C_{38}H_{40}O_{10}$, a substance giving a transient blue colour with oxidizing agents, 70·35; *guaiaretic acid*, $C_{20}H_{26}O_4$, 10·5; *guaiac beta-resin*, 9·76; gum 3·7; insoluble ash constituents ·79; minute quantities of *guaiacic acid*, $C_{12}H_{16}O_6$, with *guaiac yellow* and impurities, 4·9. Acted on by heat it yields the decomposition products *guaiacene*, C_5H_8O, and *guaiacol*, $C_7H_8O_2$, and *kreosol* $C_8H_{10}O_2$, the first at 118° C., and the other two at 205°-210° C. (*cf.* CHEMISTRY, vol. v. p. 564), and, at a still higher temperature, *pyroguaiacin*, $C_{38}H_{44}O_6$.

Guaiacum wood was first introduced into Europe by the Spaniards in 1508, and Nicolaus Poll, writing in 1517 (see Luisinus, *De Morbo Gallico*, p. 210, Ven., 1566), states that some three thousand persons in Spain had already been restored to health by it. The virtues of the resin, however, were not known until a later period, and in Thomas Paynel's translation (*Of the Wood called Guaiacum*, &c., p. 9, ed. of 1540) of Ulrich von Hutten's treatise *De Morbi Gallici curatione per administrationem ligni guaiaci* (1519) we read of the wood:—"There foloweth fro it, whan it bourneth a gomme, which we yet knowe not, for what pourpose it serueth." Flückiger and Hanbury (*Pharmacographia*, p. 95) state that the first edition of the *London Pharmacopœia* in which they find the resin mentioned is that of 1677. The decoction of the wood was administered in gout, the stone, palsy, leprosy, dropsy, epilepsy, and other diseases, but principally in the "morbus gallicus," or syphilis, for which it was reckoned a certain specific, insomuch that at first "the physitions wolde not allowe it, perceyuynge that theyr profite wolde decay therby" (Paynel, *op. cit.*, p. 8). Minute instructions are given in old works as to the mode of administering guaiacum. The patient was confined in a closed and heated chamber, was placed on the lowest possible diet, and, after liberal purgation, was made twice a day to drink a milk-warm decoction of the wood. The use of salt was specially to be avoided. A decoction of 1 lb of guaiacum was held to be sufficient for the four first days of the treatment. The earlier opinions as to the efficacy of guaiacum came to be much modified in the course of time, and Dr Pearson (*Observations on the Effects of Various Articles of the Mat. Med. in the Cure of Lues Venerea*, chap. i., 2d ed., 1807) says:—"I never saw one single instance in which the powers of this medicine eradicated the venereal virus." He found its beneficial effects to be most marked in cases of secondary symptoms. Guaiacum resin is an ingredient in the *mistura guaiaci*, *tinctura guaiaci ammoniata*, and *pilula hydrargyri subchloridi composita* of the *British Pharmacopœia*. It is administered in cutaneous diseases, more especially those of a syphilitic character; for long-standing gouty and rheumatic affections, as in the nostrum known as "Chelsea pensioner;" in some forms of neuralgia; in sciatica (*Lancet*, 1864, i. p. 450); bronchorrhœa; tonsillitis (see *inter alia*, *Lancet*, 1864, ii. p. 735); and in sore-throat, or in incipient sore-throat of whatever kind, in the form of the simple resin (Broadbent, *Lancet*, 1867, i. p. 393); and has been found serviceable in amenorrhœa and ovarian complaints of inflammatory origin (Cleland, *Braithw. Retrosp.*, 1873, i. p. 347); and formerly (Graily Hewitt, *Dis. of Women*, p. 387, 3d ed., 1872) was much employed in dysmenorrhœa. Copland (*Med. Dict.*, ii. 656) regards the decoction or tincture of guaiacum as the best of diaphoretics, especially when the skin is cool as well as dry. Pearson found that if a patient exposed himself freely to the air, guaiacum acted as a diuretic, instead of as a diaphoretic. Guaiacum causes, when administered, dryness in the mouth, thirst, and a feeling of warmth in the stomach. According to Pearson, it increases the temperature of the skin and quickens the pulse. It has, seemingly, a considerable influence in lessening excessive secretion from mucous surfaces. In large doses it occasions headache, pyrexia, great heat at the epigastrium, and purging and vomiting. Guaiacum resin is sometimes adulterated with common resin, and has itself been used to sophisticate the resin of scammony and of jalap.

See, besides the above-quoted works, Macfadyen, *The Flora of Jamaica*, p. [illegible], 1837; J. Lindley, *Flora Medica*, p. 214, 1838; Asa Gray, *Genera of the Plants of the United States*, vol. ii. p. 121, pl. 148 and 149, 1849; Berg and Schmidt, *Offizin. Gewächse*, ii. pl. xiv.b, [illegible]; Grisebach, *Flora of the Brit. West Ind. Islands*, p. 134, 1864; E. J. Waring, *Manual of Practical Therapeutics*, 3d ed., 1871; Bentley and Redwood, *Pereira's Elem. of Mat. Med. and Therap.*, p. 892, 1874; Bentley and Trimen, *Medicinal Plants*, pt. [illegible], tab. 41, 1878; and Lanessan, *Hist. des Drogues*, i. pp. 191-201, 1878. For lists of numerous early treatises on guaiacum, see Reuss, *Repertorium*, tom. xi. p. 142, 1816, and E. J. Waring, *Bibliotheca Therapeutica*, ii., New Syd. Soc., 1879. (F. H. B.)

GUALDO TADINO, a town of Italy, in the province of Perugia and circondario of Foligno, with a station on the line from Ancona to Rome about 58 miles from the former city. It is picturesquely situated in the lap of the Apennines on the post-road that leads to the Furlo Pass. The cathedral and several of the other churches possess paintings by Nicolo and Matteo da Foligno of the 15th century. In 1871 the inhabitants of the commune numbered 7799. Gualdo has inherited the distinctive epithet of Tadino (which prevents it being confounded with Gualdo near Macerata, or Gualdo Cattaneo near Spoleto) from the ancient Roman town of Tadinum, the ruins of which, discovered in 1750, are situated in the vicinity, not far from the church of Sta Maria Tadina. It was near Tadinum that Narses gained his famous victory over Totila in 552. Recovering from the effects of the Gothic and Lombard invasions, the town, which even then was defended by walls, became for a time an independent commune; but it ultimately passed under the control of Perugia. In 1815 it was incorporated with the Roman States, and in 1833 it was made a city by Gregory XVI.

GUALEGUAY, a town of the Argentine republic, department of Entre-Rios, is situated on the Gualeguay river, which falls into the Parana, and is navigable up to this point, 120 miles N.N.W. of Buenos Ayres. It is a prosperous and increasing town, and has an active shipping trade in beef, mutton, hides, wool, tallow, and timber. In 1874 the total value of exports was £268 970. The population is about 10,000.

GUALEGUAYCHÚ, a city of the Argentine republic, department of Entre-Rios, is situated on the Gualeguaychú river, which there falls into the Uruguay, 120 miles north of Buenos Ayres. Like Gualeguay, it depends for its prosperity chiefly on the sheep and cattle grazed in the neighbouring country, and its export trade includes beef, mutton, hides, wool, tallow, and bone manure. The total value of the exports in 1874 was £163,968. The population is about 20,000.

GUAMANGA. See HUAMANGA.

GUAN, a word apparently first introduced into the ornithologist's vocabulary about 1743 by Edwards,[1] who said that a bird he figured (*Nat. Hist. Uncommon Birds*, pl. xiii.) was "so called in the West Indies," and the name has hence been generally applied to all the members of the Subfamily *Penelopinæ*, which are distinguished from the kindred Subfamily *Cracinæ* or Curassows by the broad postacetabular area of the pelvis, as pointed out by Prof. Huxley (*Proc. Zool. Society*, 1868, p. 297), as well as by their maxilla being wider than it is high, with its culmen depressed, the crown feathered, and the nostrils bare—the last two characters separating the *Penelopinæ* from the *Oreophasinæ*, which form the third Subfamily of the *Cracidæ*,[2] a Family belonging to that taxonomer's division *Peristeropodes*[3] of the Order *Gallinæ*.

The *Penelopinæ* have been separated into seven genera, of which *Penelope* and *Ortalida* (properly *Ortalis*), containing respectively about sixteen and nineteen species, are the largest, the others numbering from one to three only. Into their minute differences it would be useless to enter: nearly all have the throat bare of feathers, and from that of many of them hangs a wattle; but one form, *Chamæpetes*, has neither of these features, and *Stegnolæma*, though wattled, has the throat clothed. With few exceptions the Guans are confined to the South-American continent; one species of *Penelope* is however found in Mexico and at Mazatlan, *Pipile cumanensis* inhabits Trinidad as well as the mainland, while three species of *Ortalis* occur in Mexico or Texas, and one, which is also common to Venezuela, in Tobago. Like Curassows, Guans are in great measure of arboreal habit. They also readily become tame, but all attempts to domesticate them in the full sense of the word have wholly failed, and the cases in which they have even been induced to breed and the young have been reared in confinement are very few.[4] Yet it would seem that Guans and Curassows will interbreed with poultry (*Ibis*, 1866, p. 24; *Bull. Soc. Imp. d'Acclimatation*, 1868, p. 559; 1869, p. 357), and what is more extraordinary is that in Texas the hybrids between the Chiacalacca (*Ortalis vetula*) and the domestic Fowl are asserted to be far superior to ordinary Game-cocks for fighting purposes. More information on this subject is very desirable. (A. N.)

GUANACO (*Auchenia guanacus*), one of the four species of ruminant animals which represent in South America the camels of the East, and which resemble them in the possession of canine teeth in both lower and upper jaws. The Guanaco is the largest species, standing nearly 4 feet high at the shoulders. It is an elegant creature, with gracefully curved neck and long slender legs; its body is covered with long soft hair of a fawn colour above and almost pure white beneath. It is found throughout the southern half of South America, from Peru in the north to Cape Horn in the south, but occurs in greatest abundance in Patagonia. It lives in herds usually of from six to thirty, although these occasionally contain several hundreds, while solitary individuals are sometimes met with. They are exceedingly timid, and therefore wary and difficult of approach; like many other ruminants, however, their curiosity sometimes overcomes their timidity, so as to bring them within range of the hunter's rifle. Their cry is peculiar, being described by Cunningham (*Natural History of the Strait of Magellan*, 1871) as something between the belling of a deer and the neigh of a horse. The chief enemies of the guanaco, according to the same authority, are the Patagonian Indians and the puma, as it forms the principal food of both. Its flesh is palatable although wanting in fat, while its skin forms the chief clothing material of the gigantic Patagonians. According to Darwin, who studied it in its native wilds, the guanaco is readily domesticated, and in this state becomes very bold and will attack man, striking him from behind with both knees. In the wild state, however, they never seek to defend themselves, and if approached from different points, according to the Indian fashion of hunting them, they get completely bewildered and fall an easy prey. They take readily to the water, and have been observed swimming from one island to another, while Byron in his *Narrative* states that he has seen them drinking salt-water. They have a singular habit of dropping their dung during successive days on the same spot, a habit which is greatly appreciated by the Peruvian Indians, who use these deposits for fuel. They seem also to have favourite locali ties in which to die, as appears from the great heaps of bones bearing no sign of having been gnawed by the puma, which have been found in particular spots.

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[1] Edwards also gives "Quan" as an alternative spelling, and this may be the original form, since we find Dampier in 1676 writing (*Voyages*, [illegible]) of what was doubtless an allied if not the same bird as the "Quam." The species represented by Edwards does not seem to have been identified by the latest authorities.

[2] [illegible] for this [illegible] *Proceedings of the Zoological Society* for [illegible], which [illegible] in the *Transactions* of the same Society [illegible] the family, but none of very great importance.

[3] [illegible] on the [illegible] of [illegible] the [illegible] reference [illegible] Huxley's original paper [illegible], or to the epitome of it given in the *Zoological Record* [illegible] and 99).

[4] [illegible] worth reading.

GUANAJUATO, or Santa Fé de Guanajuato, a city of Mexico, capital of the state of Guanajuato, is situated in 21° 0' 50" N. lat. and 101° 54' 27" W. long., at a height of 7200 feet above the sea. Built as it is at the meeting-place of three mountain gorges, and obliged by lack of space to climb the underfalls of the surrounding heights, Guanajuato has a highly picturesque appearance. The houses of the lower town are four or five stories in height, most of the streets are narrow and tortuous, and the principal is small though beautiful. The cathedral, the Jesuit church, the mint dating from 1812, the new theatre built in 1874, the university, and the gymnasium are worthy of mention. The Alhondiga de Granaditas, originally a corn magazine, was occupied as a fort in the War of Independence, and acquired peculiar interest as the spot where the patriot Hidalgo met his death. Guanajuato, founded in 1554, owed its existence and prosperity to the fact that it is the centre of the greatest silver-mining district in the world. Of the individual mines perhaps the most famous is the Valenciana, with a shaft 2000 feet deep, which is in process of being cleared of the water by which it has long been flooded. The population, which includes a considerable number of foreigners, formerly amounted to 100,000, but in 1869 was only 63,000.

GUANCAVELICA. See Huancavelica.

GUANO. The deposits of guano, or *huano*, known locally as *huaneras*, are found in characteristic condition and abundance upon a large number of the islands lying off Peru and upon certain parts of the mainland. They occur in Bolivia and to the north of Peru also, but are there generally poorer in quality, if not always less in quantity. For the production and preservation of good guano two conditions are requisite—a rainless or nearly rainless climate and abundance of fish in the waters of the ocean. Both conditions are fulfilled on parts of the Bolivian and Peruvian coasts. The penguins, gannets, divers, cranes, cormorants, flamingoes, and other fish-eating birds thus find ample supplies of food; while their excreta retain their soluble and more valuable constituents. But even Peruvian guano is not exclusively excrementitious, nor wholly the produce of birds. These marine and maritime *huaneras* are the breeding-places, the resorts, and the cemeteries not only of sea-birds, but of many other sea-animals,—seals, sea lions, &c., frequenting many guano lands and islands, and adding considerably during life and when dead to the deposits. In Peruvian guano, it is true, the evidences of its origin are often obscure, but the somewhat complex sources of this material are well shown in the West-African guano islands. On these Mr T. R. Eden found (1845) three varieties of guano, the lowest being a crust or rock guano, the next above this being a seal guano, containing much seal-fur, and the uppermost layer being a bird guano, in which there were many mummified bird skins and large quantities of feathers.

The dung of bats, which has been found in large quantities in many caverns, both in Europe and in certain parts of France, the Pyrenees and Italy, in New Zealand, and on the North American continent, has been designated "bat-guano."[1] Further, the term guano, even when employed to describe the marine and maritime deposits previously mentioned, includes a considerable variety of substances very different in chemical composition and in manure value. For the deposits of guano occurring on the rainless or nearly rainless islands and coasts of Peru vary much in the proportion of their constituents—such variation being due less to differences in the origin of the deposits than to subsequent changes. Exposure to the action of the sea and of sea mist, and the pressure of superincumbent layers, are not without influence on the nature of the guano, very different qualities being found at different depths.

Although allusions to guano occur in the writings of travellers in the 17th and 18th[2] centuries, the credit of directing the attention of Europe to this curious and useful product is due to Humboldt. In 1804 he brought from the Chincha Islands a specimen which Klaproth and then Fourcroy and Vauquelin analysed. But it was not until the publication in 1840 of Liebig's work on chemistry in its relations to agriculture and physiology had demonstrated the importance of artificial manures that a lively interest in this Peruvian fertilizer was awakened. In that year a firm of merchants of Lima sent a large cargo of guano to England; but it was not until 1842 that the regular trade in guano began. Messrs Gibbs & Co. imported 182 tons in that year, while in 1862 the amount was no less than 435,000 tons. The price was lowest (£9 per ton) in 1848–9. It rose successively, in the years 1854 to 1856, from £10 to £13, and has since remained at about the last sum for the best qualities. Happily the Peruvian Guano Company are now permitted to sell this manure according to the results of analysis, and not, as before, at a fixed price irrespective of the variable qualities of different cargoes. Each unit per cent. of nitrogen is set down as worth 19s. 2d. per ton; while the phosphates, calculated as tricalcic phosphate, are reckoned as worth 2s. 3½d. per unit per ton. The only drawback to this plan lies in the rather exaggerated price which it assigns to the low qualities of Peruvian guano, namely, those which are poor in nitrogen but rich in phosphates—containing perhaps 40 to 60 per cent. of these compounds, which may be much more cheaply purchased in other forms. Still it must be urged that the phosphates of Peruvian guano are more useful than those from most other sources, on account of their physical condition, and their solubility. After all, however, the high phosphatic guanos are not much appreciated by farmers, who prefer to use bones and superphosphates as manure for grass lands and root crops.

For a long time the group of Peruvian islands known as the Chinchas furnished nearly all the guano that found its way to Europe. When these deposits, amounting to 7 million tons or more, were practically exhausted,—only 150,000 tons of deep deposits remaining in 1872,—their further working was stopped except for use in Peru itself. Then the guanos on the Macabi and Huanape islands were exported to Europe, in four years (1870 to 1874) about 1 million tons having been shipped and about half a million tons remaining in 1875. Since then the Lobos islands, situated about 70 miles north of Macabi, have been worked, as have also the islands of the Ballestas group. Even in 1871 three-fourths of the cargoes of nitrogenous guano were from Huanape, but the amount of nitrogen generally present in them was rather low, often not exceeding 10 per cent. of "potential" ammonia, while the percentage of water was remarkably high—sometimes not less than 25 per cent. The Ballestas guanos of the same year were drier and contained one-third more nitrogen.

In spite of many testings and surveys, the amount of Peruvian guano still remaining to be exported has not been even approximately determined. Not only do contiguous deposits differ much in composition, but it is frequently impossible to ascertain what is guano and what is sand or rock. Sometimes the layers of guano are too thin to be worth removing, in other places they fill up ravines to a much greater depth than would be imagined. An estimate of the total quantity of Peruvian guano remaining in 1877 gave over 2 million tons available for commerce, but this figure presumably includes all varieties, both nitrogenous and phosphatic. Most of the guano lately and now exported comes from the following groups of islands, or places on the coast—Macabi, Huanape, Ballestas, Punta de Lobos, Pabellon de Pica, and Huanillos, and, since 1877, particularly from the last two localities.

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[1] This bat guano generally contains much water (over 60 per cent.) with about 5 per cent. of phosphates, and 3 to 7 per cent. ammonia.

[2] *The Art of Metals*, by A.A. Barba, published in an English translation in 1670 in London, mentions guano from Arica and Iquique.

In the article AGRICULTURE (vol. i. p. 347) some statistics of guano imports were given. According to the British Consular Reports (1878, No. iv. pp. 525–539) the quantities of Peruvian guano sold of late years were, in tons—

1869	[illegible]	1874	[illegible]
1870	451,561	1875	[illegible]
1871	363,200	1876	[illegible]
1872	[illegible]	1877	310,042
1873	342.425		

The amounts of Peruvian guano taken by different countries during 1876 and 1877 were as follows:—

	1876.	1877.
England and her colonies	130,598	109,954
France and her colonies	102,165	72,067
Germany	63,724	23,455
Belgium	48,246	71,473
Spain	28,259	23,455
Italy	3,594	5,440
Holland	1,977	3,658

In 1872, when the number of countries contributing guano was very large, the imports into the United Kingdom were as follows:—

	Tons.		Tons.
Peru	74,401	Australia	1,168
Pacific Islands	17,475	British West Indies	1,050
Bolivia	14,068	St Helena	951
West Coast of Africa	3,201	Chili	503
Dutch West Indies	1,562	United States	458
Brazil	1,232	Other places	2,545

The following are amongst the more obvious characteristics of good Peruvian guano. Although at the present time it is by no means of uniform appearance or of constant composition, yet it may be stated that the best qualities, which most closely resemble the former supplies from the Chinchas, are light in colour, do not weigh much more than 60 lb per bushel, are friable, and do not cohere strongly when pressed between the fingers. Small soft lumps are often observed in good samples; when these are broken a white or pale-coloured substance is seen in the centre. This lighter-coloured matter contains carbonate and other ammoniacal salts; in some adulterated samples its appearance is imitated by means of gypsum. The hard lumps found in guano are of very varying composition, some being highly phosphatic and others highly siliceous. The ash left on burning a good Peruvian guano is white or grey; a red ash generally indicates adulteration with ochre or ferruginous earth. An unusual proportion of water commonly points to damage by sea water or rain, a kind of injury which is the more serious, since it is usually accompanied by a considerable loss of ammonia. If more than a mere trace of chlorine be found in a sample of guano, damage by sea-water may be suspected. Although a good guano commonly contains more than half its weight of organic matter and of other substances driven off by a red heat, yet when a still larger quantity of such volatile matters is found their presence may be, and often is, a sign of admixture with peat.

Guanos have been often subjected to analysis, [illegible] frequently, [illegible] for the sake of determining their agricultural value than their [illegible] chemical components. There would [illegible] nitrogen and phosphates. The nitrogen, we know, [illegible] with [illegible] oxalic, carbonic, and phosphoric [illegible] $C_5H_5N_5O$ [illegible] it is not unlikely that the nitrogen of this body [illegible] of direct assimilation by plants. A considerable [illegible] of nitrates and nitrites has been recognized in some guanos, ranging, when expressed as potassium nitrate, from no more than $\frac{1}{10}$ per cent. up to 5 and even 6 per cent. Other nitrogenous compounds present are those indeterminate substances which originate from the decay of the debris of bone, skin, cartilage, and feathers, and of the [illegible] of flesh. These intermediate products of decay are ultimately resolved into ammonia salts and nitrates. Some guanos, notably those of the West-African coast (Ichaboe, for example), contain many undecomposed feathers, which cannot possibly yield their nitrogen to vegetation for some time. On this account less than half of the 8 to 12 per cent. of so-called "potential" ammonia in these guanos is as effective as that in the genuine Peruvian samples. The phosphates of guano are numerous, including tricalcic, dicalcic, ammonio-magnesic, and ammonio-[illegible] phosphates. The solubility of a great part of the phosphates in guano helps to render its action more intense and immediate; as much as 16 to 20 per cent. of phosphorus pentoxide has been found to be soluble in some instances. Such is said to be often the case with the guano of Tarapacá; Baker Island and Jarvis Island guanos are similar. This solubility arises partly from the composition of the phosphates present, some of which are naturally moderately soluble in ordinary water; but it arises partly also from the presence of ammonium oxalate, by which the solubility of the calcic phosphates is increased. The carbon dioxide which the decaying organic matter of guano continually evolves also aids in effecting the solution of those phosphates which are not soluble in pure water.

As a great part of the nitrogen of guano exists in the form of the volatile carbonate, it will be found that this manure deteriorates sometimes very much on being kept. One sample of Chincha guano imported in 1865 contained nitrogen equal to 20½ per cent. of ammonia; of this 10½ per cent. was lost when the guano was exposed to the heat of boiling water, and 9½ per cent. when the sample was merely kept for a year in a powdered condition in an ordinary bottle. With so strongly ammoniacal a guano as this, the fixation of the volatile nitrogenous compounds by means of an acid is highly desirable. Oil of vitriol is employed in different proportions and in different ways for this purpose. About 5 or 6 lb of oil of vitriol diluted with water and mixed with sand or peat may be added to each cwt. of guano. Such a process was patented in 1859 by Dr Richardson of Newcastle. In this way the ammonia of the volatile carbonate is fixed in the form of sulphate, the oxalates and phosphates of the guano remaining unaffected. But sometimes, as in the manufacture of "dissolved guano," a larger quantity of oil of vitriol is used—say 25 to 30 lb to each cwt. of raw guano. In this case a kind of rich superphosphate is obtained in which 20 per cent. or thereabouts of "bone-phosphate made soluble" is present in association with nitrogen equal to 9 or 10 per cent. of ammonia. Such a preparation is Ohlendorff's dissolved Peruvian guano, while "sulphated" and "ammonia-fixed" guanos contain less oil of vitriol, and generally some inert substance like sawdust, which reduces their concentration as manures considerably. "Phospho guano" is in reality a superphosphate made from Mejillones or other phosphatic guano, and enriched by the addition of ammonium sulphate. This Mejillones (Bolivian) guano contains about ½ per cent. of nitrogen and 55 per cent. phosphates. "Native guano" is a term applied to the dried and prepared sludge or deposit obtained in the treatment of town sewage by the "A.B.C." process—one of the many precipitation processes now in use. It has little in common with true guano. "Fish guano" is prepared chiefly from the refuse of the cod of the Newfoundland and Norwegian fisheries. It is rich both in nitrogen and in phosphates, often containing 8 per cent. of the former and 30 per cent. of the latter, but its oily nature causes its action as manure to be uncertain and slow.

Although it is usual and convenient to classify guanos into two groups according to their richness in nitrogen or phosphates respectively, there is no sharp line of demarcation between these classes. Indeed the guano from a single spot may show every gradation from [illegible] to phosphatic. For instance, three samples taken from a deposit at Punta de Lobos gave amounts of nitrogen corresponding to the following percentages of ammonia in the several layers:—surface, [illegible] per cent.; middle, [illegible] per cent.; deepest, 15.67 per cent. Three samples from another working on the same [illegible] gave these figures:—3 per cent. [illegible] feet, 8 per cent. at 2[illegible] feet, and 12 at [illegible] feet. A [illegible] per cent. of potential ammonia, that is, containing [illegible] nitrogen which, if expressed as ammonia, [illegible] may be regarded as [illegible] of guano [illegible] more than 8 or 10 per cent. of ammonia. [illegible] with 6 to 8 per cent. of ammonia, and these pass [illegible] phosphatic guanos, with but little organic matter and nitrogen, [illegible] But when we come to [illegible] what are called "rock" or "[illegible]" guanos, we [illegible] complete absence of nitrogen and organic matter, but the hardness of the material is such as to involve its being first ground and then treated with oil of vitriol to turn it into a superphosphate before it can be made available as manure. With the highly phosphatic yet powdery and soft guanos of Peru and Bolivia such treatment is rarely necessary, but it is essential with Navassa (Caribbean Sea) and with the Sombrero Island (Gulf of Mexico) guanos. The latter variety contains no nitrogen, and is very hard, but contains on an average no less than 75 per cent. of tricalcic phosphate. It may be noted that the exports into Great Britain of this Sombrero guano have been so large that the whole island has been transported thither.

The nature of the main constituents of Peruvian and Bolivian guanos may be gathered from the following figures, which roughly represent the nature and percentage proportions of the chief constituents of the samples from several localities:—

	Angamos	Chincha	Pabellon de Pica	Punta de Lobos	Bolivian
Moisture	11	16	17	16	13
Organic matter and combined water	53	52	45	34	26
Whereof is nitrogen equal to ammonia	17·5	17	12	7·5	4
Tricalcic phosphate	19	22	19	29	42
Phosphorus pentoxide in alkaline salts	1	3	4	3	3
Alkalies, &c., by difference	9	6	12	13	12

One specimen of Angamos guano actually contained 25 per cent. potential ammonia and but 6 per cent. phosphates reckoned as tricalcic phosphate. It will indeed be seen how generally with the diminution of the nitrogenous organic matter the phosphates increase, and vice versa. Analyses of guanos from many different countries exhibit the same feature. But even the phosphatic guanos are less rich in phosphates than one might expect, owing to the intrusion of siliceous matter. In some guanos analysed by Nesbit more than 50 per cent. of sand occurred. Californian guanos gave this analyst from 1¼ to 8¾ per cent. ammonia, and about 30 per cent. phosphates. In Falkland Island guano he found about ¾ to 2¾ per cent. ammonia and 20 to 25 per cent. phosphates. In the case of so variable a material as guano neither analyses of individual specimens nor averages can be considered as really representative. But it is instructive to note how low a proportion of nitrogen is present in many of the guanos from different countries:—Algoa Bay, 5 per cent. of potential ammonia; Ascension Island, 6·0; Queensland, 1·0; Chili, 1·4; Ecuador, ·8; Mexico, ·4; Patagonia, 2·7; Tasmania, 2·5.

In the guanos imported during 1847-48 Mr J. T. Way found the following average percentages of ammonia (calculated from total nitrogen) and of phosphates (calculated as tricalcic phosphate):—

		Ammonia	Phosphates.
Peru	(13 samples)	17·41	24·12
Ichaboe	(11 ,,)	7·30	30·30
Patagonia	(14 ,,)	2·54	44·60
Saldanha Bay	(20 ,,)	1·62	56·40

Dr Voelcker's analyses of samples taken in 1874 from the undermentioned places gave about 25 per cent. phosphates, and of ammonia 8 to 12 per cent. in guanos from Pabellon de Pica, 3 to 12 per cent. from Lobos, and 8 to 12½ per cent. from Huanillos.

The Lobos guanos, having since then become of generally inferior quality, have been but sparingly imported during the last few years. The percentage of ammonia in recent cargoes of guano from Punta de Lobos has been 5 to 6, from Huanillos 9, and from Pabellon de Pica 11 to 12.

The analysis of guano for commercial purposes is generally limited to the quantitative determination of three constituents,—the nitrogen, the soluble phosphorus pentoxide, and the insoluble phosphates; the latter are usually reckoned as tricalcic phosphate. The process of analysis requires a few special precautions. One of these consists in mixing the guano in the combustion tube itself when making a nitrogen determination by Will and Varrentrapp's method; otherwise a loss of ammonia may occur.

As a manure the nitrogenous guano of Peru is rich, active, and stimulating. It has a decided tendency to cause an excessive development of foliage, and is therefore peculiarly fitted for application to grass and to other plants the development of the stem and leaf of which is desired. Its effects on clover are less marked. Mixed with superphosphate it may be applied to potatoes or root-crops, and to most of the plants of the kitchen garden; for many plants cultivated for their flowers it may be used also, but with great care and moderation, mixed with water or dry soil. On light and calcareous lands sown with swedes, turnips, or mangolds, guano has frequently been found to burn and destroy the young plants or even to prevent the germination of the seed; "dissolved" guano is less liable to cause this injury.

Guano, with another very useful natural product, namely, nitrate of soda, constitutes the chief source of revenue for Peru.

The following papers and reports in the *Journal of the Royal Agricultural Society* contain interesting information on guano, ser. i. vols. ii. p. 301, x. p. 196; xxv. p. 186; ser. ii. vols. i. p. 213; v. 92; vi. 142, 463; vii. 367; viii. 220; ix. 261; x. 541. Native guano is discussed, ser. ii. vol. vi. p. 115. The *Jahresbericht der Agricultur-Chemie* contains a digest of most of the important papers on guano published on the Continent; see, *e.g.*, 1858-9, pp. 231-238; 1860-1, pp. 186-191; 1862-3, pp. 150-157; 1867, p. 189; 1870-2, pp. 180-195; 1873-4, iii. pp. 19-26. A pamphlet published in 1874 by Dunkley & Co., London, gives some important statistics and reports on the Peruvian guano then remaining; as also does the Commercial Blue Book, No. 23, 1878, pp. 525 to 539. (A. H. C.)

GUARANA, so called from the Guaranis, an aboriginal American tribe, the plant *Paullinia sorbilis*, Mart., of the natural order *Sapindaceæ* and tribe *Sapindeæ*, indigenous to the north and west of Brazil. It has a smooth erect stem; large pinnate alternate leaves, composed of 5 oblong-oval leaflets; inflorescence in narrow panicles of short-stalked flowers, having 4 or 5 sepals and 4 petals, 8 stamens, and a cylindrical 3-celled ovary; and fruit ovoid or pyriform, about as large as a grape, and containing usually one seed only, which is shaped like a minute horse-chestnut. What is commonly known as guarana, guarana bread, or Brazilian cocoa, is prepared from the seeds as follows. In October and November, at which time they become ripe, the seeds are removed from their capsules, and sun dried, so as to admit of the ready removal by hand of the white aril; they are next ground in a stone mortar or deep dish of hard sandstone; the powder, moistened by the addition of a small quantity of water, or by exposure to the dews, is then made into a paste with a certain proportion of whole or broken seeds, and worked up sometimes into balls, but usually into rolls not unlike German sausages, 5 to 8 inches in length, and 12 to 16 oz. in weight. After drying by artificial or solar heat, the guarana is packed between broad leaves in sacks or baskets. Thus prepared, it is of extreme hardness, and has a brown hue, a bitter astringent taste, and an odour faintly resembling that of roasted coffee. An inferior kind, softer and of a lighter colour, is manufactured by admixture of cocoa or cassava. Rasped or grated into sugar and water, guarana forms a beverage largely consumed in S. America. Its manufacture, originally confined to the Maubés Indians, has spread into various parts of Brazil.

The properties of guarana as a nervous stimulant and restorative are due to the presence of what was described as a new principle, and termed *guaranine*, by Dr T. Martius, but which was proved by Berthemot and Dechastelus (*Journ. de Pharm.*, vol. xxvi., 1840, p. 518 *sq.*) to be identical with *caffeine* or *theine*, $C_8H_{10}N_4O_2 + H_2O$. Of this alkaloid guarana yields 5·07 per cent., against 2·13 in good black tea, ·8 to 1 in coffee beans, and 1·2 in maté or Paraguay tea (Stenhouse, *Pharm. Journ.*, xvi. p. 213); for medical purposes it may in fact be regarded as "practically a convenient form of impure caffeine" (F. E. Anstie, *Braithw. Retrosp.*, 1873, i. p. 35). Besides this substance, which is stated to exist in it in the form of tannate, guarana yields on analysis the glucoside saponin, with tannin, starch, gum, three volatile oils, and an acrid green fixed oil (Fournier, *Journ. de Pharm.*, vol. xxxix., 1861, p. 291). As a medicine, guarana was first described in 1817 by Cadet de Gassicourt, to whom a specimen was sent from Brazil (see *Bull. Gén. de Thérap.*, lii., 1857, p. 497 *sq.*), in which country it is in popular repute as a stomachic, febrifuge, and aphrodisiac, and more especially as a specific for dysentery and diarrhœa, in which latter disease it is given in very large doses, 4 to 8 or 10 grammes (*Bull. Gén. de Thérap.*, liii. p. 139). It is said by Martius (*Syst. Mat. Med. Veget. Brasiliensis*, p. 59, Leipsic, 1843) to diminish fever by its tonic effects on the nerves, to reinvigorate the stomach and intestines, to restrain excessive mucous discharges, to increase the action of the arteries and heart, and to promote diaphoresis. In migraine, or sick-headache, it has oftentimes been found a most serviceable remedy (see *inter alia*, *Brit. Med. Journ.*, 1872, i. pp. 421 and 426; *Practitioner*, Aug. and Sept. 1873, pp. 100-102, 161-175); and it has been recommended in lumbago when the pain is of a stinging nature (Dawson, *Braithw. Retrosp.*, 1874, ii. p. 33), and in sciatica and blennorrhœa.

See Spix and Martius, *Reise in Brasilien*, vol. iii. pp. 1061 and 1098, Munich, 1831; Hooker's *Journ. of Botany*, vol. iii., 1851, pp. 193-4; Bentley and Trimen, *Medicinal Plants*, pt 4, tab. 67, 1876; and, on the preparation of "Guaranine," *Journ. de Pharm.*, 4th ser., xviii. p. 224. On the "Antagonism between Guarana and Management of Morphia," see J. H. Bennett, *Rep. on the Action of Medicines*, p. 83, 1875. Further bibliographical references will be found in Prof. P. Mantegazza's elaborate article, "Del guaranà, nuovo alimento nervoso," *Ann. Univers. di Med.*, April to June 1865, vol. 192, pp. 90-153.

GUARANTEE, or Guaranty, in English law, is a promise to be answerable for the debt of another should he fail to make payment, or generally to be answerable for the performance of any duty by another person. The debt or duty must be owing by another, who is primarily bound, and the guarantor is only liable in the event of his failure of performance. Guarantees are required to be in writing by the Statute of Frauds (29 Car. II. c. 3), which enacts (§ 4) that "no action shall be brought whereby to charge the defendant upon any special promise to answer for the debt, default, or miscarriage of another, unless the agreement upon which such action shall be brought shall be in writing, signed by the parties to be charged by the contract, or some other person thereunto by him lawfully authorized." The test of the applicability of this section is whether the original debtor continues liable. If his liability is gone, and the person promising to pay the debt becomes immediately and primarily liable, then the promise need not be in writing. Thus where a debtor had been taken in execution for a debt, and a third person promised to pay the debt if the debtor were discharged from custody, it was held that writing was not necessary, inasmuch as the discharge operated as a satisfaction of the original debt, and the person making the promise alone remained liable. The default for which liability may be assumed by another person includes any case of breach of duty, and is not confined to cases of non-performance of contracts. A promise to guarantee comes under the general rule which requires enforceable agreements to be founded on consideration, *i.e.*, a corresponding promise or performance on the other side (see Contract). It was formerly held that the consideration must appear in the memorandum of writing, not necessarily in express terms, but at any rate as a matter of fair and reasonable inference. Thus a promise to pay for goods to be supplied to another was held to disclose a consideration, viz., the future supply of goods. But when the promise was to pay for goods already supplied, no consideration was disclosed. By the Mercantile Law Amendment Act (19 and 20 Vict. c. 97), passed in consequence of representations made by merchants in Scotland and the North of England, who found the difference between Scotch and English law as to written contracts a source of great inconvenience, this section of the Statute of Frauds was repealed. The Mercantile Law Amendment Act also declares that a guarantee given to or for a firm shall cease on any change taking place in the persons constituting the firm, unless a continuance of the promise is expressly stipulated or of necessity to be inferred. The corresponding Act for Scotland (19 and 20 Vict. c. 60) requires all guarantees, securities, or cautionary obligations, and all representations as to the character of any person made with the view of obtaining credit, money, &c., for such person to be in writing in order to be binding, and establishes the same rule as the English Act with reference to guarantees to or for a firm.

GUARATINGUETA, a town of Brazil, in the province of São Paulo, situated near the right bank of the Parahiba, about 110 miles N.E. of the city of São Paulo. It was founded in 1651 by the Captain Mor Dominico da Costa. The houses are almost all constructed of mud, and there are few buildings of any note except the churches, of which the chief is dedicated to St Anthony. A considerable traffic is fostered by the fertile character of the surrounding district and the situation of Guaratinguetá on the road between São Paulo and Rio de Janeiro. Population 7400. According to Spix and Martius the name of the town is equivalent to "the place where the sun turns," and refers to its vicinity to the tropic of Capricorn. See Milliet de Saint-Adolphe, *Diccion. Geogr. do imperio do Brazil*, 1870.

GUARDI, Francesco (1712-1793), a Venetian painter, was a pupil of Canaletto, and followed his style so closely that his pictures are very frequently attributed to his more celebrated master. Nevertheless, the diversity, when once perceived, is sufficiently marked,—Canaletto being more firm, solid, distinct, well grounded, and on the whole the higher master, while Guardi is noticeable for spirited touch, sparkling colour, and picturesquely sketched figures, in these respects being fully equal to Canaletto. Guardi sometimes coloured Canaletto's designs. He had extraordinary facility, three or four days being enough for producing an entire work. The number of his performances is large in proportion to this facility, and to the love of gain which characterized our painter. Many of his works are to be found in England; seven in the Louvre; four, of exceptional merit, in the Manfrini Palace, Venice.

GUARDIAN AND WARD. See Infant.

GUARIENTO, sometimes incorrectly named Guariero, was the first Paduan painter who distinguished himself. The only date distinctly known in his career is 1365, when, having already acquired high renown in his native city, he was invited by the Venetian authorities to paint a Paradise, and some incidents of the war of Spoleto, in the great council-hall of Venice. These works were greatly admired at the time, but have long ago disappeared under repaintings. His works in Padua have suffered much. In the church of the Eremitani are allegories of the Planets, and, in its choir, some small sacred histories in dead colour, such as an Ecce Homo; also, on the upper walls, the life of St Augustine, with some other subjects. A few fragments of other paintings by Guariento are still extant in Padua. In the gallery of Bassano is a Crucifixion, carefully executed, and somewhat superior to a merely traditional method of handling, although on the whole Guariento must rather be classed in that school of art which preceded Cimabue than as having advanced in his vestiges; likewise two other works in Bassano, ascribed to the same hand. The painter is buried in the church of S. Bernardino, Padua.

GUARINI, Giovanni Battista (1537-1612), the author of the *Pastor Fido*, was born at Ferrara on the 10th of December 1537, just seven years before the birth of Tasso. He was descended from Guarino of Verona (see next article). The young Battista studied both at Pisa and Padua, whence he was called, when not yet twenty, to profess moral philosophy in the schools of his native city. He inherited considerable wealth, and was able early in life to marry Taddea de' Bendidei, a lady of good birth. In 1567 he entered the service of Alphonso II., duke of Ferrara, thus beginning the court career which was destined to prove a constant source of disappointment and annoyance to him. Though he cultivated poetry for pastime, Guarini aimed at state employment as the serious business of his life, and managed to be sent on various embassies and missions by his ducal master. There was, however, at the end of the 16th century no opportunity for a man of energy and intellectual ability to distinguish himself in the petty sphere of Italian diplomacy. The time too had passed when the profession of a courtier, painted in such glowing terms by Castiglione, could confer either profit or honour. It is true that the court of Alphonso presented a brilliant spectacle to Europe, with Tasso for its laureate poet, and an attractive circle of accomplished ladies. But the last duke of Ferrara was an illiberal patron, feeding his servants with promises, and ever ready to treat them with the brutality that condemned the author of the *Gerusalemme Liberata* to a madhouse. Guarini spent his time and money to little purpose, suffered from the spite and ill-will of two successive secretaries,—Pigna and Montecatini,—quarrelled with his old friend Tasso, and at the end of fourteen years of service found himself half ruined, with a large family and no prospects. When Tasso was condemned to S. Anna, the duke promoted Guarini to the vacant post of court poet. There is an interesting letter extant from the latter to his friend Cornelio Bentivoglio, describing the efforts he made to fill this place appropriately. "I strove to transform myself into another person, and, like a player, reassumed the character, costume, and feelings of my youth. Advanced in manhood, I forced myself to look young; I turned my natural melancholy into artificial gaiety, affected loves I did not feel, exchanged wisdom for folly, and, in a word, passed from a philosopher into a poet." How ill adapted he felt himself to this masquerade life may be gathered from the following sentence: "I am already in my forty-fourth year, the father of eight children, two of whom are old enough to be my censors, while my daughters are of an age to marry." Abandoning so uncongenial a strain upon his faculties, Guarini retired in 1582 to his ancestral farm, the Villa Guarina, in the lovely country that lies between the Adige and Po, where he gave himself up to the cares of his family, the nursing of his dilapidated fortunes, and the composition of the *Pastor Fido*. He was not happy in his domestic lot; for he had lost his wife young, and quarrelled with his elder sons about the division of his estate. Litigation seems to have been an inveterate vice with Guarini; nor was he ever free from legal troubles. After studying his biography, the conclusion is forced upon our minds that he was originally a man of robust and virile intellect, ambitious of greatness, confident in his own powers, and well qualified for serious affairs, whose energies found no proper scope for their exercise. Literary work offered but a poor sphere for such a character, while the enforced inactivity of court life soured a naturally capricious and choleric temper. Of poetry he spoke with a certain tone of condescension, professing to practise it only in his leisure moments; nor are his miscellaneous verses of a quality to secure for their author a very lasting reputation. It is therefore not a little remarkable that the fruit of his retirement—a disappointed courtier past the prime of early manhood—should have been a dramatic masterpiece worthy to be ranked with the classics of Italian literature. Deferring a further account of the *Pastor Fido* for the present, the remaining incidents of Guarini's restless life may be briefly told. In 1585 he was at Turin superintending the first public performance of his drama, whence Alphonso recalled him to Ferrara, and gave him the office of secretary of state. This reconciliation between the poet and his patron did not last long. Guarini moved to Florence, then to Rome, and back again to Florence, where he established himself as the courtier of Ferdinand de' Medici. A dishonourable marriage, pressed upon his son Guarino by the grand-duke, roused the natural resentment of Guarini, always scrupulous upon the point of honour. He abandoned the Medicean court, and took refuge with Francesco Maria of Urbino, the last scion of the Montefeltro-della-Rovere house. Yet he found no satisfaction at Urbino. "The old court is a dead institution," he writes to a friend; "one may see a shadow of it, but not the substance in Italy of to-day. Ours is an age of appearances, and one goes a-masquerading all the year." This was true enough. Those dwindling deadly-lively little residence towns of Italian ducal families, whose day of glory was over, and who were waiting to be slowly absorbed by the capacious appetite of Austria, were no fit places for a man of energy and independence. Guarini finally took refuge in his native Ferrara, which, since the death of Alphonso, had now devolved to the papal see. Here, and at the Villa Guarina, his last years were passed in study, lawsuits, and polemical disputes with his contemporary critics, until 1612, when he died at Venice in his seventy-fifth year.

The *Pastor Fido* is a pastoral drama composed not without reminiscences of Tasso's *Aminta*. The scene is laid in Arcadia, where Guarini supposes it to have been the custom to sacrifice a maiden yearly to Diana. But an oracle has declared that when two scions of divine lineage are united in marriage, and a faithful shepherd has atoned for the ancient error of a faithless woman, this inhuman rite shall cease. The plot turns upon the unexpected fulfilment of this prophecy, contrary to all the schemes which had been devised for bringing it to accomplishment, and in despite of apparent improbabilities of divers kinds. It is extremely elaborate, and, regarded as a piece of cunning mechanism, leaves nothing to be desired. Each motive has been carefully prepared, each situation amply developed. Yet, considered as a play, the *Pastor Fido* disappoints a reader trained in the school of Sophocles or Shakespeare. The action itself seems to take place off the stage, and only the results of action, stationary tableaux representing the movement of the drama, are put before us in the scenes. The art is lyrical, not merely in form but in spirit, and in adaptation to the requirements of music which demands stationary expressions of emotion for development. The characters have been well considered, and are exhibited with great truth and vividness; the cold and eager hunter Silvio contrasting with the tender and romantic Mirtillo, and Corisca's meretricious arts enhancing the pure affection of Amarilli. Dorinda presents another type of love so impulsive that it prevails over a maiden's sense of shame, while the courtier Carino brings the corruption of towns into comparison with the innocence of the country. In Carino the poet painted his own experience, and here his satire upon the court of Ferrara is none the less biting because it is gravely measured. In Corisca he delineated a woman vitiated by the same town life, and a very hideous portrait has he drawn. Though a satirical element was thus introduced into the *Pastor Fido* in order to relieve its ideal picture of Arcadia, the whole play is but a study of contemporary feeling in Italian society. There is no true rusticity whatever in the drama. This correspondence with the spirit of the age secured its success during Guarini's lifetime; this made it so dangerously seductive that Cardinal Bellarmine told the poet he had done more harm to Christendom by his blandishments than Luther by his heresy. Without anywhere transgressing the limits of decorum, the *Pastor Fido* is steeped in sensuousness; and the immodesty of its pictures is enhanced by rhetorical concealments more provocative than nudity. Moreover, the love described is effeminate and wanton, felt less as passion than as lust enveloped in a veil of sentiment. We divine the coming age of *cicisbei* and *castrati*. Of Guarini's style it would be difficult to speak in terms of too high praise. The thought and experience of a lifetime have been condensed in these five acts, and have found expression in language brilliant, classical, chiselled to perfection. Here and there the taste of the 17th century makes itself felt in frigid conceits and forced antitheses; nor does Guarini abstain from sententious maxims which reveal the moralist rather than the poet. Yet these are but minor blemishes in a masterpiece of diction, glittering and faultless like a polished bas-relief of hard Corinthian bronze. That a single pastoral should occupy so prominent a place in the history of literature seems astonishing, until we reflect that Italy, upon the close of the 16th century, expressed itself in the *Pastor Fido*, and that the influence of this drama was felt through all the art of Europe till the epoch of the Revolution. It is not a mere play. The sensual refinement proper to an age of social decadence found in it the most exact embodiment, and made it the code of gallantry for the next two centuries.

The best edition of the *Pastor Fido* is that of Venice (Ciotti, 1602). The most convenient is that of Barbèra, Florence, 1866. For Guarini's miscellaneous *Rime*, the Ferrara edition, in 4 vols., 1737, may be consulted. His polemical writings, *Verrato Primo* and *Secondo*, and his prose [illegible] called [illegible] were published at Venice, Florence, and Rome, between 1588 and 1614. (J. A. S.)

GUARINO, or GUARINUS (1370–1460), of Verona, one of the Italian restorers of classical learning, was born in 1370 at Verona, and studied Greek at Constantinople, where for five years he was the pupil of Manuel Chrysoloras. When he set out on his return to Italy he was the happy possessor of two cases of precious Greek MSS. which he had been at great pains to collect; it is said that the loss of one of these by shipwreck caused him such distress that his hair turned grey in a single night. He employed himself as a teacher of Greek, first at Verona and afterwards in Venice and Florence; in 1436 he became, through the patronage of Lionel, marquis of Este, professor of Greek at Ferrara; and in 1438 and following years he acted as interpreter for the Greeks at the councils of Ferrara and Florence. He died at Ferrara 14th December 1460, aged ninety.

His principal works are translations of Strabo and of some of the *Lives* of Plutarch, a compendium of the Greek grammar of Chrysoloras, and a series of commentaries on Persius, Juvenal, Martial, and on some of the writings of Aristotle and Cicero. See Rosmini, *Vita e Disciplina di Guarino* (Brescia, 1805-6).

GUARINO, also known as VARINUS, and surnamed from his birthplace FAVORINUS, PHAVORINUS, or CAMERS (c. 1450–1537), lexicographer and scholar, was born at Favora near Camerino about 1450, studied Greek and Latin at Florence under Politian, and afterwards became for a time the pupil of Lascaris. Having entered the Benedictine order, he now gave himself with great zeal to Greek lexicography; and in 1496 published his *Thesaurus cornucopiæ et horti Adonidis*, a collection of thirty-four grammatical tracts in Greek. He for some time acted as tutor to Giovanni dei Medici (afterwards Leo X.), and also held the appointment of keeper of the Medicean library at Florence. In 1514 Leo appointed him bishop of Nocera. In 1517 he published a translation of the *Apophthegmata* of Joannes Stobæus, and in 1523 appeared his *Etymologicum Magnum, sive Thesaurus universæ linguæ Græcæ ex multis variisque auctoribus collectus*, a compilation which has been frequently reprinted, and which has laid subsequent scholars under great though not always acknowledged obligations. Guarino died in 1537.

GUASTALLA, a town of Italy, in the province of Reggio, at the influx of the Crostolo into the Po, about 24 miles N.E. of Parma. It is the seat of a bishop, and possesses a cathedral, San Pietro, an extensive but ruined castle of the 16th century, eight churches, a civil hospital, a gymnasium, a public library (*La Biblioteca Maldotti*) with [illegible] vols., a school of music and a theatre. A statue of Ferrante I. of Gonzaga, by Leone Leoni of Arezzo, adorns the market-place. The inhabitants are largely engaged in the growing of rice, for which the marshy land around the town is specially adapted; and they [illegible] thread, and linen. In 1871 the population of the town proper was only [illegible], but that of the commune was 10,618.

[illegible]

Maria Theresa made good her claim to the imperial fief. At the peace of Aix-la-Chapelle it was ceded to the duke of Parma; and its subsequent history is practically that of Parma and Piacenza. In 1796 it was incorporated in the French Cisalpine Republic, and in 1805 it gave the title of princess to Napoleon's sister Pauline. Parma, Piacenza, and Guastalla were handed over by the peace of Vienna to Maria Louise, the wife of Napoleon; and on her death they passed to Charles of Bourbon. In 1848 Guastalla was ceded to Modena, and in 1859 along with Modena it was incorporated with Italy. The area of the duchy was about 125 square miles.

Plate III.

GUATEMALA, or more rarely GUATIMALA, was formerly a captain-generalcy of Spanish America, which included the fifteen provinces of Chiapas, Suchitepeques, Escuintla, Sonsonate, San Salvador, Vera Paz and Peten, Chiquimula, Honduras, Nicaragua, Costa Rica, Totonicapan, Quesaltenango, Solola, Chimaltenango, and Sacatepeques,—or, in other words, the whole of Central America and part of the present territory of Mexico. The name is now restricted to a small part of the area which constitutes an independent republic.

The republic of Guatemala is situated between 13° 42′ and 18° N. lat., and between 88° and 93° 5′ W. long. Conterminous on the N. with Mexico and Yucatan, it is bounded towards the E. and S.E. by Belize or British Honduras, the Gulf of Honduras, and the republics of Honduras and San Salvador; and towards the S.W. it is washed by the Pacific. The Yucatan frontier is only partially fixed, and though the Mexican frontier was nominally determined as early as 1772, the interpretation of the terms of the agreement is still open to much debate.[1] Towards British Honduras the boundary is fixed by the treaty of April 30, 1858, according to which it runs up the mid-channel of the river Sarstoon to the Gracias a Dios Falls, thence in a right line to Garbutt's Falls on the river Belize, and thence again in a right line due north to the Mexican frontier. The area of Guatemala is estimated at from 40,000 to over 50,000 square miles; an accurate statement is impossible, not only on account of the dubiety of frontier, but from the fact that the surveys are very imperfect. All the maps of the country contain a great deal of hypothetical material, especially in the filling up of the orographical details.

Mountains.—A large proportion of Guatemala may be generally described as mountainous. The main or central chain, which is usually considered a continuation of the Andes, runs in a wavy line from south-east to north-west, keeping on the whole parallel with the Pacific coast at a distance of 40 or 45 miles. Its mean elevation is about 7000 feet, but none of its summits attain to 14,000. Though it forms the main watershed of the country between the Pacific and the Atlantic versant or slope, it is pierced in one or two places by rivers. In the neighbourhood of the capital it bears the name of Sierra de las Nubes; in the north-west it is known as the Sierra Madre, and it enters the Mexican (ex-Guatemalan) state of Chiapas as the mountains of Istatan. A range called the Sierra de Chama, which, however, changes its name frequently from place to place, strikes eastward from the Sierra Madre towards Belize, where it is known as the Cockscomb; another similar range, the Sierra de Santa Cruz, continues east to Cape Cocoli between the Rio Dulce and the Sarstoon; and a third, the Sierra de las Minas or in its eastern portion Sierra del Mico, stretches between the Rio Dulce and the Rio Motagua. Between Honduras and Guatemala the frontier is formed by the Sierra de Copan. There are no real plateaus in Guatemala such as give its character to the Mexican region, the so-called plateaus of Quesaltenango, Peten, Guatemala, &c., being merely broad valleys amid the mountains, but the general relief of the country is of the most varied description, the mountains descending in all kinds of terraces and underfalls. The number of volcanic summits is very great. Bernoulli gives a list of 14 or 15, and [illegible] makes the number no less than 31. The following are those that are decidedly active:—Pacaya, in 14° 21' 30" N. lat. and 90° 44' 34" E. long., on the southern shores of lake Amatitlan, with its cone on the southern slope; Volcan de Fuego, 12,821 feet in height, in 14° 27' 25" N. lat. and 91° 53' 30" E. long., near Old Guatemala; Atitlan, 11,849 feet in height, in 14° 35' N. lat. and 91° 14' E. long.; Quesaltenango, 9358 feet in height, in 14° 53' 30" N. lat. and 91° 53' 30" E. long.; and Tajamulco, in 15° 4' 58" N. lat. and 92° 6' 7" E. long. The first two were observed in eruption by Bernoulli on occasion of the great earthquake of 1863. Like Quesaltenango, which is surrounded by an extensive *malpais*, it furnishes great supplies of sulphur. More famous, however, than any of these is the Volcan de Agua or Water Volcano, so called because in 1541 it destroyed the city of Old Guatemala by a deluge of water. It is situated in 14° 28' 48" N. lat. and 90° 53' 29" E. long. The statement of Humboldt that it rises above the snow-line is a mistake, as that would be a height of about 14,500 feet, whereas the actual height of the mountain, according to Poggendorff's revision of Captain Hall's trigonometrical measurement, is only 13,108 feet. When Dr Scherzer and Dr Wagner ascended the mountain on August 4, 1854, they found no traces of snow or ice, and though three weeks later a thin coating of snow appeared on the outer slopes of the crater, it was gone again in four days. The source of the great flood of water was probably a crateral lake.[1]

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[1] [illegible] at length in *Boletin de la Sociedad de Geografia Mexicana*, 1875.

Rivers.—Guatemala is richly watered. On the western side of the sierras the versant is short, and the streams, while very numerous, are consequently small and rapid; but on the eastern side a number of the rivers attain a very considerable development. The Motagua, whose principal head stream is called the Rio Grande, has a course of about 250 miles, and is navigable to within 90 miles of the capital, which is situated on one of its confluents the Rio de las Vacas. It forms a delta on the south of the Gulf of Honduras. Of similar importance is the Polochic, which is about 180 miles in length, and navigable about 20 miles above the river-port of Telemán. Before reaching the Golfo Amatico it passes through the Izabal Lake and the Golfete Dulce. A vast number of streams, among which are the Chisoy, the Guadalupe, the Rio de la Pasion, unite to form the Usumacinta, whose noble current passes along the Mexican frontier, and flowing on through Chiapas and Tabasco, falls into the bay of Campeachy. The Chiapas follows a similar course.

Lakes.—There are several extensive lakes in Guatemala. The Lake of Peten or Laguna de Flores, in the centre of the department of Peten, is an irregular basin about 27 miles long with an extreme breadth of 13. In an island in the western portion stands Flores the capital of the department, well known to American antiquaries for the number of ancient idols which have been recovered from its soil. On the shore of the lake is the stalactite cave of Jobitzinal, of great local celebrity; and in its depths, according to the popular legend, may still be discerned the stone statue of a horse that belonged to Cortes. The Lake of Izabal, already mentioned as the terminus of the Polochic river, is about 36 miles long, and would be of considerable value as a harbour if the bar at the mouth of the Rio Dulce did not prevent the upward passage of seafaring vessels. As a contrast the lake of Atitlan is a land locked basin encompassed with lofty mountains and possessing no visible outlet for its waters, which are replenished by numerous streams. It is about 18 miles long, with a maximum breadth of 9 or 10 miles, and it lies about 5300 feet above the sea level. "On its banks," says Mr Boddam Whetham, "stand eleven villages, whose situations are so varied that their climates and productions are those of the cold, the temperate, and the tropical regions, and whose inhabitants speak different dialects."[2] About 8 or 9 miles south of the capital lies the Lake of Amatitlan, with the town of the same name at its western extremity. It lies about 3980 feet above the sea, and has a length of 9 miles and a breadth of about 3. On the borders of San Salvador and Guatemala there is the lake of Guija, about 20 miles long and 12 broad, at a height of 2100 feet above the sea. It is connected by the river Ostuma with the Lake of Ayarza which lies about 1000 feet higher at the foot of the Andes. The large lakes, according to Dollfus, are not of crateral origin.

Geology and Mines.—The best and indeed the only elaborate account of the geology of the country is given by Dollfus and Montserrat,[3] who were members of the great French expedition for the exploration of the Mexican region. According to these savants, who, however, confess that their studies are only provisional, the basis rock is the granite which, along with trachytes and porphyries of very various character, intermingled with and overlaid by directly volcanic products, constitutes the great band of the Sierra Madre. From the main ridge towards the Atlantic there is a rich development of mica schists and calcareous formations of sedimentary origin and probably Jurassic age, while the versant of the Pacific is almost covered with modern alluvium washed down along the rapid slopes. Mastodont and elephant remains have been discovered in the tuffs. The country as a whole may be said to owe its shape to the porphyries. Though some of the strata are essentially metalliferous, Guatemala possesses few mines of importance. During the Spanish rule about 40 million pesos of silver were obtained at Alotepeque in Chiquimula; and the works are still carried on, though with poorer results. Lead is found extensively in Huehuetenango and Verapaz; beds of excellent coal exist in Izabal; marble is quarried at San Juan in Guatemala, and on the Rio Hondo in Zacapa; and lithographic stone is met with in the last-mentioned department.

Climate.—Except in the marshy lagoons along the Pacific, which are inhabited by groups of fishers and salt-gatherers, the climate of Guatemala is considered a healthy one. The peculiar relief of the country gives rise to a large amount of local differences in the matter of heat and cold; but the whole may be rudely divided into a tropical or low-lying region, a temperate or middle region, and a cold or elevated region. The tropical region, or *tierra caliente*, extends from the level of the sea to an elevation of about 1300 feet; the temperate, or *tierra templada*, from 1300 to 4900 feet; and the cold, or *tierra fria*, from 4900 to 8200 feet. Fortunately for the future of Guatemala the templada is by far the most extensive. In the caliente the rainy season lasts four months. During that period the south west wind prevails, and is often tempestuous like the Cordonazo de San Francisco, or "flagellation of St Francis," on the coast of Mexico; during the dry season the north wind is the most usual. The rainy season lengthens as we ascend to the templada: the Boca Costa district indeed has a rainy season of seven months, from May to November, and the dry season is not completely dry. Higher still, in the tierra fria, the rain lasts five months, from May to October, and the dry season is quite worthy of the name. At Guatemala, the only place where meteorological observations have been made through a long series of years, the minimum thermometer readings varied from 41° to 45° Fahr. in the five years 1859 to 1863, and the maximum from 84° to 87°.

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[1] See Wagner, *Wissenschaftlichen Reisen im tropischen Amerika.*

[2] See *Across Central America*, 1877, p. 103.

[3] *Voy. géol. dans les républiques de Guatemala et San Salvador*, Paris, 1868.

The hottest months are April and May. In the summer, or rainy season, the morning has usually a clear sky; about 2 or 3 o'clock in the afternoon the clouds begin to gather in great cumulus masses; suddenly the lightning flashes out and the rain crashes down; and by evening the sky is clear and starry. In the middle of the rainy season there is often a pause of two or three weeks. At Guatemala the mean annual rainfall for the five years 1859 to 1863 was 54 inches; at Boca Costa it is upwards of 78 inches.[1]

Animals.—The fauna of Guatemala is more closely connected with the fauna of South than with that of North America. As the country [illegible] and its limits are purely conventional, there [illegible] its own. It is [illegible] free from the [illegible] (*Felis* [illegible]), [illegible] called the tiger; the [illegible] (*Felis* [illegible]), popularly called the lion; the tigrillo (*Felis tigrina*), which is some-[illegible]. Several species of monkeys [illegible] in the warm [illegible]. The Mexican [illegible] has a wide range [illegible] lowlands and highlands. Besides the tapir there are two [illegible] or [illegible]. The [illegible] a species of [illegible] and the [illegible]; and among the rodents [illegible], the fruit [illegible] and the [illegible]. The [illegible] is [illegible] the [illegible]. [illegible] that villages have sometimes had to be left to [illegible]. For the [illegible] there is a rich [illegible] Guatemala. As the [illegible] great variety of [illegible] and it [illegible]. In the city of [illegible] (Bernoulli). [illegible] the [illegible] of the [illegible]. Neither the [illegible] of the southern continent nor the great eagles of the northern are known in Guatemala. Of the great [illegible] upwards of 400 species, including 35 species of humming-birds, 18 of woodpeckers, and 8 of the trogons. One of the last, the quetzal, [illegible] (*Trogon* [illegible]), is of special note, not only from the fact that its [illegible] tail-feathers, 2 feet long, were formerly worn as insignia by the Indian princes, but because it has been adopted as the [illegible] on the national arms of Guatemala. The [illegible] order is well represented, and comprises several [illegible], as the [illegible] and the [illegible] (*M*[illegible]), which has a bronze sheen on its plumage; and the palmipeds, it is almost needless to add, are unusually numerous in a country so richly furnished with lagoons and rivers and lakes.

There are two species of alligator, one in the Pacific and the other in the Atlantic [illegible]. Snakes are met with in great variety, but only about a fourth of the species are venomous, and even the bite of the rattlesnake is said to be less deadly than in the north. The [illegible] is one of the most common. Five species of [illegible] are known, 9 of the frogs, and 5 of the toads. Fourteen species of fish have been found in Lake Peten, [illegible] in Lake Atitlan, [illegible] in the river Motagua, 10 in the Polochic, and 17 in the [illegible].

The general character of the country induces a rich profusion of insect life. Of the *Coleoptera*, the [illegible], the [illegible], [illegible] and the *Chrysomelidae* [illegible] of the *Lepidoptera* the [illegible] *Papilio*, *Heliconius*, [illegible], and [illegible]. [illegible] bee, known as [illegible], has been [illegible]. [illegible] Mosquitoes [illegible] in several districts [illegible].

[illegible] the [illegible] of Guatemala [illegible] the horse, the ox, the goat, the sheep, the pig, the dog, the rabbit, the [illegible] the [illegible] *de Castilla*. [illegible] and Honduras. The [illegible] is the black. [illegible] the Guatemalan [illegible] and the [illegible] most sought after are the sensontle, the guarda-barranco (*Myiadestes* [illegible]), the [illegible], and the [illegible]. The last of these is as good as a watch-dog, as "no stranger can enter the yard without being greeted by its shrill cries."[2]

Vegetable Products.—As may be judged from the description of the configuration of the country and its climate the natural productions of Guatemala are sufficiently varied. [illegible] gives a list of upwards of 100 kinds of timber trees. Maize and haricot beans [illegible], which form the main sustenance of the people, are grown in all the departments, and in some places there are two harvests a year. [illegible] less extensively distributed. For the [illegible] plant is the most important product. While in 18[illegible] export was [illegible] cwt., by 187[illegible] it had increased to upwards of 18[illegible] cwt. Meanwhile the cultivation of indigo [illegible], which was formerly the principal [illegible], is being [illegible]. [illegible] is [illegible] cultivated in the [illegible]; [illegible] throughout the country. [illegible] Sugar [illegible]. [illegible] is one of the chief hindrances to the development of industry and trade.

Political Divisions.—The following table from [illegible] exhibits the 20 departments into which the republic of Guatemala is divided, their estimated areas, their respective capitals, their populations, and the population of the capitals. [illegible] the republic contains 10 cities, 22 towns, [illegible] townships, and 1794 hamlets, &c.

Department.	Area, Sq. M.	Population.	Capitals.	Population.
[illegible]	[illegible]	100,000	Guatemala	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1,950	[illegible]	[illegible]	[illegible]
Chimaltenango	[illegible]	[illegible]	Chimaltenango	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1,700	[illegible]	[illegible]	7,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]		

Government.—The constitution of Guatemala is republican and representative. The council of state consists of 24 members elected by the house of representatives, which consists of 52 members elected by the people. The [illegible] president [illegible] four years. The [illegible], which in 1874 amounted to [illegible] dollars [illegible], is mainly derived from import duties, [illegible], a large part of the expenditure, [illegible] absorbed by the army, [illegible]. The public debt, [illegible] in 1875 to [illegible].

Religion and Education.—The national religion is the Roman Catholic, but there is absolute toleration of other creeds. The Government pays a regular [illegible] to the church. In the 17 [illegible] into which the country is divided there are 111 parishes. [illegible] In [illegible] there were [illegible] schools, with [illegible] and [illegible] pupils. In 1874 the schools had increased to 541, [illegible].

Population.—[illegible] it is calculated that about [illegible] whites, [illegible]. According to [illegible] 1874 [illegible] of whom 391 were Mexicans, [illegible] Spaniards, [illegible], 73 Italians, 64 Germans, and [illegible]. The native population [illegible]. A [illegible] the [illegible]; [illegible] "Viva la religion, y mueran los extranjeros" [illegible].

Roads.—The means of communication between one part of the country and another are very poor. In the [illegible] it was [illegible] roads, [illegible]. [illegible] a great proportion of the [illegible] by the dry season, [illegible] and many

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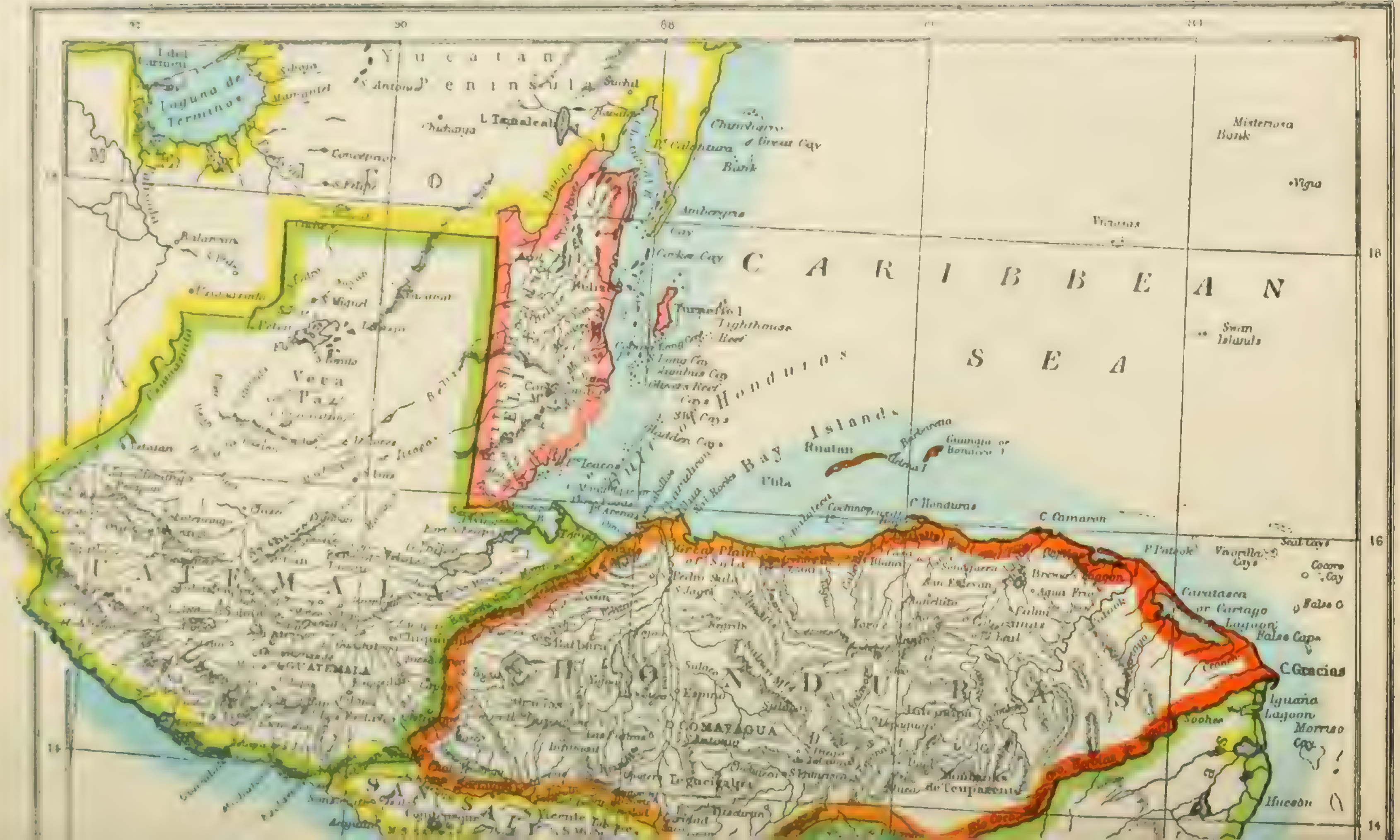
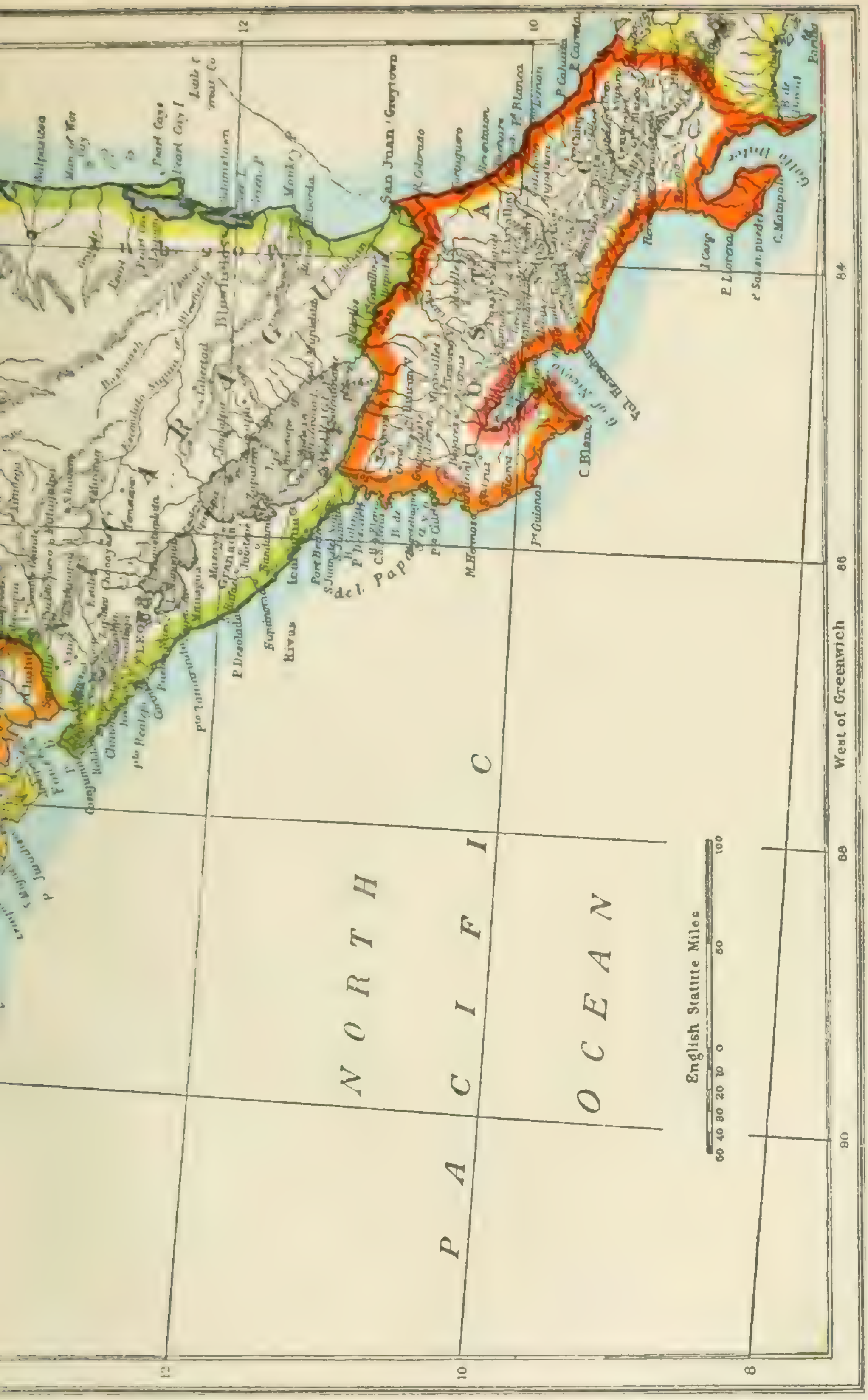
[1] See paper [illegible] "[illegible] Central Amerikas," in [illegible], 18[illegible].

[2] [illegible] exploration are Salvin, [illegible], Sumichrast, Boucard, [illegible], and Bernouilli.

GUATEMALA, HONDURAS, &c.





NORTH
PACIFIC
OCEAN
NICARAGUA
COSTA RICA
San Juan (Greytown)
Bluefields
Pearl Cays
Pearl Cay I.
Monkey Pt.
R. Colorado
Pt. Blanca
Limon
P. Cahuita
Granada
Rivas
Port Brito
S. Juan del Sur
G. of Nicoya
C. Blanco
Pt. Guiones
M. Hermoso
Golfo Dulce
C. Matapalo
P. Llorona
I. Caño
P. Desolada
Pto. Realejo
English Statute Miles
50 40 30 20 10 0
50
100
West of Greenwich
84
86
88
90
8
10
12

of the bridges are of the slightest construction and in a pitiable state of repair. Nearly a week is the time taken by the ordinary waggons to accomplish the journey from San José to Escuintla, a distance of about 30 miles. According to the terms of a contract with the Government, a railroad between San José and Escuintla was begun in 1878, but it is still uncompleted. The telegraph has been more extensively introduced. In 1874 there were in all ten lines, with [illegible] miles in operation, and 111 in course of construction.

Harbours.—The country is poorly furnished with ports. Izabal, Santo Tomas, Livingston, Gualan, and Panzos exhausting the list on the Atlantic, and San José, Punta de las [illegible], Tecojate, San Geronimo, San Luis, and Champerico that on the Pacific. Izabal, situated in 15° 24′ N. lat. and [illegible] W. long., is of little use, as it is separated from the sea by the bar of the Rio Dulce. Santo Tomas, in 15° [illegible] N. lat. and 88° [illegible] W. long., has the position at the southern extremity of the Gulf of Amatique, which is at once spacious and well protected. Livingston is at the mouth of the Rio Dulce, in 15° 48′ N. lat. and 88° [illegible] W. long. Gualan is a river port in the Motagua, and Panzos lies below Teleman on the Polochic. Of the Pacific ports San José is the most noteworthy as the usual landing place for strangers on their way to the capital. It is situated in [illegible] N. lat. and 90° 42′ W. long. A fine pier was built in 1868, but vessels have usually to anchor about a mile out, and the roadstead is not very secure. Champerico, opened to foreign trade in 1870, is also a simple roadstead. It is situated in the department of Suchitepequez, in 14° 17′ N. lat. and 91° 57′ W. long. Iztapa, formerly the principal port on the north coast, has been almost abandoned since 1853.

Antiquities.—Though it has no ancient remains so remarkable as those at Copan in Honduras, or Palenque in Chiapas, Guatemala preserves many traces of its earlier inhabitants. A careful summary of what is known in regard to them is given in Bancroft's *Native Races of the Pacific States of North America*, vol. iv. On the left bank of the Motagua are the ruins of an ancient city visited in 1840 by Mr Catherwood and in 1854 by Dr Scherzer. They resemble the ruins of Copan, and contain mounds, terraces, colossal heads, idols, pillars, and altars. Ruins are also to be seen at [illegible] and [illegible] in the same valley, at Cinaca Mecallo, and at the hacienda of Carrizal about 20 miles north of Guatemala. A few leagues to the west are the ruins of Mixco with a vast cave divided into chambers. An ancient aqueduct is mentioned at Rosario, 8 or 10 miles south of Lake Amatitlan and another at the foot of the Volcan de Fuego. Solola is said to occupy the site of Tecpan Atitlan; and in the neighbourhood of Tecpan Guatemala are the substructions and tombs of Patinamit, the old Cakchiquel capital. Utatlan, the Quiché capital has left near Santa Cruz del Quiché sufficient to confirm the early Spanish accounts of its greatness. The absence of sculptures is a striking feature. Rude mounds mark the site of Zakuleu, the chief town of the Mams, near Huehuetenango. At the junction of the Pacalah with the Chisoy Brasseur de Bourbourg in [illegible] found pyramidal mounds and long lines of fortifications. The half-explored country of Peten is reputed to conceal many evidences of its former civilization, and about 40 miles north-east of the lake about a league is occupied by the ruins of Tikal.[1]

History.—In 1820 Guatemala began to shake off the Spanish yoke, and in 1822-23 it supported the Mexican patriot Iturbide. A confederation of the Central American states was effected in 1824, slavery was abolished, and a democratic constitution was established. On the assassination of the vice-president Flores in 1827 the San-Salvadorans marched against the city of Guatemala; and though they were repulsed then they returned in 1829, and after a severe battle established their general Morazan as president. Guatemala recovered its independence under Carrera, who in 1851 defeated the Hondurans and Salvadorians at La Arada, near Chiquimula and was recognized as the protector of the republic. In 1851 the new constitution [illegible] form was promulgated, and Carrera was appointed president [illegible], a dignity which was afterwards in 1854 bestowed upon him for life. His rivalry with Barrios, president of Salvador, resulted in open war in 1863. In the battle of Coatepeque the Guatemalans suffered a severe defeat, which was followed by a truce. Honduras now joined with San Salvador, and Nicaragua and Costa Rica with Guatemala. The contest was finally settled in favour of Carrera, who besieged and occupied the San Salvador capital, and made himself dominant also in Honduras and Nicaragua. During the rest of his rule, which lasted till his death in April 1865, he continued to act in concert with the clerical party, and endeavoured to maintain friendly relations with the European Governments. Carrera's successor was General Cerna, who had been recommended by him for election. In the struggle between Spain and Chili Guatemala maintained a strict neutrality. The liberal party began to increase its influence about 1870, and in May 1871 Cerna was deposed by Granados. The archbishop of Guatemala and the Jesuits were driven into exile as intriguers in the interests of the clerical party; and General Barrios having been chosen president in 1872 the order was declared extinct and its property confiscated. All cities except those on the frontier of Chiapas, San Salvador, and Honduras, were opened to foreign commerce. An alliance was formed with San Salvador for offence and defence. In 1876 Barrios invited representatives from the other Central American republics to meet at Guatemala to deliberate on their amalgamation, but the commission separated amid a clash of arms, and war was soon raging between Guatemala, San Salvador, and Honduras. Guatemala was enabled by her superior resources to come forth victorious from the conflict.

Besides the numerous works of Brasseur de Bourbourg and Squier, who has devoted so much attention to Central America, see the interesting narrative of Thomas Gage, the English missionary; Juarros, *Compendio de la Historia de Guatemala*, 1808-1818, 2 vols., new ed., 1857, which in Baily's English translation (Lond., 1823) long formed the chief authority; Larrazabal, *Apuntamientos sobre la agricultura y comercio del reyno de Guatemala*, N. Guat., 1811; Obert, *Mém. . . . statistique de l'État de Guatemala*, Brussels, 1840; Ximenez, *Las historias del origen de los Indios de Guatemala*, Vienna, 1857; Gavarrete, *Catecismo de Geografía de la repub. de Guatemala*, 1860 (republished by the *Sociedad Economica*); Alfred de Valois, *Mexique, Havana, et Guatemala*, Paris, 1862; Orozco y Berra, *Geografía de las lenguas y Carta etnográfica de Mexico*, Mexico, 1866; Mechlin & Warren, *Report of a Journey from Belize to the City of Guatemala*, Belize, 1872; Foleda, *Geografía de Centro America*, Guatemala, 1874; Laferrière, *De Paris à Guatemala*, Paris, 1877. The most valuable maps of Guatemala are Van der Gehacht's *Mapa general*, &c. (New York, 1859), Bourgeois and Feustel's appended to Foleda's *Geografía* (1874), and Au's (Hamburg, 1876). The last is perhaps the best. A geological map is given by Dollfus and Montserrat. (H. A. W.)

GUATEMALA, properly **SANTIAGO DE GUATEMALA**, or **GUATEMALA LE NUEVA**, or the New, is the capital of the above republic. It is situated at a height of 5270 feet above the sea in a fertile meseta or plateau, which is crossed by the valley of the Rio de las Vacas or Cow River, so called from the first specimens of the bovine race introduced by the Spaniards. On almost all sides it is surrounded by barrancas or ravines. The latitude is stated as either 14° 36′ or 14° 37′ N., and the longitude as 90° 24′ or 90° 30′ W. of Greenwich. Like most Spanish American towns it is laid out in wide and regular streets, and it has extensive suburbs. The houses, though usually of only one story, are solidly and comfortably constructed, and many of them are furnished with large gardens and courts. Among the open spaces the chief are the Plaza Major, which contains the cathedral, erected in 1730, the archiepiscopal palace, the Government buildings, the mint, and other public offices, and the Plaza de la Concordia, recently laid out by the Ministerio de Fomento, and now the favourite resort of the inhabitants. The theatre, founded in 1858, which is one of the best of Central America, is situated in the middle of another square. Besides the cathedral, the most important churches are those of San Francisco, La Recoleccion or church of the La Recollets, La Merces, with a black image of the Virgin, greatly reverenced by the Indians, and Santo Domingo, the oldest church in the town. The educational and benevolent institutions comprise the university, the normal school, the national school for girls founded in 1875, the polytechnic school, the general hospital, the orphanage, the hospicio, the maternity hospital, and the Colegio de Belen for the education of girls. The military college is located in the old convent of the Recollets. An excellent museum, founded in 1831, is maintained by the Sociedad Economica, which in various ways has done great service to the city and the country. There are two fortresses in the city, the Castello Matamoros, built by Carrera, and the Castello de San José, used as a state prison. Water is brought from a distance of about 8 miles by two old aqueducts. The general prosperity of Guatemala has procured it the name of the Paris of Central America. Though it has neither railway nor river communication with either coast, it carries on a busy trade; and it also possesses cigar factories, wool and cotton factories, breweries, and other industrial establishments. The population is stated at from 30,000 to 45,000. It is only since 1775 that New Guatemala has been in existence.

Old Guatemala, frequently called merely Antigua, was destroyed by the Volcan de Agua in 1774, but still remains the chief town of the department of Sacatepequez. It is situated in a beautiful valley in 14° 32′ 58″ N. lat. and 90° 44′ 5″ W. long. Till the fatal outbreak of the volcanic forces it was one of the richest and most beautiful cities of Spanish America, possessing about 100 churches and convents and more than 60,000 inhabitants. The ruins are still almost majestic, and many of the buildings appear as if they had been fortresses. Among those best preserved are the ancient residence of the Spanish governors, now occupied by the administration, and the university building, now the national college. Great damage was done to the place by the earthquake of September 1874. The population is about 20,000. An older Guatemala was situated at Ciudad Vieja or Almalonga, but seventeen years after it was founded by Alvaredo it was carried away by the great inundation to which the Volcan de Agua owes its name.

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[1] Compare Bastian, *Reisen*, &c., Berlin, 1878.

GUAVA (from the Mexican *guayaba*) is the name applied to the fruits of species of *Psidium*, a genus belonging to the natural order *Myrtaceæ*. The species which produces the bulk of the guava fruits of commerce is *Psidium Guayava*, Radd., a small tree from 15 to 20 feet high, a native of the tropical parts of America and the West Indies. It bears short-stalked egg-shaped or oblong leaves, with strongly marked veins, and covered with a soft tomentum or down. The flowers are borne on axillary stalks, and the fruits vary very much in size, shape, and colour, numerous forms and varieties being known and cultivated. The variety whose fruits are most valued is that which is sometimes called the white guava (*P. Guayava*, var. *pyriferum*). The fruits are pear-shaped, about the size of a hen's egg, covered with a thin bright yellow or whitish skin filled with soft pulp, also of a light yellowish tinge, and having a pleasant sweet-acid and somewhat aromatic flavour. *P. Guayava*, var. *pomiferum*, produces a more globular or apple-shaped fruit, sometimes called the red guava. The pulp of this variety is mostly of a darker colour than the former and not of so fine a flavour, therefore the first named is most esteemed for eating in a raw state; both, however, are used in the preparation of two kinds of preserve known as guava jelly and guava cheese, which are made in the West Indies, and imported thence to England; the fruits are of much too perishable a nature to allow of their importation in their natural state. The two varieties here mentioned have been described by some botanists as distinct species. They have both been introduced into various parts of India, as well as in other countries of the East, where they have become perfectly naturalized. Though of course much too tender for outdoor planting in England, the guava thrives there in hothouses or stoves.

Psidium Cattleyanum, Sab., a tree of from 10 to 20 feet high, supposed to be a native of Brazil, but originally brought to Europe from China, is known as the purple guava. The fruit, which is very abundantly produced in the axils of the leaves, is large, spherical, of a fine deep claret colour; the rind is pitted, and the pulp is soft, fleshy, purplish, reddish next the skin, but becoming paler towards the middle, and in the centre almost or quite white. It has a very agreeable acid-sweet flavour, which has been likened to that of a strawberry.

GUAYAQUIL, or SANTIAGO DE GUAYAQUIL, the principal seaport of the republic of Ecuador, South America, is situated on the western bank of the Guayaquil river, about 29 miles from its mouth, in 2° 12′ 24″ S. lat. and 79° 51′ 24″ W. long. The site forms part of a low and level tract of ground bounded on the north by the hills of Santa Ana; and the streets are for the most part laid out with great regularity. To the north lies the old town, mainly inhabited by the poorer classes; to the south the new town. As the houses are generally built of wood or bamboo and mud, the risk of conflagrations is unusually great; and a strong fire brigade is maintained. Since 1870 the town has been drained, the river has been dredged, and an abundant supply of good water has been brought from a distance. The principal streets are lighted with gas. None of the public buildings are of any architectural interest. All the churches, with the exception of Santo Domingo, are built of wood. There are two colleges (San Vicente and San Ygnacio), a civil hospital (De la Caridad), a new and commodious military hospital, municipal buildings, and a custom-house.

As its harbour is one of the best on the Pacific coast, and permits vessels of large tonnage to come up to the town, Guayaquil is the centre of the foreign trade not only of Ecuador but of part of Peru, and has regular steamship communication both with American and European ports. Bamboos, cocoa, coffee, hides, india-rubber, ivory-nuts, orchilla, and Panama hats are the staple articles for the outgoing cargoes; and there is a demand for pine apples, oranges, and other fresh fruits for Chili and Peru. The average value of the exports in the five years from 1867 to 1871 was £529,785; and the value of the imports increased from £434,560 in 1867 to £1,168,656 in 1871. In 1876 there entered 79 British vessels, other 57 foreign vessels, and 60 national vessels, with a tonnage respectively of 118,560, 25,979, and 2222. One of the greatest hindrances to a development of the export trade is the want of proper roads from the interior. It is only recently that the carriage road to Quito has been completed. Below the town there is a large astillero or ship-building yard of great repute on the Pacific coast. The Guayaquil bank, with a capital of $1,000,000 in native currency, dates from 1868, and the Banco de Credito Hipotecario, with a capital of $500,000, from 1872. The population of the town is from 20,000 to 22,000, mainly mulattos, mestizos, and Indians.

Santiago de Guayaquil was so called because it was founded on St James's Day, 25th July 1531. Declared a city by Charles V. on October 6, 1535, it was officially constituted the same year by Balalcazar; and two years later it was restored by Francesco Orellana. In the course of the 17th and 18th centuries the main facts in its history are the attacks of pirates and disasters by fire. The Dutchman Jacob Clerk was the assailant in 1624, the Frenchman David in 1686-7, William Dampierre in 1707, and Clapperton in 1709. As late as 1741 the only defences were three indifferent forts in the river; but in 1763 the town was made the seat of a governor, and a good castle and other fortifications were constructed. The following year a great fire destroyed property to the value of 2,000,000 pesos. In 1837 Guayaquil was made the see of a bishop.

See Villavicencio, *Geographia del Ecuador*.

GUAYRA, LA, or LA GUAIRA, a town of Venezuela, in the province of Caracas, about 8 miles from the city of Caracas, in 10° 36′ N. lat. and 71° 46′ W. long. It is situated on a low-lying strip of coast, but at the same time has a certain amount of picturesqueness as seen against the background of the Cordilleras. Being one of the four principal ports (*puertos habilitados*) of the country, it enjoys a degree of commercial prosperity; but its trade, which is mainly in the hands of Germans, is almost exclusively of the transit description. Its imports are principally from Hamburg and Bremen. There is regular steamboat communication with Puerto Cabello, Maracaibo, and St Thomas. The population is about 4000. The railway to Caracas, though contracted for, has been stopped. The municipality maintains 19 schools, in which 370 boys and 260 girls are educated free of expense.

GUBBIO, a city of Italy, in the province of Umbria, about 20 miles N. of Perugio. Built along the western ledges of Monte Calvo, it shares alike in the grandeur of the mountains and the beauty of the plain, and its churches and palaces are brought into relief by the varying elevation of the site. Its ancient walls are still retained, and a certain mediæval impress lingers about the place. Besides the cathedral of SS. Mariano and Giacomo, which consists of a small single nave and has a fine wheel window, San Francisco may be mentioned for the sake of the Conception by Fr. Signorelli, S. Agostino for a Madonna del Soccorso by Ottaviano Nelli, and S. Maria Nova with the same artist's finest work—a votive fresco. Portions still remain of the old palace of the dukes of Urbino, built for Federigo by Luciano Laurana. The palazzo municipale or del comune is a fine building erected between 1332 and 1346 after the designs of Matteo Giovanello, surnamed Gattapone.

Like Urbino and Faenza, Gubbio was formerly noted for its majolica, and it was Maestro Giorgio of Gubbio who rediscovered the ruby glazing for which this ware is remarkable. The manufacture has been resumed in modern times. In the north-west end of the town there is a great reservoir, La Bottaccione, capable of containing 4,720,000 cubic feet of water. The population in 1871 was 5343 in the town and 22,757 in the commune. See EUGUBINE TABLES.

The ancient Umbrian city of *Ikuvium*, *Iguvium*, or *Eugubium* occupied a site a little farther out in the plain, to the left of the Via Flaminia. There is no mention of it in Roman history till the [illegible]. It was the place selected by the senate for the detention of the Illyrian king Gentius and his sons, and it was an important point in the wars between Cæsar and Pompey. The site is still marked by ruins, among which are those of the theatre discovered in [illegible], Perugia, 1790, and further excavated in 1863 (*Bull. dell' Instit. di corr. arch.*, tom. xii.). It is also known that the town possessed temples to Diana, to Vesta, to Janus, to Pallas, and to the Sun and Apollo; and about 8 miles to the north was the celebrated temple of the Apennine Jove. The modern city was raised from the decay into which it had fallen by Otho the Great, whose charter may be seen in Reposati's *Della Zecca di Gubbio*, Bologna, 1773. In 1155 it was besieged by Frederick Barbarossa, but was saved by the intercession of St Ubaldo. The temporal government of the town, which had previously been in the hands of the papal legate, the bishop, or the prior of the cathedral, was then placed by the emperor in the hands of the people. The first podesta appears in 1163. During the 14th century the prosperity of Gubbio was greatly advanced; it obtained jurisdiction over 130 castles, had great influence over the neighbouring cities, and possessed about 50,000 inhabitants. In 1384 it surrendered to Montefeltro, and thus became incorporated with the duchy of Urbino. An account of the school of painting which flourished in Gubbio in the 15th century is given by Ranghiasci Sebastiani in vol. iv. of the Siena edition of Vasari, and by Angelo Rossi in his *Memorie di belle arti in Gubbio*, Perugia, 1861. Reference may also be made to *Statuta civitatis Eugubii*, Gubbio, 1686; Greffolini, *De gestis Eugubinorum*; Sarti, *De Episcopis Eugubinis*, 1755; and the Marchese Brancaleoni, "Dei palazzi municipali e pretorio di Gubbio" in *Archivio Storico*, 1867.

GUBEN, a town of Brandenburg, Prussia, capital of a circle in the government district of Frankfort, is situated at the confluence of the Lubist with the Neisse and at the junction of three different railways, 28 miles S.S.E. of Frankfort. It is the seat of a circle court and of a district office, and possesses three evangelical churches, an Old Lutheran church, a Catholic church, a synagogue, a gymnasium, a real-school of the first order, two higher female schools, an infirmary, and a theatre. The principal industries are the spinning and weaving of wool, dyeing, tanning, and the manufacture of pottery ware, hats, and machinery. The vine is cultivated in the neighbourhood to some extent, and there is also some trade in fruit and vegetables. The population in 1875 was 23,704.

Guben is of Wendish origin. It is mentioned in the time of the emperor Henry II., and received town rights in 1235. It was surrounded by walls in 1311, about which time it came into the possession of the margrave of Brandenburg, from whom it passed to Bohemia in 1367. It was twice devastated by the Hussites, and in [illegible] and 1635 it was occupied by the Swedes. In the latter year it came into the possession of the electorate of Saxony, and in 1815 it was, along with the rest of Lower Lausatia, united to Prussia.

GUDGEON (*Gobio*), a small fish of the family *Cyprinidæ* (see ICHTHYOLOGY), with narrow, cylindrical body, and with a small barbel at each corner of the mouth. These fishes are generally distributed over Europe, the most common being *Gobio fluviatilis*, called "goujon" in France, "grässling" or "gründling" in Germany, and "gobione" in Italy. They thrive in streams as well as lakes, always keeping to the bottom, and scarcely exceeding a length of 8 inches. Gudgeons differing but little from the European are equally common in China and Japan.

GUELDERLAND, GELDERLAND, or GUELDERS (in Dutch *Gerderland* or *Gelre*, in German *Geldern*, and in Latin *Geldria*), formerly a duchy of the empire, bounded by Friesland, Westphalia, Brabant, Holland, and the Zuydersee. At the beginning of the Christian era the land was held by Batavians and Chamavians, and a few centuries later both Saxons and Franks were added to its population. The Carolingian kings ruled over it by means of a number of counts, among whom those of Hameland, Teisterbant (Testrebant), and Nimeguen were the most prominent; but hitherto it has not been discovered how these counts are connected with the later dynasty of the counts of Guelderland and Zutphen, which makes its appearance in the 11th century. There is documentary proof at Braunweiler of the existence of a Count Otto at the end of the 10th century, and a charter of 1096 is sealed by Gerhard of Gelder. Count Gerhard II. of Gelder married Ermgard of Zutphen, and their son Henry succeeded to the double inheritance. Both Henry (1131–1182) and his son and successor Otto I. (1182–1207) considerably extended their domains, and Otto deserves to be remembered for the civic rights which by a happy innovation he bestowed on the town of Zutphen in 1190. Gerhard III. (1207–1229) obtained from the emperor Frederick II. the right of removing the toll of Arnheim to Lobith, where it long proved the principal source of income to the countship. Otto II., son of Gerhard III., greatly augmented his power and territory, and secured the internal stability of his government by erecting numerous free communes, such as Harderwijk, Arnheim, Emmerich, Lochem, &c. Reinald I. (1271–1326) had the chagrin of seeing the dukedom of Limberg, which fell to him by the death of his father-in-law, seized by John I. of Brabant in 1288; but from the emperor Henry VII. he received, in 1310, the right of bestowing full municipal privileges on any free communities he might establish, and in 1317 he was raised to the rank of prince of the empire by Frederick of Austria, which implied possession of legislative authority and liberty to coin his own money. A steady increase of power rewarded the exertions of Reinald II. (1326–1339), and shortly before his death (March 19, 1339) he received the hereditary title of duke of Guelderland from the emperor Louis of Bavaria. The new duchy, however, had an ill beginning of its history. Reinald III., the natural successor, found a bitter rival in his brother Edward, and in 1361, after a contest of eleven years, he was completely defeated in the battle of Tiel; and though ten years later, on Edward's death, he recovered his rightful position, he survived his restoration only three months. A protracted contest between the hostile factions was at length decided in favour of William a nephew of the last duke, and son of William of Juliers, who succeeded in 1378, but did not receive imperial recognition till 1383. Between 1384 and 1386 he assisted the Teutonic knights against the Prussians; and in 1393 he became duke of Juliers by the death of his father. He died 16th February 1402, and was followed by his brother Reinald IV., whose reign of three and twenty years was mainly noticeable for several contests with Holland, the surrender of Emmerich and other portions of territory, and the gradual consolidation of the Guelderland states. Reinald IV. dying childless in 1423, the coronet passed to his grand-nephew Arnold, the son of John of Egmond. Arnold of Egmond was at first recognized by the emperor Sigismund in 1424, but in 1425 the emperor revoked his sanction, and gave his support to Adolphus of Cleves. In the war that followed the people of Guelderland stood true to Arnold, but his extravagance and carelessness brought the financial affairs of his duchy into confusion; and at length, in 1444, after the defeat of his forces by Adolphus at Linnich, he was constrained to pawn part of his territory to Cleves. The states had complained of the maladministration in a diet of 1436, and the malcontents ultimately, in 1456, found a leader in the duke's own son Adolphus, who, after an apparent reconciliation with his father made the old man a prisoner in January 1465, and confined him in the castle of Buren. A civil war now broke out, and Charles the Bold of Burgundy seized the opportunity for his own advantage; in 1471 Adolphus was forced to set his father at liberty; and Arnold, in return for the service done him, made over his duchy to the Burgundian duke for 20,000 gulden, only reserving the usufruct till the close of his own life. On 23d February 1473 Arnold died, and Charles was duke of Guelderland. The town of Nimeguen made an heroic effort to oppose the Burgundian accession, but it fell after a lengthened siege. On Charles's death at the battle of Nancy in 1477, a party in the powerful city of Ghent became anxious to marry Charles of Egmont to their princess, Mary of Burgundy. Before the year was out, however (29th June 1477), the young man had perished before the walls of Tournay, against which he had led an army of Burgundians and Flemings to recover it from the French. By his marriage with the Princess Mary, Maximilian of Austria considered himself the rightful possessor of Guelderland, and he succeeded by 1482 in quelling all opposition. But ten years later young Charles of Egmond, the son of Adolphus, set foot once more in his native country; the people soon flocked to his standard; and victorious campaigns proved the capacity of the leader and the enthusiasm of the soldiers. The fierce contest continued for years, and Charles carried the war into the enemy's territories. In 1507 he pushed into Holland and Brabant, in 1512 appeared before Amsterdam, and in 1514 made capture of Groningen. It was not till 1528 that Charles V. granted him the lifelong occupation of Guelderland, Zutphen, Groningen, Coevorden, and Drenthe. In return he agreed that if he died childless his possessions should revert to the emperor; but such was his hatred of the house of Austria that towards the close of his life he planned to make France his heir. This, however, was prevented by the states of Guelderland insisting on his appointing as his successor William, the youthful son of the duke of Cleves and Juliers. Charles died 30th June 1538, and William assumed the title of duke. But Charles V. was not disposed to give up the rights secured by the treaty of Gorinchem, and after a contest in which much damage was done to various parts of the Low Countries, William was obliged to surrender his claims on 7th September 1543. On the rise of the Dutch republics most of Guelderland threw off the Spanish yoke. One "quarter" only, that of Roermonde, continued subject, and it received the name of Spanish Guelderland; the other three "quarters," Nimeguen, Zutphen, and Arnheim, became Dutch Guelderland, and had their provincial diets twice a year. By the peace of Utrecht Spanish Guelderland or the Upper Quarter (Overkwartier) passed to Prussia, including the town of Guelders, but excluding Venloo, which went to the Netherlands, and Roermonde, which went to Austria. By the peace of Paris (1814) the temporary divisions of the French revolutionary period were abolished, and all Guelderland was incorporated with Holland except the portion which still forms the Prussian circle of Düsseldorf.

Guelderland, the modern province of the Netherlands, has an area of 1962 square miles, and its population in [illegible], and 1873 were respectively [illegible], and [illegible]. The largest towns are Nimeguen ([illegible] in 1876), Arnheim ([illegible]), Zutphen ([illegible]), Apeldoorn ([illegible]), Ede ([illegible]), and [illegible] ([illegible]), and there are at least [illegible] other communes with more than 5000 inhabitants.

[illegible]

GUELDER ROSE, so called from Guelderland, its supposed source, termed also Marsh Elder, Rose Elder, Water Elder (Germ., *Wasserholder*, *Schneeball*; Fr., *Viorne-Obier*, *l'Obier d'Europe*), the *Viburnum Opulus* of Linnæus, is a shrub or small tree of the natural order *Caprifoliaceæ*, and a native of Britain and other parts of Europe, and of Russian Asia. It is common in Ireland, but rare in Scotland. In height it is from 6 to 12 feet, and it thrives best in moist situations. The leaves are smooth, 2 to 3 inches broad, with 3 to 5 unequal serrate lobes, and glandular adnate stipules. In autumn the leaves change their normal bright green for a pink or crimson hue. The flowers, which appear in June and July, are small, white, and arranged in cymes 2 to 4 inches in diameter. The outer blossoms in the wild plant have an enlarged corolla, ¾ inch in diameter, and are devoid of stamens or pistils; in the common cultivated variety all the flowers are sterile, and the inflorescence is globular, hence the term "Snowball Tree" applied to the plant, the appearance of which at the time of flowering has been prettily described by Cowper in his *Winter Walk at Noon*. The guelder rose bears juicy, red, elliptical berries, 4 lines in length, which ripen in September, and contain each a single compressed seed. In northern Europe these are eaten, and in Siberia, after fermentation with flour, they are distilled for spirit. The plant has, however, emetic, purgative, and narcotic properties; and Taylor (*Med. Jurisp.*, vol. i. p. 448, 2d ed., 1873) has recorded an instance of the fatal poisoning of a child by the berries. Both they and the bark contain valerianic acid. The woody shoots of the guelder rose are manufactured into various small articles in Sweden and Russia. See Loudon, *Arboretum*, vol. ii., 1838; and Syme, *Eng. Bot.*, iv. p. 202, pl. 639.

GUELDERS, or GELDERN, a town of Rhenish Prussia, in the government district of Düsseldorf, chief and only town of the circle of Geldern, is situated on the Niers, 28 miles N.W. of Düsseldorf. Its industries include the manufacture of cloth and hats, wool-spinning, and wool, silk, and linen weaving. It has a Catholic and a Protestant church and two convents. The town was built in 1097, and was till 1343 the residence of the counts and dukes of Guelderland. It was fortified by Philip II., but its fortifications were razed by Frederick II. of Prussia in 1764. The population in 1875 was 5184.

GUELFS AND GHIBELLINES. The names Guelfo and Ghibellino, as applied to parties in Italy, are Italianized forms of names which at an earlier period designated parties in Germany. Guelfo is the Italian form of Welf, and Ghibellino the Italian form of Waiblingen, a castle of the emperor Conrad. In Germany these names, which are said to have been first used as battle cries at the battle of Weinsberg in 1140, designated the struggle between the Welfs of Altdorf and the imperial line of the Hohenstaufen. In Italy the names acquired a different meaning, being generally applied respectively to the party of the pope and the party of the emperor. The conflict between the authority of the emperor and the independence of the Italian towns began before the names were used in Germany. These parties first came into prominence in the Lombard league of 1167. In the war which followed we find the following distribution of parties: on the Ghibelline side were Cremona, Pavia, Genoa, Tortona, Asti, Alba, Acqui, Turin, Ivrea, Ventimiglia, Savona, Albenga, Imola, Faenza, Ravenna, Forli, Cesena, Rimini, the marquis of Montferrat, the counts of Lomello, Guasto, Bosco, &c.; on the side of the Guelfs were Venice, Treviso, Padua, Vicenza, Verona, Brescia, Ferrara, Mantua, Bergamo, Lodi, Milan, Novara, Vercelli, Alessandria, Piacenza, Parma, Reggio, Modena, Bologna. These names spread further in consequence of the bitter rivalry which existed between several pairs of Italian towns, for instance between Rome and Tusculum, Pisa and Genoa

Verona and Mantua, Bergamo and Brescia. A further step in this direction was the division of the towns themselves into Guelf and Ghibellin parties. The struggle for the imperial throne between Philip of Swabia and Otto of Brunswick (1198–1208) enlisted the sympathies of Italy; the Guelfic towns Milan, Piacenza, Brescia, Reggio, Modena, took the part of the Welf Otto. The 13th century witnessed a great increase of the jealousies between rival towns, and very serious divisions of the leading families in the towns themselves. Examples of this were the quarrels between the Montecchi and Cappelletti at Verona, the Lambertazzi and Geremei at Bologna, the Rossi and Correggi at Parma, the Doria and Spinola, the Grimaldi and Fieschi at Genoa, the Buondelmonti and Amedei, the Donati and Cerchi at Florence, the Colonna and Orsini at Rome, the Traversari and Polenta at Ravenna, the Delle Torre and Visconti at Milan, the Cancellieri and Panciatichi at Pistoia, the Salimbeni and Tolomei at Siena.

Of the principal towns in North and Central Italy, Arezzo was generally Ghibellin. Bergamo was torn in sunder by party quarrels: the Suardi fought against the Colleoni, and afterwards both these against the Rivoli and Bonghi. It was generally more Guelf than Ghibellin. Bologna was generally Guelf. Brescia was much divided. It was originally Guelf, but was conquered by the Ghibellins in 1258. It came under the power of the Visconti of Milan in 1337. Cremona was generally Guelf, but occasionally Ghibellin. Always unhappy, it was wasted by the most violent party conflicts. The family of Cavalcabò led the Guelf party in this town in the 14th century. Ferrara was Ghibellin under the Torelli; it became Guelf under the Este. Florence, after 1158, was the chief support of the Guelfs. The struggles which desolated it were between different branches of the Guelf—the Bianchi, and Neri, and others. Forli was Guelf till 1315, afterwards Ghibellin under the Ordelaffi. Genoa was divided between the two parties. Lucca was generally Ghibellin, but had hard work to maintain its position against the attacks of Florence. Mantua was Guelf up to 1220, afterwards mainly Ghibellin. Padua was the enemy of Venice; in 1227 it was Guelf, fighting against the Ghibellin Vicenza; about 1318 it became Ghibellin under the house of Carrara. Parma was divided in its sympathies. It was generally more Guelf than Ghibellin. Pavia was Ghibellin unless compelled to be otherwise. Perugia became Guelf in 1198. It was much torn by party quarrels. Piacenza was generally Guelf. Pisa was chiefly Ghibellin during a great part of its history. Pistoia was divided up to 1267, after which time it became mainly Guelf. Ravenna was chiefly Guelf under the family of Polenta. Rimini belonged to the family of Malatesta, which was divided between Guelf and Ghibellin. Siena was at first Ghibellin; in 1270 it became Guelf. Venice was scarcely touched by these party quarrels. Verona was much divided. Up to 1259 it was mainly Guelf; under the Della Scala it was Ghibellin. Vicenza was Ghibellin after 1227; at a later period it followed the fortunes of Padua. Viterbo was Ghibellin after 1328.

It would be generally true to assert the principle that the Guelfs were more attached to liberty than the Ghibellins. The town of Alessandria was the creation of the Lombard league, a protest against the reduction of Italy under a German sovereign. Yet Dante, the keenest patriot, the most ardent aspirant towards the unity of Italy, was a Ghibellin. With him Ghibellinism meant (1) unity under a strong head, and (2) the abolition of the temporal power of the popes. No one, he thought, but an emperor could sit firmly in the saddle or guide the reins of so fierce a steed. The last hope of obtaining this object lay in Henry VII. of Luxembourg. But the object itself was probably impossible of realization. The death of Henry at Buonconvento extinguished the last hope of uniting Italy under the supremacy of Cæsar.

To give a full account of the party quarrels of Guelf and Ghibellin would be to write the history of mediæval Italy. The names began to die out gradually at the beginning of the 15th century. Twenty years before the two parties had united in opposing John of Bohemia. The expedition of Charles IV. into Italy destroyed what shred still remained of respect for the authority of the empire, and with the extinction of Ghibellinism Guelfism perished also; yet we find the name of Guelf appearing in Milan in 1403, after the death of Gian Galeazzo Visconti, and also in 1477, in the struggle between Ludovico Sforza and the Duchess Bona of Savoy. In the conquest of Milan by Louis XII., in the beginning of the 16th century, we find the supporters of the emperor and Sforza called Ghibellins by Roman writers, and the French party called Guelf.

Of the literary supporters of either cause we can only mention a few. Brunetto Latini, the master of Dante, was a Guelf. Dante himself, as we have seen above, was a Ghibellin; so was his friend Guido Cavalcanti. Petrarch was a Guelf; the three historians Villani are singularly impartial. For further information, see Wachsmuth, *Geschichte der Politischen Parteiungen*, vol. i. (O. B.)

GUELPH, the chief town of Wellington county, Ontario, Canada, is situated in a fine agricultural district on an elevation on the river Speed, a branch of the Grand River, and on the Grand Trunk Railway and the Wellington, Grey, and Bruce division of the Great Western Railway, 45 miles west by south of Toronto. The river is navigable at this point, and there is a considerable shipping trade in wheat. Abundant water power is obtained for flour-mills, saw-mills, and woollen-mills, and there are also breweries, tanneries, and manufactories for agricultural instruments and sewing machines. The population in 1871 was 6878.

GUERCINO. See BARBIERI.

GUERET, a town of France, chief town of the department of Creuse, is situated on a mountain declivity near the Creuse, about 250 miles south from Paris. It has a church of the 13th century, a communal college, a normal school, two hospitals, a botanical garden, a library, a picture gallery, and a museum for natural history and antiquities. The principal industries are the manufacture of beer, leather, potash, combs, and buttons; and there is a considerable trade in wood and cattle. Guéret grew up in the 8th century round an abbey founded by Clotaire in 720. The population in 1876 was 4973.

GUERICKE, OTTO VON (1602–1686), an experimental philosopher, distinguished by his original discoveries of the properties of air, was born at Magdeburg, in Prussian Saxony, November 20, 1602. Having studied law at Leipsic, Helmstadt, and Jena, and mathematics, especially geometry and mechanics, at Leyden, he visited France and England, and, returning to Saxony, took up the profession of engineer-in-chief at Erfurt. In 1627 he was elected alderman of Magdeburg, and in 1646 mayor of that city, and a magistrate of Brandenburg. It was whilst holding these offices that Guericke devoted his leisure to scientific pursuits, especially in pneumatics. Incited by the discoveries of Galileo, Pascal, and Torricelli, he attempted the creation of a vacuum, a desideratum in science from before Aristotle. He began by experimenting with a pump on water placed in a barrel, but found that when the water was drawn off the air permeated the wood. He then took a globe of copper fitted with pump and stopcock, and discovered that he could pump out air as well as water. Thus Guericke became the inventor of the air-pump (1650). This important discovery was publicly explained before the emperor Ferdinand III. at the imperial diet which assembled at Ratisbon in 1654. Guericke at the same time illustrated in a simple but effective way the force of atmospheric pressure. Placing side by side two hollow hemispheres of copper, he exhausted the air from between them by means of pump and stopcock, and it is recorded that thirty horses, fifteen back to back, were unable to pull them asunder. The apparatus used on this occasion is still preserved in the imperial and royal library at Berlin. Guericke further demonstrated, by the aid of the air-pump, that in a vacuum all bodies fall equally fast, that animals cannot exist therein, and other phenomena. He also invented the air-balance, and the anemoscope, a species of weathercock. The discovery of the property of electro-repulsion is also attributed to him; and he made successful researches in astronomy, predicting the periodicity of the return of comets. In 1681 he gave up office, and retired to Hamburg, where he died May 11, 1686.

His principal observations are given in his work, *Experimenta nova, ut vocant, Magdeburgica de vacuo spatio* (Amsterdam, 1672). He is also the author of a *Geschichte der Belagerung und Eroberung von Magdeburg*. See Hoffmann, *Otto von Guericke*, Magdeburg, 1874.

GUÉRIN, Georges Maurice de (1810–1839), a French poet, whose few compositions in prose and verse, published posthumously, show him to have possessed a true and rare genius, was descended from a noble but poor family, and was born at the château of Le Cayla in Languedoc, 4th August 1810. He was educated with a view to the church at a religious seminary at Toulouse, and then at the Collége Stanislas, Paris, after which he procured entrance to the society at La Chesnaye in Brittany, founded by Lamennais, bishop of Rennes. Here his most intimate companions were persons whose tastes were literary rather than ecclesiastical; and his dreamy and meditative temperament found its solace and happiness more in intercourse with nature than in theological study or the exercises of piety. It was therefore only after great hesitation, and without being satisfied as to his religious vocation, that under the influence of Lamennais he joined the new religious order in August 1833; and when, in September of the same year, Lamennais, who had come under the displeasure of Rome, severed connexion with the society, Guérin's doubts as to his vocation returned in full force, and on the 7th October he renounced his novitiate. Early in the following year he went to Paris, where he obtained an engagement on the periodical press, but finding it impossible to submit to the mental drudgery of continuous literary work he became a teacher at the Collége Stanislas. In November 1838 he married a Creole lady of some fortune; but a few months afterwards he was attacked by a malady which proved to be consumption, and which terminated by death his short period of leisure and happiness, 19th July 1839. In the *Revue des Deux Mondes* for May 15, 1840, there appeared a notice of Guérin by George Sand, to which she added two fragments of his writings—one a composition in prose entitled the *Centaur*, and the other a short poem. His *Reliquiæ*, including the *Centaur*, his journal, a number of his letters, and several poems edited by G. S. Trébutien, and accompanied with a biographical and critical notice by Sainte-Beuve, appeared in 1860 in two volumes; and a translation of it was published at New York in 1867. Though Guérin was essentially a poet, his prose is more striking and original than his poetry. Its peculiar and unique charm arises from his strong and absorbing passion for nature, a passion whose intensity reached almost to adoration and worship, but in which the pagan was more prominent than the moral element. According to Sainte-Beuve, "no French poet or painter has rendered so well the feeling for nature—the feeling not so much for details as for the ensemble and the divine universality, the feeling for the origin of things and the sovereign principle of life."

The name of Eugénie de Guérin (1805–1848), the sister of Maurice, cannot be omitted from any notice of him, if only on account of the ties of love that united them; but her *Journals*, published in 1861, English translation 1865, and her *Lettres*, published in 1864, English translation 1865, indicated the possession of gifts of as rare an order as those of her brother, though of a somewhat different kind. In her case mysticism assumed a form more strictly religious, and she continued to mourn her brother's loss of his early Catholic faith. Five years older than he, she cherished a love for him which was blended with a somewhat motherly anxiety. In him she centred her chief earthly hopes, and after his death her only remaining earthly purpose was to rescue his name from oblivion by the collection and publication of the scattered fragments of his writings. She died, however, on the 31st May 1848, before her task was completed.

See the notices by George Sand and Sainte-Beuve referred to above; Sainte-Beuve, *Causeries du Lundi*, vol. xii., and *Nouveaux Lundis*, vol. iii.; G. Merlet, *Causeries sur les femmes et les livres*, Paris, 1865; Selden, *L'Esprit des femmes de notre temps*, Paris, 1864; Marelle, *Eugénie et Maurice de Guérin*, Berlin, 1869; Harriet Parr, *M. and E. de Guérin, a monograph*, London, 1870; and Matthew Arnold's essays on Maurice and Eugénie de Guérin, in his *Essays in Criticism*.

GUÉRIN, Jean Baptiste Paulin (1783–1855), French painter, belongs to the group who specially represent the Restoration. Born at Toulon, on the 25th March 1783, of poor parents, he learnt, as a lad, his father's trade of a locksmith, whilst, at the same time, he followed the classes of the free school of art. Having sold some copies to a local amateur, Guérin started for Paris, where he came under the notice of Vincent, whose counsels were of material service. In 1810 Guérin made his first appearance at the Salon with some portraits, which had a certain success. In 1812 he exhibited Cain after the murder of Abel (formerly in Luxembourg), and, on the return of the Bourbons, was much employed in works of restoration and decoration at Versailles. His Dead Christ (Cathedral, Baltimore) obtained a medal in 1817, and this success was followed up by a long series of works, of which the following are the more noteworthy:—Christ on the knees of the Virgin, 1819; Anchises and Venus, 1822 (formerly in Luxembourg); Ulysses and Minerva, 1824 (Musée de Rennes); the Holy Family, 1829 (Cathedral, Toulon); and Saint Catherine, 1838 (St Roch). In his treatment of subject, Guérin attempted to realize rococo graces of conception, the liveliness of which was lost in the strenuous effort to be correct. His chief successes were attained by portraits and those of Charles Nodier and the Abbé Lamennais became widely popular. Guérin died January 19, 1855. We possess no account of his life and works beyond that which is afforded by brief notices in contemporary biographical dictionaries.

GUÉRIN, Pierre Narcisse (1774–1833), French painter, was born at Paris, May 13, 1774. The artistic ideal of the first empire found complete expression in his works, the most famous examples of which show a peculiar combination of the dry pseudo-classic style, then popular, with strong pathos of a highly exaggerated character; yet from his atelier went forth, as if in necessary protest against the defects of their master, the leaders of the Romantic and Realistic movements,—Delacroix and Géricault. The first teacher of Guérin was Nicolas Brenet, whom he left to place himself under Jean Baptiste Regnault, the representative, as contrasted with David, of a distinct form of the classic revival, a form tempered by a tincture of Italian tradition. Guérin became the most distinguished of his pupils, and carried off one of the three "grands prix" offered in 1796, in consequence of the competition not having taken place since 1793. The pensions were not then re-established, but Guérin fulfilled at Paris the conditions imposed upon *pensionnaires*.

and produced various works, one of which brought him prominently before the public. This work, Marcus Sextus (Louvre), exhibited at the Salon of 1799, excited wild enthusiasm, partly due to the subject—a victim of Sulla's proscription returning to Rome to find his wife dead and his house in mourning—in which an allusion was found to the actual situation of the emigrés. Guérin on this occasion was publicly crowned by the president of the Institute, and before his departure for Rome (on the re-establishment of the École under Suvée) a banquet was given to him by the most distinguished artists of Paris. In 1800, unable to remain in Rome on account of his health, he went to Naples, where he painted the Grave of Amyntas. In 1802 Guérin produced Phædra and Hippolytus (Louvre); in 1810, after his return to Paris, he again achieved a great success with Andromache and Pyrrhus (Louvre); and in the same year also exhibited Cephalus and Aurora (Collection Sommariva) and Bonaparte and the Rebels of Cairo (Versailles). The Restoration brought to Guerin fresh honours; he had received from the first consul in 1803 the cross of the legion of honour, and in 1815 Louis XVIII. named him Academician. The success of Guérin's Hippolytus, of Andromache, of Phædra, and of Clytæmnestra (Louvre) had been ensured by the skilful selection of highly melodramatic situations, treated with the strained and pompous dignity proper to the art of the first empire; in Æneas relating to Dido the disasters of Troy (Louvre), which appeared side by side with Clytæmnestra at the Salon of 1817, the influence of the Restoration is plainly to be traced. In this work Guérin sought to captivate the public by an appeal to those sensuous charms which he had previously rejected, and by the introduction of picturesque elements of interest which, even now, distract attention from the artificial mannerism too painfully apparent in his treatment of tragic subject. But with this work Guérin's public successes came to a close. He was, indeed, commissioned to paint for the Madeleine a scene from the history of St Louis, but his health prevented him from accomplishing what he had begun, and in 1822 he accepted the post of director of the École de Rome, which in 1816 he had refused. On returning to Paris in 1828, Guérin, who had previously been made chevalier of the order of St Michel, was ennobled. He now attempted to complete Pyrrhus and Priam, a work which he had begun at Rome, but in vain; his health had finally broken down, and in the hope of improvement he returned to Italy with Horace Vernet. Shortly after his arrival at Rome Baron Guérin died, on July 6, 1833, and was buried in the church of La Trinità de' Monti by the side of Claude Lorraine. A careful analysis and criticism of his principal works will be found in Meyer's *Geschichte der Französischen Malerei*, but his life has not yet been made the subject of special treatment.

GUERNSEY, the second in size of the Channel Islands, is situated between 49° 25′ and 49° 31′ N. lat. and between 2° 30′ and 2° 41′ W. long., 30 miles W. of Normandy, and 81 miles S. of Portsmouth. The total area at low water is estimated at 15,560 acres, or rather more than 24 square miles, and of this about 10,000 acres are under cultivation. Gradually rising from the north to the south, the island attains its maximum elevation of 349 feet above mean tide at Haut Nez, above Point Icart. According to J. A. Bird's "Geology of the Channel Islands" in *The Geological Magazine*, London, 1878, it consists geologically of three very unequal portions, one characterized by a very felspathic syenite and gneiss, another by a hornblendic "granital," and a third by a micaceous syenite. The felspathic portion yields magnificent crystals of felspar, surpassing those of the porphyritic granites of Cornwall or Cumberland; and the hornblendic portion occasionally affords crystals of black hornblende in similar perfection. No Secondary or Tertiary rocks are found in position, but post-Tertiary clays containing flints are found all round the island and even on its summit, and Mr Bird is disposed to assign them to the interglacial period of submergence. The soil of Guernsey is generally a light sandy loam, and the subsoil consists for the most part of angular gravel, except in certain places occupied by a curious clay, chiefly composed of a silicate of alumina, which proves destructive to vegetable life. While the island does not grow sufficient grain for its own consumption, it has a large export of fruits and other garden produce. Parsnips were formerly one of the principal items, but they are now less extensively cultivated, having been supplanted by potatoes and turnips. Grapes, which were exported to the amount of 50 tons in 1873, are the source of an increasing trade. Granite is largely shipped at St Sampson.

For administrative purposes Guernsey is united with Alderney, Sark, Herm, and the adjacent islands in the bailiwick of Guernsey. The island proper is divided into the ten parishes of St Peter Port, St Sampson, Vale, Câtel, St Saviour, St Andrew, St Martin, Forest, St Peter du Bois, and Torteval. The administration is under the supervision of a lieutenant governor appointed by the crown; and the parliamentary assembly consists of a bailiff, twelve jurats, a procureur or attorney-general, the beneficed clergy, and twelve delegates elected by the people. Taxation is very light, and the annual revenue amounts to about £10,000. Ecclesiastically the island is a deanery of the Winchester diocese of the Church of England.

The only town of any great importance is St Peter Port on the eastern coast. In 1861 it had a population of 16,388 (6968 males and 9420 females), and in 1871, 16,166 (6731 males and 9435 females). The sea frontage of the town extends for about a mile, and is protected in nearly all its length by a wall with an esplanade. On the improvement of the harbour, which was begun in the 13th century by order of King Edward I., a sum of £285,000 has been expended since 1854. It is formed by two piers, which enclose an area of 73 acres, the southernmost of the two running out to Castle Cornet and then sending out a breakwater for about 3000 yards. The whole of the works are of the most massive description. Among the principal buildings of the town, which has been greatly improved by the formation of a new street from the harbour up to the hill, are the Government house, the court-house, Elizabeth college, the town hospital, St Stephen's church built in 1866, the Roman Catholic church designed by Pugin, and the new vegetable market constructed at a cost of £16,000. On the higher ground above the town is a monument in memory of the Queen's visit to the island in 1846, and on the pier there was erected in 1863 a monument to the Prince Consort by Mr Durham, a copy of the monument in the gardens of the Horticultural Society at South Kensington. St Sampson, which is the only port besides St Peter Port, is situated at the eastern end of the Braye du Val, a depression which at no distant date used to form an arm of the sea at high tides, cutting the island into two unequal parts. The harbour accommodation has been improved at St Sampson contemporaneously with that of St Peter Port. To the south of the latter is the strong fort of St George's with barracks for 5000 men, and smaller forts, batteries, and martello towers are to be found on suitable points all round the coast.

By the old Guernsey laws, all the male population from sixteen to sixty are obliged to serve in the militia; but the custom of paying exemption fines has gradually become so common that the real force is very far below its nominal limit. Guernsey is both populous and wealthy, and the wealth is very evenly distributed among the people. In 1873 the assessment value of the town parish was

£3,564,750, or £2262 per head, and that of the rural parishes £1,831,620, or £1233 per head. Like the neighbouring part of France, Guernsey still possesses numerous traces of its early inhabitants, in the form of sepulchral caves, dolmens, and menhirs. The most remarkable group of the second class is in the north at Ancresse. Details will be found in Mr Lukis's paper in vol. i. of the *Archæological Journal*, and in vols. i. and viii. of the *Journal of the Archæological Association*, as well as in the special chapter in Dr Ansted's *Channel Islands*. The island is usually identified with the Sarnia of the latter Roman writers. Its present name would appear to be a corruption of the Norse for Green Isle. For details on its history see CHANNEL ISLANDS. An account of a number of its more eminent natives, many of whom have served with high distinction in the British army, will be found in *Sarnia, or brief Memorials of many of her Sons*, Guernsey, 1862. Among the better known families are the Saumarezes, the Tuppers, and the Careys.

Besides the works referred to under CHANNEL ISLANDS, see [illegible] *de Guernesey*, Guernsey, 1814; *Views of Guernsey*, with descriptive letterpress, Edinburgh, 1867; John Jacob, *Annals of the Bailiwick of Guernsey*, London, [illegible]; L. Marchant, *Laws and Customs of Normandy as used in Royal Court of Guernsey*.

GUERRAZZI, FRANCESCO DOMENICO (1804–1873), Italian writer and politician, was born at Leghorn, August 12, 1804. He studied law at Pisa, and happened to become acquainted there with Byron, who produced a very strong impression on his lively imagination. Having taken his degree in law, he went back to Leghorn to practise his profession, but engaged at the same time in literary pursuits. In 1827 he published his first novel, *The Battle of Benevento*, a work displaying powerful imagination and strong patriotic feeling. While exiled in 1834 to Portoferraio, on the island of Elba, he wrote *Isabella Orsini* and *The Siege of Florence*, the latter producing great enthusiasm in Italy. The two compositions which followed, *Veronica Cibo* and *The New Tartufes*, are of inferior value. In 1844 Guerrazzi was again exiled to Portoferraio. When the revolution broke out in 1848, he was named deputy, then president of the counsel of ministers, and finally, in the beginning of 1849, along with Montanelli and Mazzoni, triumvir and dictator of Tuscany. He had to expiate these few months of power by years of imprisonment and exile. He was banished first to Corsica, where he wrote *Beatrice Cenci*, *The Tower of Nonza*, and *Fides*; and then to Genoa, where he composed the *Memoirs of Himself*, *The Hole in the Wall*, *Messer Arlotto Mainardi*, *Paolo Pellicione*, *The Italian Plutarch*, *The Lives of Andrea Doria*, *Francesco Ferruccio*, *Pasquale Paoli*, *The Siege of Rome*, and *The Ass* (*L'Asino*), a humorous work. When the kingdom of Italy was constituted, Guerrazzi was several times sent to parliament as deputy. Towards the end of his life he withdrew to a villa he had on the sea-shore, near Cecina, not far from Leghorn, where he wrote his novel entitled *The Dying Century*. He died there on the 23d September 1873, and was buried in the church of Montenero, near Leghorn. His letters are being collected for publication under the direction of the poet Joseph Carducci.

See Guerrazzi's own *Apologia*, Florence, 1851; [illegible], Florence, 1873; and [illegible] *F. D. Guerrazzi*, Rome, [illegible].

GUERRERO, formerly TIXTLA, the chief town of the state of Guerrero, Mexico, is situated at an elevation of about 5000 feet in a narrow and unhealthy valley in the Sierra Madre, [illegible] miles from the coast and 150 miles S.W. of Mexico. Mining is carried on, but not to any great extent, and some cotton is manufactured. The population in 1869 was [illegible].

GUESCLIN. See DU GUESCLIN.

GUEVARA, ANTONIO DE (c. 1490–1545), Spanish chronicler and moralist, was a native of the province of Alava, and passed some of his earliest years at the court of Queen Isabella. In 1528 he entered the Franciscan order, and he afterwards accompanied Charles V. during his journeys and residencies in Italy and in other parts of Europe. After having held successively the offices of court preacher, court historiographer, bishop of Guadix, and bishop of Mondoñedo, he died in 1545. His earliest work, entitled *Relox de principes, o Marco Aurelio*, published in 1529, and, according to its author, the fruit of eleven years' labour, is a kind of romance designed, after the manner of Xenophon's *Cyropædia*, to delineate in a somewhat ideal way for the benefit of modern sovereigns the life and character of an ancient prince distinguished for wisdom and virtue. It was very often reprinted in Spanish; and before the close of the century had also been translated into Latin, Italian, French, and English. It is difficult now to account for its extraordinary popularity,—its thought being neither just nor profound, while its style is stiff and affected. It gave rise to a literary controversy, however, of great bitterness and violence, the author having ventured without warrant to claim for it an historical character, appealing to an imaginary "manuscript in Florence." Other works of Guevara are the *Decada de los Césares*, or "Lives of the Ten Roman Emperors," in imitation of the manner of Plutarch and Suetonius; and the *Epistolas Familiares*, sometimes called "The Golden Epistles," often printed in Spain, and translated into all the principal languages of Europe. They are in reality a collection of stiff and formal essays which have long ago fallen into merited oblivion (see Ticknor, *Hist. of Span. Lit.*, vol. ii.).

In Spanish literature occurs also the name of LUIS VELEZ DE GUEVARA (1570–1644), who is said to have written nearly 400 comedies, of which however only a few, and these of little value, have been preserved. This Guevara is chiefly noteworthy as having been the author of a prose romance entitled *El Diablo Cojuelo*, which suggested to Le Sage the ideas and materials of his *Diable Boiteux*.

GUGLIELMI. There are several Italian musicians of this name, the most celebrated of them being Pietro, born at Massa Carrara in May 1727. He received his first musical education from his father, and afterwards studied under Durante at the Conservatorio di San Loretto, Naples. His first operatic work was produced at Turin in 1755, and the success was such as falls to the lot of few primary efforts. Guglielmi's reputation was thenceforth established, and soon his fame spread beyond the limits of his own country, so that in 1762 he was called to Dresden to conduct the celebrated opera there. He remained for some years in Germany, where his works met with much success, but the greatest triumphs were reserved for him in England. He went to London in 1772, and stayed there five years, returning to Naples in 1777. He still continued to produce operas at an astounding rate, but was unable to compete successfully with the younger masters of the day. In 1793 he became maestro di capella at St Peter's Cathedral, and died at Rome, November 19, 1804. He was a very prolific composer, and occupies a respectable if not absolutely first-rate position among the earlier masters of Italian comic opera. There is indeed in most of his scores a vein of humour and natural gaiety not surpassed by Cimarosa himself. In serious opera he was less successful. But here also he betrays at least the qualities of a competent musician. Considering the enormous number of his works, his unequal workmanship and the frequent instances of mechanical and slipshod writing in his music need not surprise us. The following are among the most celebrated of his operas:—*I due gemelli*, [illegible], *La pastorella nobile*, *La* *bella pescatrice*, *Rinaldo*, *Artaserse*, *Didone*, and *Enea e Lavinia*. He also wrote oratorios and miscellaneous pieces of orchestral and chamber music. Of his eight sons two at least acquired fame as musicians—Pietro Carlo (1763-1817), a successful imitator of his father's operatic style and Giacomo, an excellent singer.

GUIANA, GUYANA, or GUAYANA, an extensive territory in the north-eastern part of South America, comprehending in its widest acceptation all the extent of country lying between the rivers Amazon and Orinoco from 3° 30′ S. to 8° 40′ N. lat., and from 50° 22′ to 68° 10′ W. long. It is bounded on the N. by the Orinoco and the Atlantic, E. by the Atlantic, S. by the rivers Negro and Amazon, and W. by the Orinoco and the Cassiquiare. Its greatest length from east to west is about 1200 miles, its greatest breadth, from the mouth of the Orinoco to the confluence of the Rio Negro with the Amazon, about 800 miles; and the estimated area is 690,000 square miles. This vast territory is divided into Brazilian (formerly Portuguese) Guiana, Venezuelan (formerly Spanish) Guiana, and Colonial Guiana. The first two divisions, comprising about five-sixths of the entire region, are claimed by or included in Brazil and Venezuela respectively; and stretching eastward from the mouth of the Orinoco towards that of the Amazon lie the territories of British, Dutch, and French Guiana, which are in that order noticed below.

Columbus in 1498 decided that the Orinoco must flow through some vast continent. Vincent Yanez Pinzon, a Spanish navigator, is believed to have first sailed up the Amazon from the coast. Vasco Nuñez landed on the coast of Guiana in 1504, but the discovery is also claimed for Diego de Ordas, one of the captains of Cortez in the conquest of Mexico in 1531. Sir Walter Raleigh ascended the Orinoco in 1595 in search of the El Dorado. The first settlement is stated to be that of some Dutch people in 1580 near the river Pomeroon. This possession was contested by the Spaniards, but in 1613 a colony of Zealanders on the banks of the Essequibo was reported in a flourishing condition. English and subsequently French colonization was attempted up the Surinam river. The English returned in 1652 to Paramaribo, and in 1662 the whole colony was granted by Charles II. to Lord Willoughby. In 1669, however, Dutch Guiana covered all the territory now divided into British, Dutch, and French. In 1712 the French attacked the settlement and exacted a contribution. In 1732 Berbice received a constitution from the states-general, and in 1763 there was a formidable insurrection of negro slaves who had been introduced from Africa. In 1781 Rodney took possession; and though the colonies were restored to Holland in 1783, they surrendered again to the British in 1796. The Dutch resumed authority in 1802, and in 1803 the proper history of British Guiana began.

I. BRITISH GUIANA, when finally acquired in 1803, and formally ceded in 1814, consisted of the three colonies, Demerara, Essequibo, and Berbice, so named after the principal rivers which drain them. These were consolidated into one colony in July 1831. It is bounded on the N. and N.E. by the Atlantic, E. by Dutch Guiana, from which it is separated by the river Corantyn, S. by Brazil, and W. by Venezuela. It lies between 0° 40′ and 8° 40′ N. lat., and 57° and 61° W. long., and has an estimated area of 76,000 square miles, but the boundaries are still disputed by Venezuela and Brazil. An engagement, however, exists between the British and Venezuelan Governments that neither shall occupy territory claimed by both. The colony has now three divisions, called counties:—Berbice, extending from the Corantyn about 95 miles along the sea-coast; Demerara, from the Abari about 65 miles, including Georgetown, the capital; and Essequibo, from the river of that name about 120 miles to the Barima near the Orinoco mouth. There is thus a length of coast of 280 miles, with an extent inland varying from 300 to 450 miles.

Surface.—From the coast-line seaward the ocean deepens very gradually, and at low tide extensive mud-flats and sandbanks are left bare. Traced inland, this fluvio-marine deposit is found to rise to 10 or 12 feet above high-water mark, and to end at an older deposit of sand and clay beds, which forms an extensive undulating country, rising to not more than 150 feet above the sea, and stretching back to where the solid rock strata underlying it crop out. Upon the rich alluvial soil of the depressed coast-land, and for a few miles up the rivers, the sugar estates are situated. They are not only protected by dams from the sea, but, as in wet weather water rapidly accumulates in the savannahs behind, they are similarly defended on that side also. A narrow sand reef, some little distance farther inland, running parallel with the coast-line, marks a previous sea limit, and still farther back a higher range of coarse white sand probably marks a yet earlier coast. The eastern portion of the colony from the sources of the Corantyn and Essequibo is a rough inclined plane, sloping down to the sea-level from a height of about 800 feet, the most elevated part being mountainous and rising to 2000 feet above the sea. This plain extends westward and northward, broken by ranges of mountains, its western portion constituting part of the extensive savannah which stretches eastward from Brazil. Two great parallel mountain systems cross the colony from west to east, the greater being that of the Pacaraima and Merumé mountains, and the lesser including the Canucu, Cumucumu, and Coratamung mountains, while the Sierra Acarai, a densely wooded chain rising to 2500 feet, forms the southern boundary of Guiana and the watershed between the Essequibo and the tributaries of the Amazon. The Pacaraima mountains, a wide extent of rough country traversed by broad valleys, extend from about 4° to 5° 30′ N. lat., and rise to 3000 feet between the Potaro and Siparuni rivers, and to 7500 feet at Roraima mountain, which rises, a perpendicular inaccessible wall of red sandstone, at the extreme western limits of the colony. The southern portion of Pacaraima shows rugged hills and valleys strewn with rocks, but to the north, where the sandstone assumes table-shaped forms, there are dense forests, and the scenery is of extraordinary grandeur. The Imataca range lies between the Cuyuni and Barima;

rivers in 7° to 8° N. lat. A sandstone formation can be traced from the northern Pacaraima mountains on the west to the Corantyn on the east. Interbedded with it are three great layers of greenstone. The surface of a very large portion of the colony is composed of gneiss, which is seen in large rounded bosses in the river beds. Schist of different kinds is associated with gneiss in many localities. Quartz-porphyry and felstone occupy extensive areas over the surface of the granite and underlying the gneiss. A large proportion of the surface rock in the interior is granite. The white sand at the sandhills on the Demerara and elsewhere is very pure and well-adapted for glass-making. Gold has been found about 40 miles up the Cuyuni river. Attempts to work it have met with small success, and have been complicated with questions of boundary.

Rivers.—The colony is traversed by numerous large rivers, the principal being the Essequibo, Corantyn, Mazaruni, Cuyuni, Berbice, and Demerara. The Corantyn forms the boundary between British and Dutch Guiana. It rises in 2° N. lat., 100 miles eastward of the Essequibo, flows generally northward, and falls into the Atlantic by a broad estuary in 6° N. lat., 57° W. long. It is navigable for small vessels for 150 miles from its mouth, and is remarkable for its magnificent cataracts. The Cuyuni, coming from Venezuela, runs a course of 120 miles through territory claimed as British. The Essequibo rises in the Sierra Acarai, 0° 40′ N. lat., and after a course of at least 600 miles discharges itself into the ocean by an estuary 15 miles in width, in 7° N. lat., 58° 40′ W. long. In this estuary are a group of islands where sugar is grown, several being from 12 to 15 miles long and 3 miles broad. The principal are Hog Island, Wakenaam, and Leguan; a smaller one is named Tiger Island. The entrance of the Essequibo is difficult owing to deposits of mud and sand. Its course lies through forests of gigantic vegetation. About 43 miles from its mouth it is joined by the Mazaruni, which is itself joined by the Cuyuni at 8 miles from its mouth. The cataracts, of which one of the greatest is the King William's Cataract of Schomburgk, in 3° 14′ 35″ N. lat., put a stop to the navigation of the Essequibo by large vessels about 50 miles up. In 3° 57′ 30″ N. lat. and 58° 3′ W. long. it receives the Rupununi, which has a course of 220 miles. Another large tributary is the Potaro, upon which is the celebrated Kaieteur (Old Man's) Fall, so named from an Indian legend, and discovered on April 24, 1870, by Mr C. B. Brown of the Geological Survey, who, owing to cataracts, took a fortnight to reach the fall from the coast up the Essequibo and Potaro. This fall, in 5° 8′ N. lat. and 59° 19′ W. long., is produced by the river flowing over a sandstone and conglomerate table-land 822 feet into a deep valley below. For the first 741 feet the water falls perpendicularly, as one great continuous whitish column, circled by rainbows, into a basin below, continuing thence over a sloping cataract 88 feet in height, and through the interstices of great blocks of rock, to the river-bed below. The head of the fall is 1130 feet above the sea. The river 200 yards above the fall is 400 feet wide, and the width of the fall itself varies, according to the season, from 240 to 370 feet. The Demerara or Demerary rises probably near 5° N. lat., and after a northward course nearly parallel with the Essequibo for more than 200 miles, enters the Atlantic near 6° 50′ N. lat. and 58° 20′ W. long. It is navigable for 85 miles, and at its mouth at Georgetown is 1½ miles across. A bar, or deposit of mud and sand, prevents the entrance of large vessels at low tide. Farther east is the Berbice, whose source is probably about 3° 40′ N. lat. It is 2½ miles wide at its mouth in 6° 21′ N. lat., 57° 12′ W. long., and is navigable for 175 miles by vessels drawing 7 feet of water. The Canje creek falls into the Berbice near its mouth. Several large streams called creeks fall directly into the Atlantic between the Berbice and the Demerara. The Boerasiri creek divides the counties of Demerara and Essequibo, and between the Essequibo and the Barima are the rivers or creeks Pomeroon, Morucca, and Waini.

Climate.—The climate, especially in the interior, is healthy. The even temperature is considered suitable for pulmonary complaints; and tubercular consumption is unknown. There are no hurricanes, and gales are not frequent. Occasionally there is a long drought, but the following order of seasons is generally maintained. From the middle of April to June there is a long season of heavy rains, which decrease in July; the long dry season lasts from August to November; December and January comprise the short rainy season, and February and March the short dry season. The winds during the rains are generally westerly. In the dry seasons they blow from the ocean and modify the heat. The thermometer seldom rises above 90° or falls below 75° Fahr. At Georgetown the mean annual temperature is 81° 2′. The rainfall in 1878 was 69·94 inches, the average having been 74 inches for 1873–77.

Population.—The census of 1871 was as follows:—113,570 born in British Guiana (including 70,000 to 80,000 negroes, 10,000 born of Indian and Chinese parents, and the "coloured" population), 42,681 immigrants from India, 6295 Chinese, 7925 from Madeira and Azores, 13,385 negroes from West-Indian Islands, and 9635 Europeans and others; total 193,491, exclusive of aborigines, estimated at 7000. The estimated total population on 31st December 1876 was 225,365, and further explorations have increased the estimated number of aboriginal Indians. The aborigines are remnants of Indian tribes, such as the Arawaks, Warraus, Caribs, and many others, scattered in the interior of the country. They maintain themselves by fishing and hunting. Traces of "Indian picture-writing," or sculptured figures, have been found in some granite blocks up the Essequibo. On December 31, 1877, 22,500 East Indian immigrants were working under a five years' indenture on the estates, and 26,000 not under indenture. Since 1857, 10,315 East Indian coolies (including women and children), with savings amounting to £260,479, have availed themselves of their right to return passage. A number re-emigrate to the colony. The Indian Government supervises the emigration. In the colony an immigration department regulates labour, wages, and general treatment. About 5000 are now annually introduced. Chinese have also been introduced with and without indenture.

Vegetation.—The vegetation is most luxuriant. The interior affords an exhaustless supply of valuable timber, such as the mora and greenheart, largely used for shipbuilding. The forests present a continuous succession of tropical flowers and fruits. Many of the trees yield gums, febrifuges, oils, and juices of more or less value, among which may be mentioned caoutchouc, and a gum called "balata," with properties intermediate between those of caoutchouc and gutta percha. The bark of the mora tree is used for tanning. The silk-cotton tree, which grows 100 feet high and 12 feet round, yields a light grey silky cotton used for stuffing pillows. Among the palm-trees are the picturesque mountain cabbage palm, growing to the height of 100 feet; the cocoa-nut palm, the sago palm, the eta palm, much esteemed for its beauty and fruit, and the [illegible] palm, which produces the most durable [illegible] of all the palm species. The mangrove tree, 15 to 20 feet high, skirts the sea-coast. The tobacco plant grows wild, and [illegible]. A little rice is grown. The fruit of the plantain and banana is largely used for food, and the stems furnish fibre for paper-making. Oranges, lime, guava, cashew and pine-apple are among the fruits. Indigo used to be cultivated. Arnotto, from which the well-known dye is obtained, is indigenous; and logwood and vanilla are also found. Maize, cassava, yams, papaw tree fruit, sweet potatoes, peppers, and other productions are valuable for food or medicine. The largest of the water lilies, the Victoria regia, was first discovered in Guiana.

Zoology.—Among the wild animals are the tapir or bush cow, the [illegible], the flesh of which is [illegible] eaten, the jaguar or "tiger," three kinds of ant-bear, the sloth, [illegible] armadillo a [illegible] birds, [illegible] monkeys, and vampires, measuring 30 inches from point to point of extended wing. The cayman, [illegible] of South America, 15 to 20 feet long, abounds in [illegible]. Among other reptiles are the iguana (the [illegible] of which is said to be suitable for eating), many lizards, and snakes [illegible] venomous. Tortoises and turtles are common on the banks of the streams and in sandy districts of the coast. The bird, insect, and fish life of Guiana is of [illegible] richness and variety.

Products, Industries, and Commerce.—There are 120 sugar and 12 [illegible] estates in the colony. Cotton was formerly exported, but [illegible] has now ceased. Coffee, the export of which in [illegible] was [illegible], is not now produced for the foreign market. The [illegible] has produced large investments in the formation of sugar estates, but the industry has undergone great fluctuations. [illegible] in 18[illegible], when [illegible] apprenticeship terminated, fell from an [illegible] to [illegible] hhds. The equalization of the English [illegible] sugar still further restricted cultivation, [illegible] in 1848 being only 32,[illegible] hhds. In 1854 matters had [illegible]. The prospect of obtaining coolie labourers from [illegible] caused new capital to be introduced and fresh [illegible]. Cultivation was improved and extended, vacuum [illegible] used, steam ploughs and tile draining were successfully [illegible]. The value of machinery imported from 1867 [illegible]. A quantity of 2 to 3 hhds. (of about 17 cwts.) [illegible] obtained, but the average is 30 cwts. The juice [illegible] rollers is about 60 per cent. of the weight of [illegible]. The "Demerara crystals" are very popular for their [illegible] strength, and command high prices. The sugar exports in 1876 were 119,891 hhds., fully equal to 100,000 tons; in 1877, 111,1[illegible] hhds., and in 1878 (a year with prolonged drought), [illegible] hhds. Nearly all this last quantity went to the United Kingdom, but 2[illegible] and 32,000 hhds. went to the United States in 1876 and 1877 respectively. The rum exported in 1876 was [illegible] puncheons, in 1877 it was 32,531, and in 1878 25,7[illegible]. The quantity of rum issued for consumption in the colony in 1878 was [illegible] gallons. The export of molasses (of which less is [illegible] as the quality of the sugar improves) is principally to the United States and British provinces, the quantity being 14,320, [illegible], [illegible] casks in 1876, 1877, 1878. The same years the [illegible] exports (nearly all to the United Kingdom) were 464,436, [illegible], and [illegible] cubic feet. The woodcutting industry, under [illegible], is a considerable one, as is shown by the export of [illegible] shingles annually. Up the rivers and creeks charcoal burning is carried on; 32,2[illegible], 35,631, and 46,746 barrels of charcoal were exported in 1876, 1877, 1878. There are 1,250,000 [illegible] exported yearly. In 1853 the total value of imports was £[illegible], in 1877, £2,229,908 (£1,079,898 from the United Kingdom); in 1878, £2,150,714. The exports were in 1853, £[illegible], in 1877, £3,[illegible]49,157 (£1,954,766 to the United Kingdom); and in 1878, £2,5[illegible]7,571. The tonnage, inwards and outwards, was 2[illegible] tons in 1853, and 519,986 tons in 1877.

Government.—The government is vested in a governor appointed by the British crown and a court of policy, originally instituted by the Dutch in 1773 for Demerara, and including Essequibo in 1789. Berbice had until 1831 a separate constitution. The unofficial members of the court were elected by a college of kiezers or electors, who were themselves elected by duly qualified inhabitants. In 17[illegible] this college commissioned some of their own members to act with the court of policy in financial matters. This resulted in an independent body, called financial representatives, being elected by the inhabitants who were qualified to vote for kiezers. The financial representatives and the court of policy meet in annual session as the "combined court," to discuss finance and pass the annual tax ordinance. The civil list is not permanent, being renewed every seven years. All other ordinances or local laws are passed by the court of policy,—every ordinance being subject to confirmation by the queen. The colony is divided into five electoral districts, with a total of 863 registered electors. These districts elect for life one or two kiezers, seven in all, and one or two financial representatives, six in all. When a vacancy occurs in the court of policy the seven kiezers nominate two persons, one of whom is selected by the court. There are five unofficial members chosen as above and five official members, viz., the governor, attorney-general, Government secretary, auditor-general, and immigration agent-general. The public revenue in 1853 was £250,617, and the expenditure £2[illegible]6,557. In 1877 the revenue was £389,872, and in 1878 £4[illegible]. Half of this revenue is derived from import duties, and the remainder principally from wine and spirit duties, rum duty, and retail spirit licences. The expenditure in 1877 was £[illegible],766, and in 1878 £417,995. The public debt in 1877 was £[illegible],563. Public and mercantile accounts are kept in dollars [illegible] sterling and cents.

The Roman Dutch law is in force in civil cases, modified by [illegible] local ordinances; the criminal law is based [illegible] Britain, and administered in the same way, except that there is no grand jury. The supreme court consists of the chief justice and two puisne judges. Appeal in cases involving £500 and upwards lies to the privy council. There are an inferior court of civil justice, courts of admiralty and vice-admiralty, of petty debt [illegible] by stipendiary magistrates), of bail and review of magistrates' decisions. One judge sits in the supreme criminal court, and there is an inferior criminal court. Questions of law are decided by three judges in the court of crown cases reserved. Besides a police magistrate for Georgetown, there are thirteen districts, each with a stipendiary magistrate appointed by the secretary of state.

Towns.—For a notice of GEORGETOWN, the capital (resident population about 4[illegible]), see vol. x. p. 430. The lighthouse, with revolving light visible for many miles, is at the north end, near the mouth of the river. The lightship is 11 miles off in 6° 56′ N. lat. and 58° 1¼′ W. long. The chief town of Berbice is New Amsterdam, on the east bank of the Berbice river. It is well laid out, and has a population of 6000. The Berbice lightship is in 6° 29′ 10″ N. lat. and 57° 23′ 40″ W. long.

Religion and Education.—The diocese of Guiana was established in 1842. The official list shows—1 bishop, 1 archdeacon, 10 rectors, 14 curates, 2 incumbents, and several missionary clergymen and chaplains to institutions. The Church of England has 69 churches or chapels. The Coolie Mission Association and Diocesan Society maintain missionaries and catechists. The Church of England claims 90,000 members. The Church of Scotland has 10 ministers. The Roman Catholics also have several churches and mission stations. The Church of England receives an annual grant of £10,000 from the public revenue, the bishop's salary (£2000) being paid from imperial funds; the Church of Scotland has £5000, and the Roman Catholic Church £2500 from public revenue. There are also 14 Wesleyan Methodist ministers, a Moravian mission, and several chapels of Congregational Dissenters and others belonging to the London Missionary Society. The system of education supported by the general revenue is denominational. There are 177 schools sanctioned by the board of education. The estimate for primary education in 1879 was £29,695. The Church of England has 81 schools, exclusive of those on estates for coolies.

See Schomburgk's *British Guiana*; Martin's *British Colonies*; Dalton's *History of British Guiana*, 1855; Waterton's *Wanderings in South America*, 1852; *Geological Survey Reports*; J. G. Sawkins, "On Geology of British Guiana" in *Quarterly Journ. of Geolog. Soc.*, London, 1871; Brown's *Canoe and Camp Life in British Guiana*, 1876; Brett's *Indian Tribes of Guiana*, 1876; *Colonial Office List*; *British Guiana Directory*, Bennet's *British Guiana*; Boddam-Whetham's *Roraima*, 1879. (J. L. O.)

II. DUTCH GUIANA, or SURINAM, lies to the E. of British Guiana, from which it is separated by the Corantijn or Corantyn in 57° 5′ W. long. Its coast extends for upwards of 220 miles to the mouth of the Maroni or Marowijne, which forms the boundary towards French Guiana. The Dutch claim possession of 58,530 square miles; but of this extensive area, equal to more than four times that of Holland, not more than 3230, according to Wolbers, had been explored in 1868, the colonial territory did not comprise more than 640 square miles, and the actual area under cultivation was little over 200. In 1875 this last was 29,852 acres (47 square miles), and in 1876, 22,180. The principal settlements have been made in the lower valley of the Surinam, or between that river and the Saramacca on the W. and the Commewijne on the E. At its mouth the Surinam is 3 miles broad, and at Paramaribo, the capital, about half a mile. Ships of from 18 to 19 feet of draught can reach the anchorage in front of the town, which has room for 100 vessels. The water is of a dirty yellow colour with brown bubbles on its surface, and its current can be traced far out at sea. As yet no one has seen the source of the Surinam, but it is understood to be high up in the Tumac Humac hills. The principal tributaries are the navigable Para on the left hand and the Paulus Creek on the right, both of which join it about 6 or 7 miles above Paramaribo.[1] The Marowijne or Maroni is a much larger river than the Surinam. Its water is clear as crystal, so that stones can be distinguished at a depth of 12 feet. Unfortunately its mouth, though about 4 miles broad, is full of sand-banks, and consequently it has been less visited than might have been expected from the excellent character of the country through which it flows. The banks are high enough to confine the floods, though at Armina, about [illegible] miles inland, the difference of level between the dry and the rainy season is 23 feet. Between the rivers of Dutch Guiana there are remarkable cross channels available during the floods at least. The Maroni is even connected with the Corantyn on the one hand (though there is 200 miles of country between) and with the Oyapock on the other. As it communicates with the Cottica, which is in turn a tributary of the Commewijne, a boat can pass from the Maroni to Paramaribo; thence by the Sommelsdijk canal it can reach the Saramacca; and from the Saramacca it can proceed up the Coppename, and by means of the Nickerie find its way to the Corantyn.

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[1] An interesting account of a voyage up the Surinam by Zimmermann, with a [illegible] map on a large scale, will be found in *Tijdschrift van het Aardrijkskundig Genootschap*, 1877.

Climate.—The climate of Surinam has long enjoyed a reputation for exceptional unhealthiness which it does not appear to deserve. Though hot and moist like a Turkish bath, it seems congenial even to the European constitution. The mean temperature of the year is 80·4° Fahr., that of the coldest month 78° and that of the warmest 99°. On the average of the eight years from 1847 to 1854 the rainfall at Monbijou is 129 inches, at Paramaribo 101, at Gelderland 108, at Groningen 91, and at Nickerie 67. According to the tables at the end of the *Jaarboek* of the *Kon. Nederlandsch Meteor. Instit.* (Utrecht), the greatest quantity falls in May, June, July, September, and December. There are no endemic diseases; and though cholera, fevers, and small pox have appeared from time to time, they are not more violent than in more temperate regions. Leprosy and elephantiasis, introduced it is believed from Barbados, are not infrequent among the negro population. The former is locally known as boassi. In 1790 there were only 7 patients in the lazaretto of Voorzoorg, but by 1797 they had increased to 300, and in 1812 to 500. A new establishment was founded at Batavia on the right bank of the Coppename in 1823. Between 1831 and 1839 an average of 103 suspected persons were examined yearly, and 46 declared infected. In 1853 there were 448 inhabitants (216 males and 232 females) in the settlement; of these however 112 were personally free from the disease, though born and brought up among the patients.

Population.—Between 1838 and 1852 the free population of Surinam increased from 8893 (4242 males and 4651 females) to 13,193 (6709 males and 6484 females). In 1855 the total number of slaves was 31,780, of whom 27,914 (13,556 males and 14,358 females) were on the plantations and 3866 (2027 males and 1839 females) in private service. Since the abolition in 1863 many attempts have been made to augment the working population of the colony. Up till 1874 the total number of immigrants was 9049, of whom at least 2028 died. In 1870 a convention was signed between Holland and England for the regulation of the coolie traffic, and a Dutch Government agent for Surinam was appointed at Calcutta. In 1873 2448 immigrants arrived from British India, and 1405 in 1874, but owing to dissatisfaction on the part of England with the Dutch arrangements there were none in 1875 and 1876. In December 1875 the whole population was stated at 51,329 ([illegible] males and [illegible] females), exclusive of about 17,000 bush negroes and [illegible] number of Indians. There were 700 Euro[illegible] [illegible] soldiers and seamen in [illegible] [illegible] [illegible] amounted to [illegible] ([illegible] males and 1173 females), and comprised 2559 from British India, [illegible] from the West Indies, 392 Chinese from China, and [illegible] from the Dutch Indies, and 37 settlers from the Netherlands.

The bush negroes ([illegible]) are the descendants of runaway slaves. They consist of three tribes—the A[illegible], the Saramaccans, and the Bekoe or M[illegible]. The first, who [illegible] [illegible] their chief settlements in the district near the junction of the Lava and the Tapanahoni with the Upper Marowijne, but they are also settled on the Sara Creek, on the Upper Cottika, and on the Curmotibo. The Saramaccans, who are numerically about as important, dwell between the Saramacca and the Upper Surinam. The bush negroes retain curious traces of their former connexion with Christianity, though they are and consider themselves pagans. Their chief god is Gran Gado (grand-god), his wife is Maria, and his son Jesi Kist. Various minor deities are also worshipped, Ampuka the bush-god, Toni the water-god, &c. Among themselves they speak a language based on a bastard English, mingled with many Dutch, Portuguese, and native elements. The Moravian missionaries have promoted its cultivation, but it is almost certain to give way before the Dutch.[1]

Vegetation.—A large portion of Dutch Guiana is covered with primeval forests; but hitherto the lack of labour and cost of transport have prevented the [illegible] of its vast supplies of timber and cabinet wood. In some years indeed the export of these materials is actually exceeded by the import. An idea of the wealth that awaits the future [illegible] may be obtained from Focke's paper in the *West Indië* for [illegible], where a list is given of 77 different kinds. Among the more important are the following [illegible], known in the Netherlands as paardenvleesch or horse-flesh; the bruinhart ([illegible], Aubl.); the [illegible] (*[illegible]*), which is never attacked by worms; the [illegible] (*[illegible]*, Schomb.); the male and female letterwood; the [illegible] (*[illegible]*, L.); the [illegible] tree (*[illegible]*); the [illegible] or [illegible], which is good both for timber work and furniture; and the kopie (*[illegible]*), largely used for flooring. Besides the banana, to which the negro is indebted for a large part of his sustenance, maize, sorghum, or Curaçoa maize, yams, kayers (*[illegible]*), arrowroot, okro or gumbo, the ground nut or pinda (*Arachis hypogæa*), Spanish pepper, the antrua (*[illegible]*), the [illegible], the [illegible] (*[illegible]*), the pomme de Cythère (*[illegible]*), and the *M[illegible]* may be mentioned from the vast list of plants of interest for their edible products.[2]

Commerce.—The great staple of Surinam industry was formerly sugar. Between 1849 and 1863 the average quantity exported was 392,857 cwts.; in 1865, two years after the emancipation of the slaves, it sank as low as 151,842 cwts.; and though it has again increased, the average between 1864 and 1874 is only 212,9[illegible]6 cwts. In 1876 the production was 218,115 cwts., and the export [illegible] cwts. The first [illegible] from Surinam was sent to Amsterdam in 1733; but it is only since about 1855 or 1860 that it has [illegible] into favour with the colonists. In 1876 the production was no less than 262,907 cwts., and the export 26,662 cwts. Cotton and coffee are next in order, the former having a yield in 1876 of [illegible] cwts. and the latter of 215 cwts. The total exports of the colony had a value of 2,762,[illegible] gulden or florins; of which Great Britain took 969,945, the United States 872,277, and the Netherlands [illegible]. Of the total imports, valued at 3,1[illegible],252 gulden, the mother country furnished the value of 1,2[illegible].

Minerals.—The gold-diggings of Surinam are beginning to [illegible] attention, the [illegible] of 1874 having [illegible] [illegible] [illegible] about the Marowijne. By May 1876, [illegible] of land had been rented to private parties, and a fair amount of success has attended their labours. The lead, silver, and iron ores may yet prove of importance.

Administration.—In 1865 several changes were introduced into the government of Surinam. The Code Napoleon was adopted, [illegible] [illegible] from time to time by [illegible]. A [illegible] was constituted, the members of which were never to be less than [illegible] nor more than thirteen, [illegible] being appointed by the Government and the others by the [illegible]. [illegible] was given to all [illegible] paying 40 guilders of taxes [illegible] for six years. The [illegible] the [illegible] [illegible] law only [illegible] [illegible] and [illegible] by the king; but a [illegible] [illegible] [illegible] [illegible] the Netherlands [illegible] [illegible] [illegible] [illegible] [illegible].

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[1] [illegible] [illegible] W[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Leiden, 1864, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[2] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] in Holland [illegible] [illegible] [illegible]

only at Paramaribo, there are three cantonal and three district courts. [illegible] by the crown. "The king," says Mr Palgrave, "is almost everything; the 'lands,' in a consultative capacity, are something; but the 'colonists' are merely honorary."

History.—The Dutch began to visit the coasts of Guiana about 1580, and we find Amsterdam and Hoorn sending vessels thither in 1599. In 1614 the states of Holland granted to any Dutch citizen four years' monopoly of any harbour or place of commerce which he might discover in that region. The first settlement, however, in Surinam or Dutch Guiana was made by an Englishman, whose name is still preserved by Marshall's Creek. When Cayenne was taken by the French in 1664 a number of Jews who had settled in that part of Guiana removed to the Surinam district, where they soon constituted an important and flourishing community. In 1666 the English settlement was taken by storm by the Zealanders under Crynssen or Krynsen (the name is spelt in various ways), and 100,000 lb of sugar were exacted as a ransom. By the peace of Breda the Dutch were formally recognized as masters of Guiana, and though the Willoughbys, who considered their rights infringed, did all they could to weaken the colony and draw off a large part of its English population to Jamaica, it continued to flourish, and was confirmed to the Dutch by the treaty of Westminster in 1674. For some time the Zealanders claimed that they alone had right to the country, but it was ultimately decided that the possession was a national one in the full sense of the word. The New Dutch West Indian Company, founded in 1674 to replace the older company which had failed, received Guiana by charter from the states general in 1682.[2] In the following year the company sold one-third of their territory to the city of Amsterdam, and another third to Cornelis van Aerssens, lord of Sommelsdijk. The new owners and the company incorporated themselves as the Chartered Society of Surinam, and Sommelsdijk agreed to fill the post of governor of the colony at his own expense. The lucrative trade in slaves was retained by the West Indian Company, but the society could import them on its own account by paying a fine to the company. Sommelsdijk's rule was marked by rare wisdom and energy. He repressed and pacified the Indian tribes; he erected forts and disciplined the soldiery; he constructed the canal which still bears his name; he established a high court of justice; he introduced the cultivation of the cocoa-nut; and in short he devoted himself in all ways to the welfare of the colony. But on 17th June 1688 he was massacred in a mutiny of the soldiers. The "third" which Sommelsdijk possessed was offered by his widow to William III. of England, but it was ultimately purchased by the city of Amsterdam for 700,000 fl. In 1712 the French, under Cassard, sailed up the river and put Paramaribo to ransom; and after their departure there was hot dispute between the Society and the colonists as to who should pay the indemnity. During the rest of the 18th century the chief troubles of Surinam were the bush negroes and the slaves. Peace with the Aukan negroes was made in 1760, and with the Saramaccas in 1762; but in 1776 the governor Nepveu still found it necessary to surround the colony with a military cordon against the attacks of the Bonni tribe. By the spring of 1786 pacification was complete. In 1795 the Society was abrogated, and the affairs of Surinam placed under a committee of twenty-one members. The English, who had assumed the protectorate of the colony from 1799 to 1802, took actual possession in 1804, and appointed Sir Charles Green governor. In 1807 the slave trade was abolished. At the restoration of the Dutch authority in 1815 the colonists of the district of Nickerie sought to remain under English rule, or at least to receive the right of trading with English colonies. In 1825 the privileges of the Jews were annulled, and the rights of ordinary citizens bestowed on them instead. Surinam and the West Indies were placed under a common government in 1828, but the governor was to reside at Paramaribo. In 1832 several negro slaves who had set fire to the city were publicly burned alive. The administration of Surinam was separated from that of the West Indies in 1845. Baron van Raders, who assumed the governorship in that year, had the honour of greatly improving the state of the slave-laws, and of declaring the commerce of Guiana open to all nations at peace with the Netherlands. The suppression of slavery and the organization of immigration, as already indicated, are the main moments of the recent history of the colony.

Among the older works on Surinam the first rank is held by Hartsinck's masterly *Beschrijving van Guiana of de Wilde Kust in Zuid America*, 2 vols. 4to, Amsterdam, 1770. A valuable *Geschiedenis der Kolonie van Suriname*, by a number of "learned Jews," was published at Amsterdam in 1791; and it has been supplemented and so far superseded by Wolbers, *Geschiedenis van Suriname*, Amsterdam, 1861. Sketches of Surinam life are given in the form of a tale in Schaik's *De Manja. Familie Tafereel uit Suriname's Volksleven*, Arnhem, 1866; and a number of excellent pictorial illustrations will be found in A. Halberstadt's *Kolonisatie van Europeanen te Suriname*, Leyden, 1872, &c. The English reader is indebted to W. G. Palgrave for a brilliant study on *Dutch Guiana*, London, 1876, reprinted from the *Contemporary Review*. See also the *Jaarboekje* of the *Letterlievend Genootschap "Oefening Kweekt Kennis,"* at Paramaribo; the *Staatkundig Jaarboekje*, published by the *Vereeniging voor de Statistiek in Nederland* (Amsterdam); and the *Surinaamsche Almanak*, published by the *Maatsch. tot Nut van 't Algemeen*, Leyden and Amsterdam. (H. A. W.)

III. FRENCH GUIANA is bounded on the west by the Maroni or Marowijne, which separates it from Dutch Guiana. Towards the south and east its limits are still uncertain. According to the treaty of Utrecht in 1713 it was to be bounded towards Brazil by the river of St Vincent Pinzon, but the identification of this river has never been officially determined.[3] The Oyapock is accepted provisionally by both countries, but the French claim that the Arouari is the real St Vincent Pinzon, and consequently that they have a right to the country for 100 miles further south along the coast. Between the Maroni and the Oyapock the coast-line is about 130 miles. The fourteen quarters of the colony are estimated to have an area of 1,308,739 hectares, *i.e.*, about 3,233,893 acres, or 5052 square miles, nearly as much as half the area of Belgium; but if the frontier be pushed back to the watershed, the whole area of the country could not be less than 53,000 square miles.

Surface.—A considerable portion of the low coast-land of French Guiana is occupied by swamps and marshes, the most deeply submerged of which are covered with a dense growth of mangroves, and receive the name of *pripris*, while the drier stretches are occupied by the pinot or wassay palm (*Euterpe oleracea*), and are designated pinotières. In a few places, as in the Sinnamary quarter, there are peat bogs in process of formation. About 40 or 50 miles inland, where the land begins to rise, the traveller reaches the outskirts of those primeval forests which stretch back vast and vague towards the mountains. Between the narrow maritime selvage, so to speak, and the commencement of the highlands are undulating plains or savannahs. Hitherto the colony has confined itself almost exclusively to the littoral and alluvial region, with its fertile mud-banks. The savannahs are still in a state of nature; and though the earlier colonists made clearings in the highlands, they soon grew disappointed with the barrenness of the cold granitic soil. The mountains behind Guiana do not exceed 3000 or 4000 feet of elevation; the principal range indeed, the Tumac Humac, was estimated by M. Creveaux, who crossed it in 1877, at no more than 1312 feet above the sea-level. But the dense tropical forests attract so much moisture from the ocean winds that the highlands are the birthplace of a large number of rivers which in the rainy season especially pour down vast volumes of water. Upwards of twenty are counted between the Maroni and the Oyapock. United as they often are in their navigable sections by cross channels, they constitute a valuable means of communication from district to district. Omitting the Maroni already described under Dutch Guiana, the first of importance as we proceed southwards is the Mana, which is navigable for large vessels 10 miles from its mouth, and for smaller vessels 27 miles further. Passing the Sinnamary and the Kourou we next come to the Cayenne, at the mouth of which lies the island on which the colonial capital is built. About a dozen lakes, of which Mepecucu, Macari, and Mapa are the largest, have been counted in the French territory.

Climate.—The rainy season begins in November or December, and lasts till the latter part of June; but there are usually three or four weeks of good weather in March.

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[1] Compare Mr Cohen's Report in Parliamentary Papers [C 1861], 1877.

[2] See the Octroy or Charter in Hartsinck, or in *Verzameling van Stukken aangaande de Surinaamsche Aangelegenheden*, &c., The Hague, 1845.

[3] See "Memoria sobre os limites do Brasil com a Guyana Franceza," by J. Caetano da Silva in *Revista trimensal de Hist. e Geogr.*, Rio de Janeiro, 1850.

During the rest of the year there is often hardly a drop of rain for months. At Cayenne the annual rainfall amounts on an average to from 10 to 11 feet, and it is naturally heavier in the interior. It has been calculated indeed that, if all the fluvial outlets were blocked, a single winter would be sufficient to submerge the whole colony to a depth of 15 or 16 feet. During the hotter part of the year—August, September, October—the temperature usually rises to about 86° F., but it almost never exceeds 88°; in the colder season the mean is 79°, and it seldom sinks so low as 70°. Between day and night there is very little thermometric difference. The longest day is 12 hours 18 minutes, the shortest 11 hours 42 minutes. The prevailing winds are the N.N.E. and the S.E.; and the most violent are those of the N.E. During the rainy season the winds keep between N. and E., and during the dry season between S. and E. Hurricanes are unknown. Sudden rises of the sea are occasionally experienced in November and December. Within the present century there have been three earthquakes (1821, 1843, and 1877), none of which did much damage.

Population.—The population of French Guiana consists of a few pure whites, negroes from Africa, mulattoes, coolies, a decreasing number of Indians, convicts from France and its colonies (among whom are many Arabs from Algeria), and Chinese, Hindu, and Anamite immigrants. In 1877 the fixed population was stated at 17,230, and the floating population included 2300 aboriginal Indians, a military force of 1084, 338 Government officials and ecclesiastics, 4750 workmen connected with the commerce of immigration, and 1330 convicts outside of the penitentiaries; so that in round numbers the total amounted to 27,000. Of the fixed population the males were 7972, and the females 9258. The widows were 1108, while the widowers were 298.

Vegetation.—French Guiana has a rich variety of trees, and several of them are attracting increasing attention from their economic value. The *Leguminosæ* are abundantly represented, including the [illegible] of Surinam, which grows 70 or 80 feet high without branching, the [illegible] Saint Martin, and the [illegible] To the family of the [illegible] of British Guiana, the [illegible]; to the [illegible] Of the *Leguminosæ* it is enough to mention the black [illegible] Among the palms are the [illegible] palm of Africa, and the [illegible] palm. [illegible]

[illegible] is the principal [illegible] in French Guiana; [illegible]

[illegible] 46,044 oz. of gold

were obtained in 1872: 46,044 oz., equal to 4 million francs, were exported from Cayenne in 1874; and in 1875 and 1876 the yield was 4[illegible] oz. per month. As various ferruginous minerals are abundant in some places, it is possible that iron ores may exist.

Commerce.—The total value of the imports into French Guiana in 1871 was 5,903,413 francs; and it exported to the value of 2,550,158 francs to France, 10,6[illegible] francs to the French colonies, and 148,809 francs abroad. It is with Martinique that it stands in closest commercial relations, but the imposition in 1872 of a duty on eau de vie from that island has almost put a stop to its importation. Several small steamers maintain communication between different parts of the colony.

Convict Establishments.—It was in 1851 that Guiana was recommended to the French Government by a special commission of inquiry as a suitable place for criminal penitentiaries. In February 1852 transportation thither was offered as a favour to the convicts then under sentence, and more than 3000 of them accepted the change. As the minister of the colonies is allowed by a decree of 1855 to send to Guiana any Asiatics or Africans who are condemned to hard labour or solitary confinement, and as it has been deemed better since 1864 to take the European convicts to New Caledonia, the actual inhabitants of the penitentiary districts are mainly negroes, Arabs, and Anamites. The principal establishments are those of Cayenne, of the three Îles du Salut, of the Kourou, and of the Maroni. The little island La Mere is reserved for the aged, the infirm, and the convalescent. At Saint Laurent on the Maroni there is almost a little town of wooden houses built on brick pillars. The convicts carry on their several trades as carpenters, tanners, bakers, &c. After two years in the colony, those whose conduct has been satisfactory are allowed to contract marriage, to send home for their families, to have a piece of ground assigned to them for cultivation, and to receive the necessary implements. A tramway has been constructed for the use of the "concessions." (See *Rev. Col. et Mar.*, 1876.)

Administration.—Besides the governor and the military commandant, the administrative personnel comprises an *ordonnateur*, a director of the interior, and a procurator-general, as well as a privy council and a director of the penitentiary service. There is a court of appeal and a tribunal of first instance, and justices of peace are appointed for each canton. Cayenne is administered by a municipal council. Religious affairs are under an apostolic prefect.

History.—According even to the French writers, the history of Guiana is little better than a series of disasters. La Ravardière, sent out in 1604 by Henry IV. to reconnoitre the country, brought back a favourable report; but the death of the king put a stop to the projects of formal colonization. In 1626 a small body of traders from Rouen settled on the Sinnamary, and in 1634 a similar band took up their quarters at Cayenne. The Compagnie du Cap Nord, founded by the people of Rouen in 1643, the Compagnie de la France Equinoxiale, established in 1645, and the second Compagnie de la France Equinoxiale, or Compagnie des Douze Seigneurs, established in 1652, were so many lamentable failures, the result of incompetence, mismanagement, and misfortune. The Compagnie des Indes Occidentales, chartered in 1664 with a monopoly of Guiana commerce for forty years, proved hardly more successful; but in 1674 the colony passed under the direct control of the crown, and the able administration of Colbert began to tell favourably on its progress. The year 1763 was marked by a terrible disaster. Choiseul, the prime minister, having obtained for himself and his cousin Praslin a concession of the country between the Kourou and the Maroni, sent out about 12,000 volunteer colonists, mainly from Alsace and Lorraine. They were landed at the mouth of the Kourou, where no preparation had been made for their reception, and where [illegible] 918 [illegible] remained alive, and these were a famished fever-stricken band. A [illegible] Several other attempts at colonization in Guiana were made in the latter part of the century, but they all [illegible] of the convict establishments.

A detailed bibliography of French Guiana will be found in Ternaux-Compans, [illegible], 1843, and in Victor de Nouvion, [illegible], 1844. Among the works of the present century are [illegible], 1844; [illegible], 1848; M[illegible], [illegible], 1857; [illegible] Musée [illegible], 1867; [illegible] Papin [illegible]; [illegible], "[illegible]" in [illegible], 1874; [illegible], 1870; Abbé de Saint Quentin, [illegible], 1872; [illegible], "Lettre à la [illegible]," 1874; Morand, [illegible], 1874; [illegible], "Voyage en Guyane en 1877," in Bull. de [illegible], 1878, and in Tour du Monde, 1878; [illegible] Exposition Univ. de 1878, 1878; and [illegible], 188[illegible].

GUIBERT (1053–1124), of Nogent, a theological and historical writer, who flourished at the close of the 11th and the beginning of the 12th century, was born of rich and noble parents at Clermont-en-Beauvoisis on Easter Eve 1053. Dedicated from infancy to the service of God and the Virgin, he received his early education at the Benedictine abbey of Flay (Flaviacum) or St Germer, in the diocese of Beauvais; there he gave himself with great zeal to study, but chiefly of the secular poets, until a severe illness brought about a crisis in his spiritual life, in consequence of which he began to fix his attention almost exclusively upon the Holy Scriptures and the writings of the fathers, especially of Augustine and Gregory the Great. About this period he was largely influenced by personal intercourse with Anselm, afterwards of Canterbury, who at that time was head of the priory of Bec in the neighbourhood of St Germer's. Encouraged by his friend he now devoted his energies to Old Testament exegesis, and wrote a commentary upon the narrative of the creation; this was followed by other literary works both in verse and in prose. In 1104, when he had completed his fiftieth year, he was chosen to be head of the abbey of Notre Dame de Nogent, and there the remainder of his life was spent in a high degree of theological and ecclesiastical activity. He died in 1124.

His works, edited by D'Achery, were first published in 1651, in one volume folio, at Paris (*Venerabilis Guiberti Abbatis B. Mariæ de Novigento Opera Omnia*); they include, besides minor works, a treatise on homiletics (*Liber quo ordine sermo fieri debeat*); ten books of *Moralia* on Genesis, begun in 1084, but not completed until 1113, composed on the model of Gregory the Great's *Moralia in Job*; two books of *Tropologiæ* on Hosea, Amos, and the Lamentations; a treatise on the *Incarnation*, against the Jews; four books *De Pignoribus Sanctorum*, a remarkably free criticism on the abuses of saint and relic worship; eight books of the *Historia quæ dicitur Gesta Dei per Francos, sive Historia Hierosolymitana*, a history of the first crusade, which constitutes one of our most authentic sources on the events with which it deals; and three books *De Vita Sua, sive Monodiarum*. See Migne's *Patrologia Latina*, vols. clvi. and clxxxiv.

GUIBERT, or WIBERT (*c.* 1030–1100), of Ravenna, better known as the antipope Clement III., was born of noble parents in the 11th century at Parma, where, on attaining the canonical age, he entered the priesthood. During the minority of Henry, Guibert was appointed by the empress Agnes to the chancellorship of the kingdom of Italy; and in this capacity he steadfastly resisted, in the interests of the crown, the innovations of Hildebrand in relation to papal elections. For his services in this he was rewarded with the archbishopric of Ravenna, to which he was consecrated in 1073; his fidelity to Henry during the struggles which followed Hildebrand's accession to the papal throne as Gregory VII. led to his being ecclesiastically suspended in 1075. By thirty bishops of the imperialist party he was elected pope at Brixen in 1080, an election which was confirmed by the synod which Henry had convened in Rome in 1084. Guibert assuming the title of Clement III. Although it was from his hands that Henry received his coronation, Clement III. met with scant recognition from the clergy and exercised few papal functions; and his name is not enrolled in any list of popes. He died in September 1100, and was buried at Ravenna; by the order of Paschalis II. his ashes were afterwards disinterred and scattered to the winds. See Giesebrecht's *Kaisergeschichte*, vol. iii.

GUICCIARDINI, FRANCESCO (1483–1540), the celebrated Italian historian and statesman, was born at Florence in the year 1483, when Marsilio Ficino held him at the font of baptism. His family was illustrious and noble; and his ancestors for many generations had held the highest posts of honour in the state, as may be seen in his own genealogical *Ricordi* (*Op. Ined.*, vol. x.). After the usual education of a boy in grammar and elementary classical studies, his father, Piero, sent him to the universities of Ferrara and Padua, where he stayed until the year 1505. The death of an uncle, who had occupied the see of Cortona with great pomp, induced the young Guicciardini to hanker after an ecclesiastical career. He already saw the scarlet of a cardinal awaiting him, and to this eminence he would assuredly have risen. His father, however, checked this ambition, declaring that, though he had five sons, he would not suffer one of them to enter the church in its then state of corruption and debasement. Guicciardini, whose motives were confessedly ambitious (see *Autobiogr. Ricordi*, *Op. Ined.*, x. p. 68), turned his attention to law, and at the age of twenty-three was appointed by the signoria of Florence to read the *Institutes* in public. Shortly afterwards he engaged himself in marriage to Maria, daughter of Alamanno de' Salviati, prompted, as he frankly tells us, by the political support which an alliance with that great family would bring him (*ib.*, x. 71). He was then practising at the bar, where he won so much distinction that the signoria, in 1512, entrusted him with an embassy to the court of Ferdinand the Catholic. Thus he entered on the real work of his life as a diplomatist and statesman. His conduct upon that legation was afterwards severely criticized; for his political antagonists accused him of betraying the true interests of the commonwealth, and using his influence for the restoration of the exiled Casa Medici to power. His Spanish correspondence with the signoria (*Op. Ined.*, vol. vi.) reveals the extraordinary power of observation and analysis which was a chief quality of his mind; and in Ferdinand, hypocritical and profoundly dissimulative, he found a proper object for his scientific study. To suppose that the young statesman learned his frigid statecraft in Spain would be perhaps too simple a solution of the problem offered by his character, and scarcely fair to the Italian proficients in perfidy. It is clear from Guicciardini's autobiographical memoirs that he was ambitious, calculating, avaricious, and power-loving from his earliest years; and in Spain he had no more than an opportunity of studying on a large scale those political vices which already ruled the minor potentates of Italy. Still the school was pregnant with instructions for so apt a pupil. Guicciardini issued from this first trial of his skill with an assured reputation for diplomatic ability, as that was understood in Italy. To unravel plots and weave counterplots; to meet treachery with fraud; to parry force with sleights of hand; to credit human nature with the base motives, while the blackest crimes were contemplated wi cold enthusiasm for their cleverness, was reckoned then th height of political sagacity. Guicciardini could play tl game to perfection. In 1515 Leo X. took him into service, and made him governor of Reggio and Modena. In 1521 Parma was added to his rule, and in 1523 he was appointed viceregent of Romagna by Clement VII. These high offices rendered Guicciardini the virtual master of the papal states beyond the Apennines, during a period of great bewilderment and difficulty. The copious correspondence relating to his administration has recently been published (*Op. Ined.*, vols. vii., viii.). In 1526 Clement gave him still higher rank as lieutenant-general of the papal army. While holding this commission, he had the humiliation of witnessing from a distance the sack of Rome and the imprisonment of Clement, without being able to rouse the perfidious duke of Urbino into activity. The blame of Clement's downfall did not rest with him; for it was merely his duty to attend the camp, and keep his master informed of the proceedings of the generals (see the Correspondence, *Op. Ined.*, vols. iv., v.). Yet Guicciardini's conscience accused him, for he had previously counselled the pope to declare war, as he notes in a curious letter to himself written in 1527 (*Op. Ined.*, x. 104). Clement did not, however, withdraw his confidence, and in 1531 Guicciardini was advanced to the governorship of Bologna, the most important of all the papal lord lieutenancies (Correspondence, *Op. Ined.*, vol. ix.). This post he resigned in 1534 on the election of Paul III., preferring to follow the fortunes of the Medicean princes. It may here be noticed that though Guicciardini served three popes through a period of twenty years, or perhaps because of this, he hated the papacy with a deep and frozen bitterness, attributing the woes of Italy to the ambition of the church, and declaring he had seen enough of sacerdotal abominations to make him a Lutheran (see *Op. Ined.*, vol. i. 27, 104, 96, and *Ist. d' It.*, ed. Ros., ii. 218). The same discord between his private opinions and his public actions may be traced in his conduct subsequent to 1534. As a political theorist, Guicciardini believed that the best form of government was a commonwealth administered upon the type of the Venetian constitution (*Op. Ined.*, i. 6; ii. 130 *sq.*); and we have ample evidence to prove that he had judged the tyranny of the Medici at its true worth (*Op. Ined.*, vol. i. 171, on the tyrant; the whole *Storia Fiorentina* and *Reggimento di Firenze*, *ib.* i. and iii., on the Medici). Yet he did not hesitate to place his powers at the disposal of the most vicious members of that house for the enslavement of Florence. In 1527 he had been declared a rebel by the signoria on account of his well-known Medicean prejudices; and in 1530, deputed by Clement to punish the citizens after their revolt, he revenged himself with a cruelty and an avarice that were long and bitterly remembered. When, therefore, he returned to inhabit Florence in 1534, he did so as the creature of the dissolute Alessandro de' Medici. Guicciardini pushed his servility so far as to defend this infamous despot at Naples in 1535, before the bar of Charles V., from the accusations brought against him by the Florentine exiles (*Op. Ined.*, vol. ix.). He won his cause, but in the eyes of all posterity he justified the reproaches of his contemporaries, who describe him as a cruel, venal, grasping seeker after power, eager to support a despotism for the sake of honours, offices, and emoluments secured for himself by a bargain with the oppressors of his country. Varchi, Pitti, Segni, and Nardi are unanimous upon this point; but it is only the recent publication of Guicciardini's private MSS. that has made us understand the force of their invectives. To plead loyalty or honest political conviction in defence of his Medicean partisanship is impossible, face to face with the opinions expressed in the *Ricordi Politici* and the *Storia Fiorentina*. Like Machiavelli, but on a lower level, Guicciardini was willing to "roll stones," or to do any dirty work for masters whom, in the depth of his soul, he detested and despised. After the murder of Duke Alessandro in 1537, Guicciardini espoused the cause of Cosimo de' Medici, a boy addicted to field sports, and ignorant of the arts of statecraft. The wily old diplomatist hoped to rule Florence as grand vizier under this inexperienced prince. He was mistaken, however, in his schemes, for Cosimo displayed the genius of his family for politics, and coldly dismissed his would-be lord-protector. Guicciardini retired in disgrace to his villa, where he spent his last years in the composition of the *Istoria d'Italia*. He died in 1540 without male heirs.

Guicciardini was the product of a cynical and selfish age, and his life illustrated its sordid influences. Of a cold and worldly temperament, devoid of passion, blameless in his conduct as the father of a family, faithful as the servant of his papal patrons, severe in the administration of the provinces committed to his charge, and indisputably able in his conduct of affairs, he was at the same time, and in spite of these qualities, a man whose moral nature inspires a sentiment of liveliest repugnance. It is not merely that he was ambitious, cruel, revengeful, and avaricious, for these vices have existed in men far less antipathetic than Guicciardini. Over and above those faults, which made him odious to his fellow-citizens, we trace in him a meanness that our century is less willing to condone. His phlegmatic and persistent egotism, his sacrifice of truth and honour to self interest, his acquiescence in the worst conditions of the world, if only he could use them for his own advantage, combined with the glaring discord between his opinions and his practice, form a character which would be contemptible in our eyes were it not so sinister. The social and political decrepitude of Italy, where patriotism was unknown, and only selfishness survived of all the motives that rouse men to action, found its representative and exponent in Guicciardini. When we turn from the man to the author, the decadence of the age and race that could develop a political philosophy so arid in its cynical despair of any good in human nature forces itself vividly upon our notice. Guicciardini seems to glory in his disillusionment, and uses his vast intellectual ability for the analysis of the corruption he had helped to make incurable. If one single treatise of that century should be chosen to represent the spirit of the Italian people in the last phase of the Renaissance, the historian might hesitate between the *Principe* of Macchiavelli and the *Ricordi Politici* of Guicciardini. The latter is perhaps preferable to the former on the score of comprehensiveness. It is, moreover, more exactly adequate to the actual situation, for the *Principe* has a divine spark of patriotism yet lingering in the cinders of its frigid science, an idealistic enthusiasm surviving in its moral aberrations; whereas a great Italian critic of this decade has justly described the *Ricordi* as "Italian corruption codified and elevated to a rule of life." Guicciardini is, however, better known as the author of the *Storia d' Italia*, that vast and detailed picture of his country's sufferings between the years 1494 and 1532. Judging him by this masterpiece of scientific history, he deserves less commendation as a writer than as a thinker and an analyst. The style is wearisome and prolix, attaining to precision at the expense of circumlocution, and setting forth the smallest particulars with the same distinctness as the main features of the narrative. The whole tangled skein of Italian politics, in that involved and stormy period, is unravelled with a patience and an insight that are above praise. It is the crowning merit of the author that he never ceases to be an impartial spectator,—a cold and curious critic. We might compare him to an anatomist, with knife and scalpel dissecting the dead body of Italy, and pointing out the symptoms of her manifold diseases with the indifferent analysis of one who has no moral sensibility. This want of feeling, while it renders Guicciardini a model for the scientific student, has impaired the interest of his history. Though he lived through that agony of the Italian people, he does not seem to be aware that he is writing a great historical tragedy. He takes as much pains in laying bare the trifling causes of a petty war with Pisa as in probing the deep-seated ulcer of the papacy. Nor is he capable of painting the events in which he took a part, in their totality as a drama. Whatever he touches, lies already dead on the dissecting table, and his skill is that of the analytical pathologist. Consequently, he fails to understand the essential magnitude of the task, or to appreciate the vital vigour of the forces contending in Europe for mastery. This is very noticeable in what he writes about the Reformation. Notwithstanding these defects, inevitable in a writer of Guicciardini's temperament, the *Storia d'Italia* was undoubtedly the greatest historical work that had appeared since the beginning of the modern era. It remains the most solid monument of the Italian reason in the 16th century, the final triumph of that Florentine school of philosophical historians which numbered Macchiavelli and Vettori, Segni, Pitti, Nardi, Nerli, Varchi, and Giannotti. Up to the year 1857 the fame of Guicciardini as a writer, and the estimation of him as a man, depended almost entirely upon the *History of Italy*, and on a few ill edited extracts from his aphorisms. At that date his representatives, the Counts Piero and Luigi Guicciardini, opened their family archives, and committed to Signor Giuseppe Canestrini the publication of his hitherto inedited MSS. in ten important volumes. The vast mass of documents and finished literary work thus given to the world has thrown a flood of light upon Guicciardini, whether we consider him as author or as citizen. It has raised his reputation as a political philosopher into the first rank, where he now disputes the place of intellectual supremacy with his friend Macchiavelli, but it has coloured our moral judgment of his character and conduct with darker dyes. From the stores of valuable materials contained in those ten volumes, it will be enough here to cite (1) the *Ricordi Politici*, already noticed, consisting of about 400 aphorisms on political and social topics; (2) the observations on Macchiavelli's *Discorsi*, which bring into remarkable relief the views of Italy's two great theorists on statecraft in the 16th century, and show that Guicciardini regarded Macchiavelli somewhat as an amiable visionary or political enthusiast; (3) the *Storia Fiorentina*, an early work of the author, distinguished by its animation of style, brilliancy of portraiture, and liberality of judgment; and (4) the *Dialogo del Reggimento di Firenze*, also in all probability an early work, in which the various forms of government suited to an Italian commonwealth are discussed with infinite subtlety, contrasted, and illustrated from the vicissitudes of Florence up to the year 1494. To these may be added a series of short essays, entitled *Discorsi Politici*, composed during Guicciardini's Spanish legation. It is only after a careful perusal of these minor works that the student of history may claim to have comprehended Guicciardini, and may feel that he brings with him to the consideration of the *Storia d' Italia* the requisite knowledge of the author's private thoughts and jealously guarded opinions. Indeed, it may be confidently affirmed that those who desire to gain an insight into the true principles and feelings of the men who made and wrote history in the 16th century will find it here far more than in the work designed for publication by the writer. Taken in combination with Macchiavelli's treatises, the *Opere Inedite* furnish a comprehensive body of Italian political philosophy anterior to the date of Fra Paolo Sarpi.

The student may be referred to Rosini's edition of the *Storia d'Italia*, Pisa, 1819, 10 vols., and to the *Opere Inedite*, in 10 vols., published at Florence, 1857. These two books place him in possession of all that is extant of Guicciardini. (J. A. S.)

GUIDI, CARLO ALESSANDRO (1650–1712), Italian lyric poet, was born at Pavia in 1650. As chief founder of the well-known Roman academy called "L'Arcadia," he had a considerable share in the reform of Italian poetry, corrupted at that time by the extravagance and bad taste of the poets Marini and Achillini and their school. The poet Guidi and the critic and jurisconsult Gravina checked this evil by their influence and example. The genius of Guidi was lyric in the highest degree; his songs are written with singular force, and charm the reader, in spite of touches of bombast. His most celebrated song is that entitled *Alla Fortuna* (To Fortune), which certainly is one of the most beautiful pieces of poetry of the 17th century. Guidi was squint-eyed, humpbacked, and of a delicate constitution, but possessed undoubted literary ability. His poems were printed at Parma in 1671, and at Rome in 1704. In 1681 he published at Parma his lyric tragedy *Amalasunta in Italy*, and two pastoral dramas *Daphne* and *Endymion*. The last had the honour of being mentioned as a model by the critic Gravina, in his treatise on poetry. Less fortunate was Guidi's poetical version of the six homilies of Pope Clement XI., first as having been severely criticized by the satirist Settano, and next as having proved to be the indirect cause of the author's death. A splendid edition of this version had been printed in 1712, and, the pope being then in San Gandolfo, Guidi went there to present him with a copy. On the way he found out a serious typographical error, which he took so much to heart that he was seized with an apoplectic fit at Frascati and died on the spot. Guidi was honoured with the special protection of Ranuccio II., duke of Parma, and of Queen Christina of Sweden.

GUIDICCIONI, GIOVANNI, one of the best Italian poets of the first half of the 16th century, was born at Lucca in 1480, and died at Macerata in 1541. He occupied a high position, being bishop of Fossombrone and president of Romagna. The latter office nearly cost him his life; a murderer attempted to kill him, and had already touched his breast with his dagger when, conquered by the resolute calmness of the prelate, he threw away the weapon and fell at his feet, asking forgiveness. The *Rime* and *Letters* of Guidiccioni are models of elegant and natural Italian style. The best editions are those of Genoa (1749), Bergamo (1753), and that recently published at Florence.

GUIDO OF AREZZO, an Italian monk of the 11th century, has by many been called the father of modern music, and a portrait of him in the refectory of the monastery of Avellana bears the inscription "Beatus Guido, inventor musicæ." Although these statements are manifestly exaggerated, it is none the less true that Guido's reforms mark an enormous progress in the notation as well as in the teaching of music. Of his life little is known, and that little is chiefly derived from the dedicatory letters prefixed to two of his treatises and addressed respectively to Bishop Theodald (not Theobald, as Burney writes the name) of Arezzo, and Michael, a monk of Pomposa and Guido's pupil and friend. Occasional references to the celebrated musician in the works of his contemporaries are, however, by no means rare, and from these it may be conjectured with all but absolute certainty that Guido was born in the last decade of the 10th century. The place of his birth is, beyond a doubt, Arezzo; for on the title-page of all his works he is styled *Guido Aretinus*, or simply *Aretinus*. At his first appearance in history Guido was a monk in the Benedictine monastery of Pomposa, and it was there that he invented his educational method, by means of which, according to his own statement, a pupil might learn within five months what formerly it would have taken him ten years to acquire. Envy and jealousy, however, were his only reward, and by these he was compelled to leave his monastery—"inde est, quod me vides prolixis finibus exulatum," as he says himself in the second of the letters above referred to. According to one account, he travelled as far as Bremen, called there by Archbishop Hermann in order to reform the musical service. But this statement has been doubted, for chronological and other reasons.

Certain it is that not long after his flight from Pomposa Guido was living at Arezzo, and it was here that, about 1030, he received an invitation to Rome from Pope John XIX. He obeyed the summons, and the pope himself became his first and apparently one of his most proficient pupils. But in spite of his success Guido could not be induced to remain in Rome, the insalubrious air of which seems to have affected his health. In Rome he met again his former superior, the abbot of Pomposa, who seems to have repented of his conduct towards Guido, and to have induced him to return to Pomposa; and here all authentic records of Guido's life cease. We only know that he died, on May 17, 1050, as prior of Avellana, a monastery of the Camaldulians; such at least is the statement of the chroniclers of that order. It ought, however, to be added that the Camaldulians claim the celebrated musician as wholly their own, and altogether deny his connexion with the Benedictines. It is quite in accordance with the semi-mythical character of Guido's life that a great many inventions belonging to earlier as well as to later times have been attributed to him, in the same way as Charlemagne, Arthur, and Roland have been made responsible for the deeds and exploits of other kings and heroes. His eulogists declare that before him church music was in a state of utter barbarism, wholly ignoring the achievements of Gregory the Great, Hucbald, and others. The notation of music by means of the *neumæ* also, although very imperfect for practical purposes, at any rate served to give permanence to the composer's thoughts. There is, however, no doubt that in the latter respect Guido's method shows an enormous progress. It was he who invented, or at least for the first time systematically used, the lines of the staff, and the intervals or *spatia* between them, and thus fixed the principle of modern notation; and the value of this innovation for educational and general artistic purposes cannot be overrated. There is also little doubt that the names of the first six notes of the scale, *ut*, *re*, *mi*, *fa*, *sol*, *la*, still in use among Romance nations, were introduced by Guido, although he seems to have used them in a relative rather than in an absolute sense. It is well known that these words are the first syllables of six lines of a hymn addressed to St John the Baptist, which may be given here:—

Ut queant laxis *re*sonare fibris
*Mi*ra gestorum *fa*muli tuorum,
*Sol*ve polluti *la*bii reatum,
Sancte Joannes.

In addition to this Guido is generally credited with the introduction of the F clef. But perhaps more important than all this is the thoroughly practical tone which Guido assumes in his theoretical writings, and which differs greatly from the clumsy scholasticism of his contemporaries and predecessors.

The most important of Guido's treatises, and those which are generally acknowledged to be authentic, are [illegible] dedicated to Bishop Theodald of Arezzo, [illegible] the fourth volume [illegible]

GUIDO RENI. See RENI.

GUIDO OF SIENA. The name of this painter is of considerable interest in the history of art, on the ground that, if certain assumptions regarding him could be accepted as true, he would be entitled to share with Cimabue, or rather indeed to supersede him in, the honour of having given the first onward impulse to the art of painting. The case stands thus. In the church of S. Domenico in Siena is a large painting of the Virgin and Child enthroned, with six angels above, and in the Benedictine convent of the same city is a triangular pinnacle, once a portion of the same composition, representing the Saviour in benediction, with two angels; the entire work was originally a triptych, but is not so now. The principal section of this picture has a rhymed Latin inscription, giving the painter's name as Gu . . . o de Senis, with the date 1221: the genuineness of the inscription is not, however, free from doubt. In the general treatment of the picture there is nothing to distinguish it particularly from other work of the same early period; but the heads of the Virgin and Child are indisputably very superior, in natural character and graceful dignity, to anything to be found anterior to Cimabue. The question therefore arises, Are these heads really the work of a man who painted in 1221? The best informed connoisseurship of recent years (see especially the discussion of the matter in Messrs Crowe and Cavalcaselle's work, vol. i.) pronounces in the negative, concluding that the heads are repainted, and are, as they now stand, due to some artist of the 14th century, perhaps Ugolino da Siena; thus the claims of Cimabue would remain undisturbed and in their pristine vigour. Beyond this, little is known of Guido da Siena. There is in the Academy of Siena a picture assigned to him, a half-figure of the Virgin and Child, with two angels, dating probably between 1250 and 1300; also in the church of S. Bernardino in the same city a Madonna dated 1262. Milanesi thinks that the work in S. Domenico is due to Guido Graziani, of whom no other record remains earlier than 1278, when he is mentioned as the painter of a banner. Guido da Siena appears always to have painted on panel, not in fresco on the wall. He has been termed, very dubiously, a pupil of Pietrolino, and the master of Diotisalvi, Mino da Turrita, and Berlinghieri da Lucca.

GUIENNE, an old French province, whose name until the 10th century was Aquitania, and whose history until it came into the possession of England in 1152 is given under the heading AQUITANIA. It was bounded by the Pyrenees, Languedoc, Auvergne, Angoumois, Saintonge, and the sea of Gascony; and out of it are now formed the departments of Gironde, Dordogne, Lot, Aveyron, Lot-et-Garonne, Tarn, Landes, Gers, Upper Pyrenees, Ariége, and Lower Pyrenees. The chief town was Bordeaux. Soon after it was joined to the English crown the nobles twice revolted, but were each time subdued, and in 1169 Henry II. of England bequeathed it to his son Richard (Cœur de Lion), who after quelling all symptoms of revolt added in 1186 and 1188 Toulouse and Rouergue to his French possessions. In 1196 he bequeathed it to his nephew Otto of Brunswick, but he resumed its possession in 1198, when Otto was chosen king of Germany. After the death of Richard in 1199, his mother Eleanor retained possession of it during her lifetime. It was reconquered by the French in the reign of Edward I. of England, but at the peace of 1303 it was again ceded to the English, with whom it remained till 1451, when it was conquered and finally united to France by Charles VII. In 1469 Louis XI. gave it in exchange for Champagne and Brie to his brother, the duke of Berri, after whose death in 1472 it was again united to the French crown.

GUIGNES, JOSEPH DE (1721–1800), a French Orientalist, born at Pontoise October 19, 1721, became in his fifteenth year a student of Oriental languages, and especially of Chinese at the College Royal under the celebrated

Fourmont, whom in 1745 he succeeded at the Royal Library as secretary interpreter of the Eastern languages. A *Mémoire Historique sur l'Origine des Huns et des Turcs*, published by De Guignes in 1748, having brought his name with some prominence before the learned world, he was admitted a member of the Royal Society of London in 1752 and an associate of the French Academy of Inscriptions in 1754. Two years later he gave to the world the first two volumes of his learned and laborious *Histoire Générale des Huns, des Mongoles, des Turcs, et des autres Tartares occidentaux*; and in 1757 he was appointed to succeed Jault in the chair of Syriac at the Collège Royal. The completion of the *Histoire* by the publication of the three remaining volumes in 1758 was followed in 1759 by the publication of a *Mémoire* in which he propounded and endeavoured to prove the untenable and absurd theory that the Chinese nation had originated in Egyptian colonization, an opinion to which, in spite of every argument, he to the last obstinately clung. To its support, as also to the further elucidation of the chronology and arrangement of his *Histoire*, which had been, not without some justice, unfavourably criticized, he devoted several learned papers which are to be found in the *Mémoires* of the Academy of Inscriptions; and among his other literary labours, an improved edition of an old translation of the *Shoo-king* is worthy of special mention. The Revolution, while permitting De Guignes to retain some insignificant pensions which had been conferred upon him, deprived him of various posts, such as those of keeper of the antiquities in the Louvre and editor of the *Journal des Savants*, on which he was chiefly dependent for his income; and his later years are said to have brought to him considerable personal hardship, from which his sole refuge was in redoubled application to study. He died at Paris, March 19, 1800. The *Histoire* had been translated into German by Dähnert (1768–71). De Guignes left a son, Christian Louis Joseph (1759–1845), who, after learning Chinese from his father, went as consul to Canton, where he spent seventeen years. On his return to France he was charged by the Government with the work of preparing a Chinese-French-Latin dictionary. Though bearing his name alone on the title-page (1813), it was in reality only a new edition of the work of Glemona. He was also the author of a large work of travels (*Voyages à Pékin, Manille, et l'Île de France*, 1808).

GUILD. The spirit of association has in all ages induced men to join together for the pleasures of mutual enjoyment or for the attainment of some common purpose for which the support of numbers was necessary. The idea has taken shape in various ways, influenced by the temperament of race, the policy of Governments, the social condition of classes, or the need for a special object. Independently of the organization of peoples, of their constitution into towns, provinces, and states as units in a system, whether of self-government or of imposed government,—independently too of those great associations or brotherhoods, the church, the orders of knighthood, the greater and lesser monastic orders, and secret societies,—there is a third kind of association upon a basis distinct from these. The public welfare of a community within certain territorial limits is the great object of Governments, local or imperial; the pursuit of some great moral, religious, or equitable thought, touching the hearts of men in general without regard to nation, was the animating principle of the chivalric and religious orders; but when men began to form themselves into *guilds*, the benefit of each one in his individual and social capacity was concerned, naturally confined within the bounds of neighbourhood. A guild was a voluntary association of those living near together who joined for a common purpose, paying contributions, worshipping together, feasting together periodically, helping one another in sickness and poverty, and frequently united for the pursuit of a special object.

The true history of these institutions has been till recently unnoticed, their value and importance, especially in connexion with the life of towns and villages, having been but imperfectly investigated or understood. Guilds have, however, been numerous, and their influence most important, in Europe from an early period; they attained their highest prosperity and development in the Teutonic countries, and especially in England during the Middle Ages, and they have been widely spread among the Romance nations.

The meaning of the word *guild* or *gild* is closely connected with the origin of the institution. *Gild* or *geld* was Old English for a set payment or contribution, from *ȝeldan* or *ȝyldan*, to pay (whence also the present *yield*); the primary meaning was payment, and the company of those who paid became known by this chief title to membership. There are also *gilde*, Danish and Low German, in the sense of a contributory company of this kind; *gjalda* and *gildi*, Icelandic, a payment, and *gildi*, also a banquet. The word therefore, thus derived, is better spelt (as most old authorities have it) without the *u*; a colour is, however, given for the ordinary modern form *guild*, by deriving it (as Wedgwood, *English Etymology*) from the Welsh or Breton *gouil*, a feast or holiday, *gwylad*, keeping a festival.

The essential principle of the guild is the banding together for mutual help, mutual enjoyment, and mutual encouragement in good endeavour. The spirit which directed itself to the inner business and life of each society and its members is the true mark, in some degree, of all bodies, ancient or modern, that can claim the character of guilds. The peace-guild of the North in the 10th century had this character in common with the great trading guild of the 13th and 14th centuries, or the little social or religious guild of an English country village of a century later.

Some German scholars find the origin of the first guilds in the banquets and sacrificial assemblies of the heathen German tribes. Wilda, Dr L. Brentano, and others, connecting these with what is known of the importance of family relations among the Teutonic nations, find in the family union the germ from which the guild was developed, and show that when Christianity was brought from the south of Europe "the spirit of association received a mighty impulse, and the gilds spread themselves rapidly under the influence of Christian doctrine" (Brentano). It is maintained by others that the guilds have sprung from the *collegia*, in those countries where the Romans bore sway.

The Romans exercised the right of association from early times; it is attributed to Numa that he encouraged the formation of craft guilds, of which Plutarch enumerates nine; there also existed early religious societies among them. Exercised voluntarily under the republic, this right became crippled under the empire, and the *collegia* were obliged to seek authorization from the state for the narrower objects to which the imperial decrees attempted to limit them. These societies were numerous, not only at Rome, but throughout the empire, especially in the East, in Italy, and in Gaul; a large number were trade corporations, devoted to the interest of their crafts; others were united for good-fellowship, religion, and many especially to provide for burial. In the provinces, besides merchants and others, the highest persons were glad at times to belong to them; those in Rome under the empire appear to have consisted principally of workmen, freedmen, slaves, and persons of the humbler classes. All appear to have had the same general features; they chose their own masters and officers, made rules for self-government, paid contributions to a common fund, met and feasted together at stated periods, —the freedom of social intercourse being particularly appreciated among the poorer companies. They formed rules for good behaviour at table, and admitted women as members; they "affirmed their existence by a common worship," choosing a patron god. From these and other resemblances Mr H. C. Coote contends that there is an identity between the Roman *collegia* and the guilds of Saxon growth; and M. Raynouard was an advocate of a similar descent in France and Italy. But though analogous in many respects, as far as is known they lacked the essential element of the guild, that of mutual help in sickness and poverty; the soldiers' colleges, formed in spite of the law which forbade them, approach the nearest to this character, in providing their members with travelling expenses and retiring pensions. The evidence against the connexion between the *collegium* and the guild is regarded by the ablest German writers who have investigated the subject as conclusive, but this interesting historical question has not yet been fully worked out.[1]

The Greeks also, in the 2d and 3d centuries B.C., had their associations of the same kind, called *Eranoi* or *Thiasoi*, which were numerous at Rhodes, in the islands of the Archipelago, at the Piræus, and in other important places. These societies partook more nearly of the character of the mediæval guilds than did the Roman; the members paid contributions to a general fund, aided one another in necessity, provided for funerals, met in assembly to deliberate on their affairs, and celebrated feasts and religious sacrifices in common. Strict rules against disorderly conduct were to be enforced by fine; he who did not pay his yearly quota to the society was excluded, unless he could show good cause of poverty or sickness. Women could be members, and were admitted to the meetings. Some of these societies concerned themselves with religion, others with politics or commerce; in the cause of liberal as opposed to official religion, they appear to have done good service.

It is perhaps of little use attempting to ascribe to any one country or race the special initiative of these institutions, any more than it would be to say that the custom of men to congregate in towns originated with this or that nation. Human nature is the same everywhere, and two motives induce men to join together:—weakness, seeking the power of numbers for resisting oppression, or for mutual assistance; and the affinity which those pursuing the same occupation and possessing the same interests have for each other. These motives are sufficient to account for the existence of the *Eranoi* in Greece, contemporary with the *Collegia* of the Romans; they are sufficient to explain why, although the *collegia opificum*, or artisans' guilds, are found as late as the code of Justinian, and that 50 or 60 years later, in the 6th century, we have record of a soap-makers' craft in Naples (Letter of Pope Gregory the Great, lib. x. epist. 26; Migne's *Pat. Curs.*, vol. lxxvii.), the guilds in the towns of Italy should begin a new life in the 10th century (Hegel); they can explain why in England we find from the 7th to the 10th century other guilds actively in existence, while in Norway they were instituted in the 11th century. These societies "may thus have one history in China, another in India, another in Greece or Rome, another in the Europe of the Middle Ages; the like needs will require the like kinds of help, and develop institutions which, amid whatever diversities of outward garb, will substantially fulfil the same ends" (J. M. Ludlow).

In the Middle Ages guilds are recognized as belonging to three or four classes. In the north of Europe the *frith* or *peace-guild* was an important form, widely spread in early times. These were associations for defence, based upon mutual obligations, "sworn communities for the protection of right and the preservation of liberty;" we see traces of them in England from the laws of Ina (7th century) down to the "Dooms" of London in Æthelstan's time (10th century). These statutes of the old London peace-guild are thus shortly described by Prof. Stubbs:—

> "A monthly meeting is directed, at which there is to be butt-fylling and a refection, the remains of which are to be bestowed in alms; on the death of a member each brother gives a loaf, and sings or procures the singing of fifty psalms. . . . Each member pays fourpence for common purposes, towards a sort of insurance fund from which the guild makes good the losses of members, and a contribution of a shilling towards the pursuit of the thief. The members are arranged in bodies of ten, one of whom is the headman; these again are classed in tens under a common leader, who with the other headmen acts as treasurer and adviser of the hundred members."

The early English recognized the responsibility of the guild for the actions of its members and their mutual liability,—the fundamental principle of English institutions for keeping the peace; besides this, the rules still exist of Saxon guilds at Abbotsbury, Woodbury, Cambridge, and Exeter, and show by the many points in common with the social guilds of later English growth whence these derived their descent. Abroad, the frith guilds in the 11th and 12th centuries extended over the Continent; one of the most remarkable was founded at Roeskild, under king Canute, for the suppression of the piracy of the vikings. Others, as in Schleswig, Artois, Flensburg, &c., joined for hindering violence and maintaining peace, by all means that law and custom allowed, even against kings. These guilds became of such importance that in many places their law grew to be that of the *commune* or town (see BOROUGH). In France the great development of town governments at this period was frequently but the acknowledgment of an already existing defensive guild, or of the important merchant or craft guilds. At Montpellier and Paris, in the beginning of the 13th century, the trade guilds took part in the watch and ward of the city, and thus were a recognized part of the *commune*. The same was the case in London in early times.[2] Even as late as the 15th century a guild was founded at Ghent, composed of the culveriners, arquebusiers, and gunners, in order to teach the burgesses the use of firearms, so as to be able to defend the town or suppress troubles. It became the chief guild of the city, had public festivities, admitted women as "consœurs," and possessed many of the features of both peace and social guilds.

In the Frankish empire guilds were numerous for defence, for conviviality, and for religious and social duties, among the serfs and the clergy as well as others; but under Charlemagne and his successors they suffered great oppression, and were persecuted by both ecclesiastical and secular authorities. In later times the clergy formed special societies called *Guilds of Kalenders*, so named from their meeting day having originally been on the kalends of each month (Brentano); these were to be found in many towns on the Continent, sometimes we read of the major and minor guilds for the higher and lower clergy. The only company that is known to have partaken of this character in England was the ancient Guild of the Kalenders at Bristol, which kept the records of that town and other places, and in its later years supported a school for Jews.

A class of guilds widely spread in the Middle Ages, especially in England, were those which have been distinguished by the name of *Social* (Toulmin Smith) or *Religious*

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[1] For a valuable sketch of the *Collegia*, including trade-guilds and [illegible] guilds, see [illegible] 1871), and "The [illegible] of Antiquity," by H. [illegible], *Gentleman's Magazine*, [illegible] 1864; and the article [illegible]

[2] "The custom of "setting out the watch," or the "marching watch," in London, Bristol, Worcester, &c., on midsummer eve, &c. [illegible] part taken in the defence of the city by the trade [illegible] of those places; it was a kind of [illegible]" (Herbert).

[illegible] These were the small and numerous societies that sprang up all over the country in every village, in small or large towns, at different times as the need arose, or for good neighbourhood's sake. Their objects included not only devotions and alms, but also every exercise of Christian charity, and therefore, above all things, mutual assistance of the gild-brothers in every exigency, especially in old age, in sickness, in cases of impoverishment,—if not brought on by their own folly,—and of wrongful imprisonment, in losses by fire, water, or shipwreck, aid by loans, provision of work, and lastly, the burial of the dead. It included further the assistance of the poor and sick, and the visitation and comfort of prisoners not belonging to the gild (Brentano). These societies were composed of men and women of all ranks, and when, as in some instances, they grew into wealth and popularity, kings and princes did not disdain to become guild brethren. Henry IV. and Henry VI. were members of the guild of the Trinity at Coventry; Henry VIII. and his queen were members of the guild of St Barbara, of St Katherine's church next the Tower, London. Another prince belonged to the famous guild of St George at Norwich. One guild, however, who said they were "of the rank of common and middling folks," would not admit even a mayor or a bailiff.

Each member took an oath, and paid an admission fee and yearly contribution; they held regular business meetings or "morn-speech," and had an annual "guild-day." Every guild had its livery, which the members were expected to wear at funerals, feasts, &c.; and they had strict rules for good life and behaviour. The little parochial guilds met in a room or in members' houses; if the guild was rich enough it had a hall or "guild-house;" legacies and gifts were made to them, and they lent out of their stock to poor members, or devoted it to some public or charitable object. Schools and churches were founded or helped by these private guilds, as some of the colleges at Cambridge, schools at Coventry, Worcester, Brayles, Sleaford, Ludlow, Bristol, and elsewhere; forty guilds of Bodmin (of which only five were craft guilds) joined in the repair of the church there. Bridges and town-walls were repaired, both in England and in France—in which latter country M. Giry finds some relics of these social guilds. The performing of miracle and other plays, setting out of pageants, and providing of minstrels were undertaken by many of the social as well as by the craft guilds, and in many towns formed an important adjunct to the municipal proceedings, as at Coventry, York, Durham, Norwich, &c.; the Lord Mayor's show of London owes its origin to this custom.[1]

These local social guilds were very numerous in England and in the Teutonic countries; it is believed that they were so in France, but little is known of them elsewhere. There were 50 such guilds in the county of Cambridge, 909 in Norfolk, 42 in Bodmin, 80 in Cologne, 70 at Lübeck, &c.

At the time of the Reformation these guilds were abolished in Protestant countries, under pretence of their being superstitious foundations; in Denmark and North Germany their property was devoted to public service, but in England it was handed over to the king and his courtiers, their guild-halls became poor-houses, their pageants were laid aside. A very few of these societies escaped; St George's guild at Norwich continued to live on many years.

Wickliffe, in the 14th century, had complained of the abuses among the guilds, including those of trades. In 1389 returns were made into Chancery of the social and other guilds in England; these, though imperfect, give a valuable body of details, and draw the distinction between the two great classes of social and trade guilds. The trade guilds have in all countries attracted more attention than the rest, on account of their wealth and importance; they are of two orders, *guilds merchant* and *craft-guilds*. The guild-merchant arose in this way; the same men who in the growth of towns became citizens by reason of possessing town-land, frequently were also traders; the uncertain state of society in early times naturally caused them to unite for protection of their trade interests in a *gilda mercatoria*, which made internal laws akin to those of other guilds; the success of these private interests enlarged their importance; and when the towns and boroughs obtained confirmation of their municipal life by charter, they took care to have it included that the men of the place should also have their guild-merchant.[2] Thus these guilds obtained the recognition of the state; in their origin they had been as other guilds, partaking especially of the character of peace-guilds, but now "the citizens and the guild became identical, and what was guild-law" often became the law of the town. In great cities, such as London and Florence, we do not hear of merchant guilds (Norton); there the separate occupations or crafts early asserted their associating power and independence, and the craft-guilds gradually took a place in the organization of the town government. Many craft-guilds, the heads of which were concerned in the government of the commune, are found in Italy between the 9th and the 12th centuries (Perrens, *Hist. de Florence*). But in England and the north of Europe the guilds-merchant during this period, having grown rich and tyrannical, excluded the landless men of the handicrafts; these then uniting among themselves, there arose everywhere by the side of the guilds-merchant the craft-guilds, which gained the upper hand on the Continent in the struggle for liberty in the 13th and 14th centuries. In England these companies usually existed side by side with the old town or merchant guild; until at length their increasing importance caused the decay of the old guilds, and the adoption of these crafts as part of the constitution of the towns (13th to 15th century). The separation of the richer and perhaps the older from the poorer of the companies occurred, and thus arose the paramount influence of a few,—as the twelve great Companies of London, the *Arti Majori* of Florence, and others.

The constitution of the trade-guilds was formed on the model of other guilds; they appointed a master or alderman and other officers, made ordinances, including provisions for religious observance, mutual help, and burial; the town ordinances yet remaining of many places, as of Berwick, Southampton, and Worcester, show traces of the trade laws of the old guilds-merchant. As their principal objects, "the craft-gildmen provided for the maintenance of the customs of their craft, framed further ordinances for its regulation, (including care against fraudulent workmanship), saw these ordinances properly executed, and punished the gild brothers who infringed them." "Though the craft-gilds, as voluntary associations, did not need confirmation by the authorities at their birth, yet this confirmation became afterwards of the greatest importance, when these gilds wanted to be recognized as special and independent associations, which were thenceforth to regulate the trade instead of the authorities of the town" (Brentano). Hence obtained the practice of procuring a charter in confirmation and recognition of their laws, in return for which certain taxes were paid to the king or other authority. It is therefore erroneous to state, as is sometimes done, that these companies owe their origin to royal charter, or that they required a licence.

Few important towns in Great Britain have been without a more or less number of craft-guilds. London, York, Exeter, Norwich, Bristol, Coventry, &c., teemed with their life and pageantry. But the Reformation shook these as it destroyed others; the exactions they suffered, and the altered conditions of social economy and labour have contributed to their decay; "all that remains of the ancient gilds in the livery companies of to-day is the common eating and drinking." In the centres of industry of Italy, France, Germany, even in Constantinople, they once formed the strength of commerce, but, abused or decayed, in France they were abolished on 4th August 1789; in Germany their last remnants died in 1869.[1] In Constantinople numerous trade guilds were flourishing up till the war of 1877-78. In Russia there are no true spontaneous guilds: the trade companies were imposed by the imperial orders of Catherine and Peter the Great.

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[1] Probably the numerous societies in France and Flanders of the 13th and 14th centuries, for keeping the poetic and musical foundation of the *Puy de Notre Dame*, belonged to the class of social guilds. One of them was set up in London (Riley's *Liber Custumarum*).

[2] There are numerous examples of this among the borough records of England and Scotland.

See L. Brentano, *On the History and Development of Gilds*, 1870; *English Gilds, their Original Ordinances, &c.*, by Toulmin Smith, 1870; Wilda, *Das Gildenwesen im Mittelalter*, 1831; F. T. Perrens, *Histoire de Florence*, 1877; G. Schmoller, *Geschichte der Tucher- und Weberzunft in Strassburg*, 1879; G. Schanz, *Zur Geschichte der Deutschen Gesellen-Verbände im Mittelalter*, 1877; G. Fagniez, *L'Industrie à Paris au 13me et au 14me siècle*, 1877; Herbert, *The Twelve great Livery Companies of London*, 1836; G. Norton's *Commentaries on the History of London*, 1869; works by the German writers Carl Hegel, Arnold, Maurer, and Gierke; and the article CLUB. (L. T. S.)

GUILDFORD, a municipal and parliamentary borough and market-town of England, capital of the county of Surrey, is beautifully situated on a gentle acclivity of the northern chalk downs and on the river Wye, crossed there by a bridge of five arches, 30 miles S.S.W. of London. It consists chiefly of one long, wide, and well-built street, and contains a number of old picturesque gabled houses, with quaint lattices and curious doorways. The principal buildings are the ruins of an old castle, erected soon after the Norman conquest, and for a long time used as the county jail; the town-hall, erected in 1683, containing a number of interesting pictures; the corn market-house, erected in 1818; the county hall and assize court in the domestic Gothic style, erected in 1862; the Abbots Hospital, founded by Archbishop Abbot for decayed tradesmen and decayed tradesmen's widows; the county hospital, opened in 1866, erected as a memorial to the Prince Consort; the Royal Free Grammar School, founded in 1509; the Institute, formed in 1844, with museum, library, and reading and lecture rooms; the church of St Mary, in the Anglo-Norman style, of very early origin, and restored in 1863; the church of St Nicholas, in the Gothic style, erected on the site of an ancient structure of Saxon origin; and Holy Trinity church, a red brick structure erected 1749-63, with a square embattled tower. Guildford has corn mills, iron foundries, and breweries. There is considerable trade in corn, and fairs are held for cattle, sheep, horses, and pigs. Guildford first returned members to Parliament in the reign of Edward I. Formerly it had two members, but since the Reform Act of 1867 it returns only one. The population of the municipal and parliamentary borough in 1861, when the municipal and parliamentary limits were coextensive, was 8020; in 1871 the population of the municipal borough (area 5543 acres) was 9106, and that of the parliamentary borough (644 acres) 9801.

[illegible]

GUILLEMOT (French, *Guillemot*[2]), the name accepted by nearly all modern authors for a Sea-bird, the *Colymbus troile* of Linnæus and the *Uria troile* of Latham, which nowadays it seems seldom if ever to bear among those who, from their vocation, are most conversant with it, though, according to Willughby and Ray his translator, it was in their time so called "by those of Northumberland and Durham." Around the coasts of Britain it is variously known as the Frowl, Kiddaw or Skiddaw, Lavy (cf. Icelandic, *Langvia*), Lavy, Marrock, Murre, Scout (cf. COOT, vol. vi. p. 341), Scuttock, Strany, Tinker or Tinkershite, and Willock. The number of local names testifies to the abundance of this bird, at least of old time, in different places, but it should be observed that in certain districts some of them are the common property of this species and the Razor-bill. In former days the Guillemot yearly frequented the cliffs on many parts of the British coasts in countless multitudes, and this is still the case in the northern parts of the United Kingdom; but more to the southward nearly all its smaller settlements have been rendered utterly desolate by the wanton and cruel destruction of their tenants during the breeding season, and even the inhabitants of those which were more crowded had become so thinned that, but for the intervention of the Sea Birds Preservation Act (32 and 33 Vict. cap. 17), which provided under penalty for the safety of this and certain other species at the time of year when they were most exposed to danger, they would unquestionably by this time have been exterminated so far as England is concerned. The slaughter, which, before the passing of that Act, took place annually on the cliffs of the Isle of Wight, near Flamborough Head, and at such other stations frequented by this species and its allies the Razor-bill and Puffin, and the Kittiwake Gull, as could be easily reached by excursionists from London and the large manufacturing towns, was in the highest degree brutal. No use whatever could be made of the bodies of the victims, which indeed those who indulged in their massacre were rarely at the trouble to pick out of the water; the birds shot were all engaged in breeding; and most of them had young, which of course starved to death through the destruction of their parents, intercepted in the performance of the most sacred duty of nature, and butchered to gratify the murderous lust of those who sheltered themselves under the name of "sportsmen."

Part of the Guillemot's history is still little understood. We know that it arrives at its wonted breeding stations on its accustomed day in spring, that it remains there till, towards the end of summer, its young are hatched and able, as they soon are, to encounter the perils of a seafaring life, when away go all, parents and progeny. After that time it commonly happens that a few examples are occasionally met with in bays and shallow waters. Tempestuous weather will drive ashore a large number in a state of utter destitution—many of them indeed are not unfrequently washed up dead—but what becomes of the bulk of the birds, not merely the comparatively few thousands that are natives of Britain, but the tens and hundreds of thousands, not to say millions, that are in summer denizens of more northern latitudes, no one can yet say. This mystery is not peculiar to the Guillemot, but is shared by all the *Alcidæ* that inhabit the Atlantic Ocean. Examples stray every season across the Bay of Biscay, are found off the coasts of Spain and Portugal, enter the Mediterranean and reach Italian waters, or, keeping further south, may even reach the Madeiras, Canaries, or Azores; but these bear no proportion whatever to the mighty hosts of which they are merely the "scouts," and whose position and movements they no more reveal than do the vedettes of a well-appointed army. The common Guillemot of both sides of the Atlantic is replaced farther northward by a species with a stouter bill, the *U. arra* or *U. brünnichi* of ornithologists, and on the west coast of North America by the *U. californica*. The habits of all these are essentially the same, and the structural resemblance between all of them and the Auks is so great that of late several systematists have relegated them to the genus *Alca*, confining the genus *Uria* to the Guillemots of another group, of which the type is the *U. grylle*, the Black Guillemot of British authors, the Dovekey or Greenland Dove of sailors, the Tysty of Shetlanders. This bird assumes in summer an entirely black plumage with the exception of a white patch on each wing, while in winter it is beautifully marbled with white and black. Allied to it as species or geographical races are the *U. mandti*, *U. columba*, and *U. carbo*. All these differ from the larger Guillemots by laying two or three eggs, which are generally placed in some secure niche, while the members of the other group lay but a single egg, which is invariably exposed on a bare ledge. (A. N.)

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[1] [illegible] for the revival of craft guilds in Germany at the present time [illegible]

[2] [illegible] name for the bird, as was [illegible]

GUILLOTINE, the instrument for inflicting capital punishment by decapitation, introduced into France at the period of the Revolution. It consists of two upright posts surmounted by a cross beam, and grooved so as to guide an oblique-edged knife, the back of which is heavily weighted to make it fall swiftly and with force when the cord by which it is held aloft is let go. Some ascribe the invention of the machine to the Persians; and previous to the period when it obtained notoriety under its present name it had been in use in Scotland, England, and various parts of the Continent. There is still preserved in the Antiquarian Museum of Edinburgh the rude guillotine called the "maiden" by which the regent Morton was decapitated in 1581. The last persons decapitated by the Scotch "maiden" were the marquis of Argyll in 1661 and his son the earl of Argyll in 1685. It would appear that no similar machine was ever in general use in England; but until 1650 there existed in the forest of Hardwick, which was coextensive with the parish of Halifax, West Riding, Yorkshire, a mode of trial and execution called the gibbet law, by which a felon convicted of theft within the liberty was sentenced to be decapitated by a machine called the Halifax gibbet. A print of it is contained in a small book called *Halifax and its Gibbet Law* (1708), and in Gibson's edition of Camden's *Britannia* (1722). In Germany the machine was in general use during the Middle Ages, under the name of the *Diele*, the *Hobel*, or the *Dolabra*. Two old German engravings, the one by George Penez, who died in 1550, and the other by Heinrich Aldegrever, with the date 1553, represent the death of a son of Titus Manlius by a similar instrument, and its employment for the execution of a Spartan is the subject of the engraving of the eighteenth symbol in the volume entitled *Symbolicæ Quæstiones de Universo Genere*, by Achilles Bocchi (1555). From the 13th century it was used in Italy under the name of *Mannaia*, for the execution of criminals of noble birth. The *Chronique de Jean d'Anton*, first published in 1835, gives minute details of an execution in which it was employed at Genoa in 1507; and it is elaborately described by Pere Labat in his *Voyage en Espagne et en Italie en* 1730. It is mentioned by Puységur in his *Mémoires* as in use in the south of France, and he describes the execution by it of Marshal Montmorency at Toulouse in 1632. For about a century it had, however, fallen into general disuse on the Continent; and Dr Guillotine, who first suggested its use in modern times, is said to have obtained his information regarding it from the description of an execution that took place at Milan in 1702, contained in an anonymous work entitled *Voyage Historique et Politique de Suisse, d'Italie, et d'Allemagne*.

Guillotine, who was born at Saintes, May 28, 1738, and elected to the Constituent Assembly in 1789, brought forward on the 1st December of that year two propositions regarding capital punishment, the second of which was that, "in all cases of capital punishment it shall be of the same kind—that is, decapitation—and it shall be executed by means of a machine." The reasons urged in support of this proposition were that in cases of capital punishment the privilege of execution by decapitation should no longer be confined to the nobles, and that it was desirable to render the process of execution as swift and painless as possible. The debate was brought to a sudden termination in peals of laughter caused by an indiscreet reference of Dr Guillotine to his machine, but his ideas seem gradually to have leavened the minds of the assembly, and after various debates decapitation was adopted as the method of execution in the penal code which became law on the 6th October 1791. At first it was intended that decapitation should be by the sword, but on account of a memorandum by M. Sanson, the executioner, pointing out the expense and certain other inconveniences attending that method, the assembly referred the question to a committee, at whose request Dr Antoine Louis, secretary to the academy of surgeons, prepared a memorandum on the subject. Without mentioning the name of Guillotine, it recommended the adoption of an instrument similar to that which was formerly suggested by him. The assembly decided in favour of the report, and the contract was offered to the person who usually provided the instruments of justice; but, as his terms were considered exorbitant, an agreement was ultimately come to with a German of the name of Schmidt, who, under the direction of M. Louis, furnished a machine for each of the French departments. After satisfactory experiments had been made with the machine on several dead bodies in the hospital of Bicêtre, it was erected on the Place de Grève for the execution of the highwayman Pelletier on the 25th April 1792. While the experiments regarding the machine were being carried on, it received the name *Louisette* or *La Petite Louison*, but the mind of the nation seems soon to have reverted to Guillotine, who first suggested its use; and in the *Journal des Revolutions de Paris* for 28th April 1792, it is mentioned as *la guillotine*, a name which it thenceforth bore both popularly and officially. In 1795 the question was much debated as to whether or not death by the guillotine was instantaneous, and in support of the negative side the case of Charlotte Corday was adduced whose countenance, it is said, blushed as if with indignation when the executioner, holding up the head to the public gaze, struck it with his fist. The connexion of the instrument with the horrors of the Revolution has hindered its introduction into other countries, but in 1853 it was adopted under the name of *Fallschwert* or *Fallbeil* by the kingdom of Saxony, and it has been subsequently introduced into several other German states. It has often been stated that Dr Guillotine perished by the instrument which bears his name, but it is beyond question that he survived the Revolution, and died a natural death in 1814.

See Sédillot, *Réflexions historiques et physiologiques sur le supplice de la guillotine*, 1795; Sue, *Opinion sur le supplice de la guillotine*, 1796; Réveillé-Parise, *Étude biographique sur Guillotin*, Paris, 1851; *Notice historique et physiologique sur le supplice de la guillotine*, Paris, 1830; Louis Dubois, *Recherches historiques et physiologiques sur la guillotine et détails sur Sanson*, Paris, 1843; and a paper by J. W. Croker in the *Quarterly Review* for December 1843, reprinted separately in 1850 under the title *The Guillotine, a historical Essay*.

GUIMARÃES, a fortified city of Portugal, province of Minho, government district of Braga, is beautifully situated on the Ave, 12 miles south-east of Braga. It stands on an acclivity, and with its Moorish towers has a very picturesque appearance. An old castle which was the birthplace of Alphonso, the first king of Portugal, is still in a state of good preservation. Among the four churches may be mentioned the *Colegiata*, founded in 1385, and although modernized still retaining intact its beautiful choir. The principal manufactures are knives and other steel wares, leather, paper, and table linen. In the neighbourhood there are sulphurous springs, with a temperature of 164° Fahr., frequented since the origin of the city in the 4th century. Guimarães was made the chief town of the countship of Portugal in the 11th century by Henry of Burgundy, and retained that honour till 1511, when it was conferred by King Emmanuel on Lisbon. The population is about 10,000.

GUINEA, the general name applied by Europeans to part of the western coast region of intertropical Africa. Like many other geographical designations the use of which is controlled neither by natural nor political boundaries, it has been very differently employed by different writers and at different periods. In the widest acceptation of the term, the Guinea coast may be said to extend from 11° N. lat. to 16° S. lat., or in other words, from the neighbourhood of Cape Verga to Cape Negro. Southern or Lower Guinea comprises the coasts of Loango, Congo, Angola, and Benguela; and Northern or Upper Guinea comprises part of Senegambia, the Sierra Leone district, the Grain Coast, the Ivory Coast, the Gold Coast, the Slave Coast, the Niger Delta, and the Calabar district. The Cameroon mountains may be accepted as the limit of the two divisions, though some writers prefer the river Gambia or the equator. In a narrower and perhaps more common use of the name, Guinea is the coast only from Cape Palmas to the Gaboon. Originally, on the other hand, Guinea was supposed to commence as far north as Cape Nun opposite the Canary Islands; and Azurara is said to be the first authority who brings the boundary south to the Senegal. The name is derived from Ginnie, Genna, or Jinnie, a town and kingdom in the Niger district; and, though it appears on a map as early as 1351, it did not come into general use till the close of the 15th century. Few questions in historical geography have been more keenly discussed than that of the first discovery of Guinea by the navigators of modern Europe. It appears from the testimony of Jacopo Doria that two Genoese, Ugolino and Guido de Vivaldi, were sailing south along the African coast in 1291, but there is almost no further record of their voyage. The French claim that in the latter part of the 14th century the people of Dieppe sent out several expeditions to Guinea; and Jean de Bethencourt, who settled in the Canaries about 1402, made explorations towards the south. At length, in the latter half of the 15th century, the consecutive efforts of the navigators employed by Prince Henry of Portugal, Cadamosto, Usodimare, and Diego Gomes, made the whole region familiar to Europeans.

See Azurara, *Chronica do Descobrimento e Conquista de Guiné*, [illegible] [illegible], Paris, 1841; [illegible] Bernard, *Relation des* [illegible], Paris, 1876; Desmarquets, *Mémoires chronologiques pour servir à l'histoire de Dieppe*, 1785; Major, *Life of Prince Henry the Navigator*, London, 1868; and the criticism of Major's work by M. Codine in the *Bulletin de la Soc. de Géogr.*, 1873.

GUINEA FOWL, a well-known domestic gallinaceous bird, so called from the country whence in modern times it was brought to Europe, the *Meleagris* and *Afra* or *Gallina Numidica* of ancient authors.[1] Little is positively known of the wild stock to which we owe our tame birds, nor can the period of its reintroduction (for there is apparently no evidence of its domestication being continuous from the time of the Romans) be assigned more than roughly to that of the African discoveries of the Portuguese. It does not seem to have been commonly known till the middle of the 16th century, when Caius sent a description and figure, with the name of *Gallus Mauritanus*, to Gesner, who published both in his *Paralipomena* in 1555, and in the same year Belon also gave a notice and woodcut under the name of *Poulle de la Guinée*; but while the former authors properly referred their bird to the ancient *Meleagris*, the latter confounded the *Meleagris* and the Turkey.

The ordinary Guinea Fowl of our poultry-yards is the *Numida meleagris* of ornithologists, and is too common a bird to need description. The chief or only changes which domestication seems to have induced in its appearance are a tendency to albinism generally shown in the plumage of its lower parts, and frequently, though not always, the conversion of the colour of its legs and feet from dark greyish-brown to bright orange. That the home of this species is West Africa from the Gambia[2] to the Gaboon is certain, but its range in the interior is quite unknown. It appears to have been imported early into the Cape Verd Islands, where, as also in some of the Greater Antilles and in Ascension, it has run wild. Representing the species in South Africa we have the *N. coronata*, which is very numerous from the Cape Colony to Ovampoland, and the *N. cornuta* of Drs Finsch and Hartlaub, which replaces it in the west as far as the Zambesi. Madagascar also has its peculiar species, distinguishable by its red crown, the *N. mitrata* of Pallas, a name which has often been misapplied to the last. This bird has been introduced to Rodriguez, where it is now found wild. Abyssinia is inhabited by another species, the *N. ptilorhyncha*,[3] which differs from all the foregoing by the absence of any red colouring about the head. Very different from all of them, and the finest species known, is the *N. vulturina* of Zanzibar, conspicuous by the bright blue in its plumage, the hackles that adorn the lower part of its neck, and its long tail. By some writers it is thought to form a separate genus, *Acryllium*. All these Guinea Fowls are characterized by having the crown bare of feathers and elevated into a bony "helmet," but there is another group (to which the name *Guttera* has been given) in which a thick tuft of feathers ornaments the top of the head. This contains four or five species, all inhabiting some part or other of Africa, the best known being the *N. cristata* from Sierra Leone and other places on the western coast. This bird, apparently mentioned by Marcgrave more than 200 years ago, but first described by Pallas, is remarkable for the structure—unique, if not possessed by its representative forms—of its *furcula*, where the head, instead of being the thin plate found in all other *Gallinæ*, is a hollow cup opening upwards, into which the trachea dips, and then emerges on its way to the lungs. Allied to the genus *Numida*, but readily distinguished therefrom among other characters by the possession of spurs, are two very rare forms, *Agelastes* and *Phasidus*, both from Western Africa. Of their habits nothing is known. All these birds are beautifully figured in Mr Elliot's *Monograph of the Phasianidæ*, from drawings by Mr Wolf. (A. N.)

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[1] Columella (*De Re Rustica*, viii. cap. 2) [illegible] the *Meleagris* [illegible] *Gallina Africana* or *Numidica* [illegible], says, a red wattle (*palea*) [illegible] preference to [illegible], while it was blue in the former. This would look as if the *Meleagris* [illegible] what is now called *Numida ptilorhyncha*, and the *Gallina Africana* identical with the *N. meleagris*,—the two which, as said in the text, have a different range, and if so the fact would point to two distinct introductions—one by Greeks, the other by Latins.

[2] Specimens from the Gambia are said to be smaller, and have been [illegible] under the name of *N. rendallii*.

[3] Mr [illegible] (*Ibis*, [illegible] under [illegible], i. p. 294), [illegible] stock of our modern domestic birds, but hence [illegible] has been [illegible]. At any rate, it may possibly have been the true *Meleagris* of the Greeks.

GUINEA-PIG. See Cavy.

GUINGAMP, a town of France, capital of an arrondissement in the department of Côtes-du-Nord, is situated in a pretty and rich valley on the right bank of the Trieux, 20 miles W.N.W. of St Brieuc. It was formerly surrounded by walls, portions of which still exist. It has a library, a museum, a prison, and a hospital dating from the 17th century, enlarged in 1830, and having within its grounds an old oak of immense size. There are also several old buildings of interest, including the beautiful church of *Notre Dame du Bon Secours*, portions of which date from the 13th, 14th, 15th, and 16th centuries respectively, and which has been lately restored; four pillars of the tower of the chapel of Saint Leonard, dating from the 11th century; and the Ursuline convent, dating from the 17th century, now used as a cavalry depot. The beautiful fountain in the Place de Plomb, constructed by Italian artists in the 15th century, was replaced in 1743 by the present structure. The town has manufactures of ginghams (to which it gives the name), linen fabrics, thread, leather, and hats; and there is some trade in wine, brandy, cattle, and agricultural produce. Guingamp originally belonged to the dukes of Penthièvre, and was inherited from them by King Louis Philippe. The population in 1876 was 7895.

GUIPUZCOA, the smallest and most densely peopled of the three Basque provinces of Spain, is bounded on the N. by the Bay of Biscay, on the W. by the province of Biscay, on the S. and S.E. by Alava and Navarre, and on the N.E. by the Bidasoa, which separates it from France. Its area is nearly 728 square miles, and in 1870 its estimated population was 180,743. Situated on the northern slope of the great Cantabrian chain the province has a great variety of surface in mountain, hill, and valley; and the scenery accordingly is highly picturesque and romantic. The coast is much indented, and has numerous harbours, but none of very great importance; the chief are those of San Sebastian, Los Pasajes, Guetaria, Deva, and Fuenterrabia. The rivers (Deva, Urola, Oria, Urumea, Bidasoa) are all short, rapid, and unnavigable. The mountains are for the most part covered with forests of oak, chestnut, or pine; holly and arbutus are also common, with furze and heath in the poorer parts. The soil in the lower valleys is generally of hard clay and unfertile; it is cultivated with great care, but the grain raised falls considerably short of what is required for home consumption. The climate though moist, is mild, pleasant, and healthy; fruit is produced in considerable quantities, especially apples for manufacture into "zaragua" or cider. The chief wealth of the province arises from its mineral stores (iron, argentiferous lead, copper) and from its excellent fisheries, which supply the neighbouring provinces (cod, tunny, sardines, oysters). The iron, which is of excellent quality, is smelted with wood. There are also considerable manufactures of woollen and cotton fabrics, paper, and lucifer matches. The people are remarkable for their fine physique, and bold manly spirit, united with honesty, industry, energy, and enterprise. The capital of the province is San Sebastian, with a population of 17,902 in 1876. All the other towns are small, Tolosa alone having a population at all exceeding 5000; Fuenterrabia no longer retains its former importance; Mondragon is entirely dependent on the rich iron mines in its vicinity, and Salinas, on the Deva, on its salt works. A small island in the Bidasoa, called La Isla de los Faisanes, or l'Ile de la Conférence, is celebrated as the place where the marriage of the duke of Guienne was arranged between Louis XI. and Henry IV. in 1463, where Francis I. the prisoner of Charles V. was exchanged for his two sons in 1526, and where in 1659 "the peace of the Pyrenees" was concluded between D. Luis de Haro and Cardinal Mazarin.

The early history of Guipuzcoa, as of the other Basque provinces, is still the subject of much learned research. Never wholly subdued by the Romans, the Celtiberi in their mountain fastnesses continued to preserve their independence after the fall of the Western Empire until the times of the West Gothic kings Leovigild (580) and Wamba (672-680). Nominally subject to Charlemagne at a later period, they were prompt to avail themselves of the first opportunity to assert their full independence; their alliance with the Moors, and its results at Roncesvalles are prominent facts in mediæval history. About the 11th century the inhabitants of the Basque districts emerge as organized into a somewhat free confederation of detached republics, owning allegiance to a señor or lord, but under definite constitutional guarantees (fueros). In 1202 Guipuzcoa accepted as its lord Alphonso VIII. of Castile, and for many centuries it ranked as a distinct "señorio" attached to the Spanish crown. The last of its distinctive fueros was abolished in July 1876.

GUISBOROUGH, or Gisborough, a market-town of England, North Riding of Yorkshire, is situated in a narrow but fertile valley at the foot of the Cleveland Hills, 4 miles from the mouth of the Tees and 10 miles E.S.E. of Middlesborough. It consists chiefly of one wide and handsome street, having many good houses. The principal buildings are the parish church, which though partly rebuilt in 1791 and thoroughly renovated in 1875, has some remains of an ancient structure; the free grammar school, founded in 1561; the town-hall, recently much improved and enlarged; the mechanics' institute, the hospital for old men and women, and the hospital for accidents erected lately by Admiral Chaloner. The ruins of the Austin priory, founded in 1129, are beautifully situated near the eastern extremity of the town. The accumulation of rubbish has been recently removed from its foundations and floors, and a large number of interesting relics discovered. Among the historic personages who were buried within its walls was Robert the Bruce, lord of Annandale, the competitor for the throne of Scotland with John Baliol, and the grandfather of King Robert Bruce. The town within late years has been rapidly increasing, on account of the iron mines in its neighbourhood; and it has also tanneries and breweries. Alum works were established in the reign of Queen Elizabeth by Sir Thomas Chaloner, who introduced the manufacture of alum into England from Italy; but they have been long discontinued. About a mile south-east of the town there is a sulphurous spring discovered in 1822, efficacious in cutaneous, rheumatic, and bilious complaints. The population of the town in 1871 was 5202, and in 1879 about 6500.

GUISCARD. See Robert Guiscard.

GUISE, a fortified town of France, department of the Aisne, arrondissement of Vervins, is situated on the left bank of the Oise, 13 miles N.W. of Vervins. It was formerly the chief town of the Thiérache, a district in the extreme north of France, bordering on Hainault. It has an old castle dating from the 16th century, and a palatial *familistère* with accommodation for 400 families. The principal industries are woollen and cotton weaving, iron and copper founding, tanning, and the manufacture of chicory and sugar. The population in 1876 was 6242.

GUISE, House of. The House of Guise, which in the 16th century suddenly rose to an eminence unrivalled in Europe, takes title from the place noticed above. The countship of Guise, a fief under the French crown, was carried in 1333 by its holder, Marie of Blois, as her dower to Rodolf, duke of Lorraine. In 1508 René II., the conqueror of Charles the Bold, divided his territories between his sons Antony, who became duke of Lorraine, and received the Germanic part, and Claude, who had the French fief, including Guise.

Claude of Lorraine thus became founder of a great and well-marked family, which occupied the place that had in the fifteenth century been held by the princes of the lilies. Generation after generation we have a duke and a cardinal side by side: they illustrate with singular fidelity the movements of the period from its Catholic side: the first duke and cardinal belonged to the Renaissance; the second pair threw themselves into the Catholic reaction, and led the resistance to the Reformation in France; the third pair showed the decay of the religious movement, and its transit into political activities, being among the most ambitious statesmen of the later years of the century; while the fourth and last pair feel the breath of Richelieu's absolutism. The family has throughout characteristic qualities,—bravery, ambition, a certain nobleness of sentiment, an imposing presence, and winning manners; they stand between nobility and royalty,—always greater than the one, sometimes even overtopping the other. They seem never to forget that in their veins runs the blood of those who wore or claimed the crowns of Jerusalem and Naples, of Sicily and Hungary. Claude of Lorraine, born in 1496, succeeded in 1508 to a group of lordships, which by their names testify to the high fortunes of the house: besides Guise itself, he had Elbeuf, Aumale, Mayenne, Joinville, Harcourt, Longjumeau, Boves, Sablé, Lambesc, and others. In addition to these, the family gathered to itself relations with Eu, Sully, Ventadour, Aiguillon, Mercœur, Joyeuse, and Nevers; a cardinal's hat, together with a group of splendid church dignities, also went with the house of Guise; the archbishopric of Rheims, the bishopric of Metz, and several other bishoprics were family benefices, which enabled younger members to take an important share in the fortunes of the family. The shield of Claude expresses the pride of the race: we find there not only the Lorraine spread-eagle, the German bird, but also the quarterings of eight sovereign houses, those of the kings of Hungary, Naples, Jerusalem, and Aragon, and of the sovereign lords of Anjou, Guelderland, Flanders, and Bar. This young prince, who claimed so much, and did so much, who both exercised his rights as a foreign prince and took precedence of the proudest in France, attached himself closely to Francis I. He was the most brilliant among the "young men" who displaced the older wisdom of the court of Louis XII. In 1513 he married Antoinette of Bourbon, the duke of Vendôme's daughter and great-aunt of Henry IV.; in 1515 he accompanied Francis to Italy, and showed the mettle of his race at Marignano, where his brother Ferry was killed. From that time he sagaciously avoided the Italian expeditions, and stayed in France, winning popularity as protector of the realm. Thus in 1521 he was on the Spanish frontier, and helped to take Fuenterrabia; in 1522 he opposed the English in the north, covering Paris; next, he defended Champagne from the Germans, clearing that rich district with equal glory and gain. In 1525 he avoided the expedition which ended in the disaster of Pavia, where yet another of his brothers, Francis, was slain; and during the captivity of Francis I. at Madrid, he became virtual head of the regency under the queen, Louise of Savoy. In those dark days he crushed the rising of the peasants of Lorraine and Swabia, which threatened all the east of France. After the king's return, Claude was made in 1527, duke of Guise, and peer, and governor of Champagne; fresh territory and wealth were added to these honours. He had now reached his highest point; henceforth it is clear that Francis I. regarded him with [illegible]; [illegible] his ambitious views as to the crown of the "good king René," and hopes of a revived Angevin dynasty, offended the French king, though they were only dreams on his part; for the new spirit of [illegible] in the 16th century [illegible] [illegible] [illegible] [illegible] In an age in which wealth was becoming the most effective of all means of power, he gathered riches in all ways, fair or foul; and though willing to spend for his own advancement, he won and deserved the character of a grasping and greedy prince. His brother John, first cardinal of Lorraine, seconded him in every way; he was as greedy as the duke, though much more open-handed. Accepting the new ideas of the time, he became a splendid Renaissance prelate, the friend of Erasmus and Rabelais, and even of Marot, while, at the same time, he only too faithfully reflected the worst vices of the movement. His church preferment was enormous; he shamelessly took all he could get. He and his brother have the distinction of giving a bad name to a whole country; for, thanks to their rapacity, the Lorrainers got that reputation for avarice and greediness which has unjustly clung to them even to our days. After 1527 the cleverness of the cardinal rather than the prudence of the duke advanced the family. Claude had twelve children, a splendid group of princely youths, who inherited the handsome features and figure of their father, with even greater abilities and a more effective ambition. Francis, the eldest of those who grew up, was born in 1519, and became the second duke; Charles, born in 1524, was the second cardinal of Lorraine, a man as intelligent and depraved as his uncle, and more vigorous and ambitious; Claude, the next, was created duke of Aumale; Louis, archbishop of Sens and cardinal of Guise; René, marquis of Elbeuf. The daughters made brilliant matches: above all, the eldest, Marie, widow of the duke of Longueville, was married in 1538 to James V. of Scotland, and had a stormy career as regent to her daughter, Mary Stuart, queen of Scots.

In his later days Claude of Guise withdrew somewhat from public life; he stood aloof from the intrigues of the reign, while the cardinal attached himself to the "black court," the court of Diana of Poitiers, and promoted the interests of his nephews without stint. From this time all leanings towards either Renaissance or reform were at an end: henceforth the Guises became the heads of the opposition to the Huguenots, the strength and support of the new Jesuit movement, and, later, the leaders of the League. Claude of Guise died in 1550, leaving his dignities to his son Francis, "le grand Guise," who had already won great credit for bravery, and had shown that dashing contempt for all rules of military prudence which gives a captain undying popularity. The ghastly wound in the face, which his rashness won for him in 1545 at the hands of the English near Boulogne, got him the name of the first "Balafré;" it was the outward symbol of his devotion to his country, and greatly raised his repute among the people. He had too the essential qualities of popularity, a majestic presence, and friendly manners in camp; he was chivalrous, liberal, humane, discerning. In 1552, as lieutenant general in the three bishoprics, he withstood at the siege of Metz the last efforts of Charles V., and saved France from a terrible invasion. Thanks to the jealousy of the Montmorencies, he was sent in 1557 to conquer Naples, and would have added another to the long roll of reputations ruined by Italy, had he not been suddenly recalled to protect his country after the disaster of St Quentin. With happy boldness, instead of watching the victorious allies, he suddenly attacked and took Calais, ending the English occupation of French soil, and raising his own renown to the highest point. Then, with his brother Charles, second cardinal of Lorraine, he wielded unlimited power throughout the reign of Francis II. Under Charles IX. his influence declined, and he withdrew into Alsace. On his return thence in 1562, he was, however unwittingly, for he was not responsible, the cause of the massacre at Vassy, which began the civil wars. In the first war he won the battle of Dreux (1562), and three [illegible] afterward besieged the Huguenots in Orleans. There, early in 1563, he was assassinated. If he was the noblest of the Guises, his brother the cardinal was the ablest. In his earlier days the cardinal had shown some sympathy with the Reformers; in later life he vigorously repressed them, and took a leading part in the council of Trent, where he is said to have sketched the first lines of the famous League. Like all early friends of the Jesuits, he did his best for education, and patronized men of letters, while he exercised independence of thought and aimed at introducing the Inquisition. He died in 1574. His younger brother Charles, cardinal of Guise, "le cardinal des bouteilles," was a grand pluralist, an easy-going personage, whose quiet life was in striking contrast to the feverish energy of his brothers. René, marquis of Elbeuf, another brother, is the stem of the great houses of Elbeuf, Harcourt, and Lislebonne.

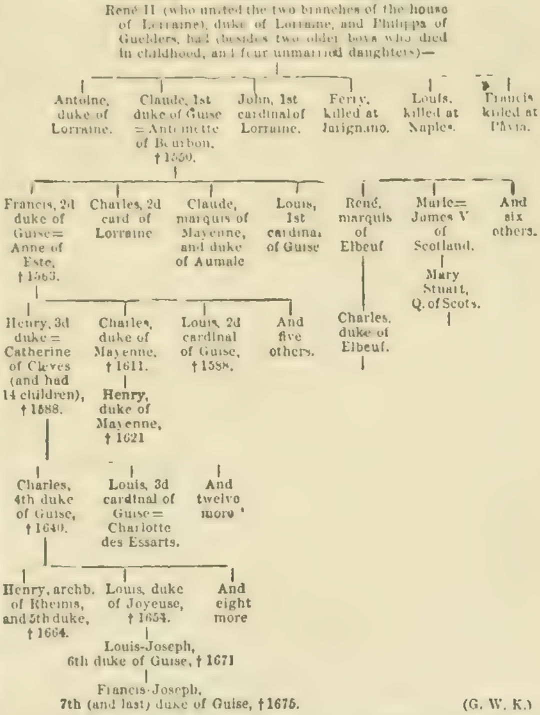
Henry of Guise, eldest son of Duke Francis, born in 1550, was with his father at Orleans, and saw his death. The boy therefore began his public life with an inextinguishable hatred against Huguenots, eager to distinguish himself in civil war. With his brother Louis, second cardinal of Guise, he entered into all the intrigues of the succession question, and bitterly opposed Henry of Navarre. He was at Jarnac, and, in the victory of Dormans (1575) over the German invaders, he too won the title of "le Balafré." He soon became the idol of Paris: manly, handsome, and decided, he won all hearts, and was at once a popular hero. Fortune too favoured him by bringing him into contrast with the wretched Henry III., and with his portly cautious brother the duke of Mayenne. In 1576 he was recognized as head of the League, supported by Philip II. and the papacy. Ambitious of the crown of France, he worked subtly for it behind the screen of old Cardinal Bourbon's name. In the war of the three Henries (Henry III., Henry of Navarre, Henry of Guise) he again drove the Germans out of France; and, when invited to the capital by the "Sixteen," ruled there unopposed, the "King of Paris." Henry III., whom he had compelled to sign the Edict of Union, found his supremacy intolerable; and just before Christmas (1588), the duke and the cardinal his brother were assassinated by the royal orders.

His eldest son Charles, born in 1571, was arrested at the time of the double murder, but escaped in 1591, and was welcomed with enthusiasm by the Paris mob, which hoped he would wed the infanta of Spain, and with the help of Philip II. secure for himself the throne of France. But the opposition of his uncle Mayenne proved fatal to the scheme. At the end of the struggle, both he and Mayenne submitted to Henry IV., helped him to reduce the nobles in Languedoc, and received the government of Provence. In Richelieu's days he sided with the queen mother, and was compelled to withdraw in 1631 to Italy, where he died in 1640. By his side also was a cardinal brother, the third of Guise, who ended by abandoning the ecclesiastical state, and marrying one of the mistresses of Henry IV.

Henry, fourth son of Charles, born in 1614, had already succeeded to that family benefice, the archbishopric of Rheims, when the death of his elder brother made him head of the family, and in 1640 fifth duke. He too went against the absolutism of the age, and joined the count of Soissons. Condemned to lose his head he fled to Brussels, and took command of the Austrian troops against France,—noble traitors to their country being then not uncommon. In 1643, however, after Richelieu's death, he returned to France; but being chosen their chief by the Neapolitans, at the time of Masaniello's revolt, and dazzled by this opening for his ambition, he betook himself to Naples. There his failure was complete; he was defeated and carried prisoner to Madrid. Delivered thence by the intercession of the Great Condé, he again attempted Naples, and failed again. After this he spent the rest of his romantic ill-ordered life at the French court, and died in 1664 leaving no issue; his sisters never married, and of all his brothers, one only, Louis, duke of Joyeuse, left a son, born in 1650, who became sixth duke of Guise. He died of small-pox in 1671, leaving an infant son, Francis Joseph, seventh duke, a sickly babe, with whom, four years later, the direct line of the house of Guise expired. The other branches had early died out, saving the family of the seventh son of Claude first duke, René, marquis of Elbeuf; the marquis of Lambese, who died in 1826, was the last descendant of this branch, and with him the family finally became extinct.

The authorities for the house of Guise are René de Bouillé, *Histoire des Ducs de Guise*, 4 vols., 1853, the most complete account of the family; Valincour, *Vie de François de Lorraine, Duc de Guise*, 1664; Guillemin, *Histoire du Cardinal de Lorraine*; the *Biographie Universelle*, art. "Guise;" and Forneron's *Ducs de Guise et leur époque*, 2 vols.

Genealogical Table of the House of Guise.


René II (who united the two branches of the house of Lorraine), duke of Lorraine, and Philippa of Guelders, had (besides two older boys who died in childhood, and four unmarried daughters)—
Antoine, duke of Lorraine.
Claude, 1st duke of Guise = Antoinette of Bourbon. † 1550.
John, 1st cardinal of Lorraine.
Ferry, killed at Marignano.
Louis, killed at Naples.
Francis killed at Pavia.
Francis, 2d duke of Guise = Anne of Este, † 1563.
Charles, 2d card. of Lorraine
Claude, marquis of Mayenne, and duke of Aumale
Louis, 1st cardinal of Guise
René, marquis of Elbeuf
Marie = James V of Scotland.
And six others.
Mary Stuart, Q. of Scots.
Charles, duke of Elbeuf.
Henry, 3d duke = Catherine of Cleves (and had 14 children), † 1588.
Charles, duke of Mayenne, † 1611.
Louis, 2d cardinal of Guise, † 1588.
And five others.
Henry, duke of Mayenne, † 1621
Charles, 4th duke of Guise, † 1640.
Louis, 3d cardinal of Guise = Charlotte des Essarts.
And twelve more
Henry, archb. of Rheims, and 5th duke, † 1664.
Louis, duke of Joyeuse, † 1654.
And eight more
Louis-Joseph, 6th duke of Guise, † 1671
Francis-Joseph, 7th (and last) duke of Guise, † 1675.

(G. W. K.)

GUITAR, a stringed instrument of Eastern origin. The name no doubt is derived from the Greek κιθάρα, but the instrument itself we owe to the Arabs, who introduced it into Spain. In the 16th century it became known in Italy and France, and about 1790 a German instrument-maker of the name of Cetto greatly increased its power by adding a sixth string to the five formerly in use. The genuine Spanish guitar was introduced into England after the Peninsular War by Ferdinand Sor, a Spaniard who was both a composer for and a player on the instrument. About the same time the guitar was very much in fashion on the Continent, and even Paganini cultivated it. But this circumstance was due to the romantic associations rather than to the intrinsic merits of the instrument, and accordingly it soon relapsed into comparative oblivion. It is, however, occasionally employed in the orchestra and for the accompaniment of simple vocal pieces, and for these purposes it has no doubt its merits. The guitar is a flat-backed instrument, the sides of which turn inwards. The sound-board, pierced by a round sound-hole, is generally made of pine, maple or cherry-wood being used for the sides and the back. The modern guitar, as already stated, has six strings, while the original *El Aud* of the Arabs had only four, subsequently increased to five. They are tuned to the notes E, A, D, G, B natural, and E. In the more remote keys transposition by means of a *capo tasto*, or *nut*, is effected. In this manner a basis of flat instead of natural keys may be substituted without any change of fingering. In the East, especially in Arabia, India, China, and Japan, many varieties of the guitar and its congeners are in use, the number of strings varying from two to five. For the technique of the guitar Madame Sidney Pratten's treatise, *Learning the Guitar simplified*, may be consulted.

GUIZOT, François Pierre Guillaume (1787–1874), historian, orator, and statesman, was born at Nimes on the 4th October 1787, of an honourable Protestant family belonging to the *bourgeoisie* of that city. It is characteristic of the cruel disabilities which still weighed upon the Protestants of France before the Revolution, that his parents, at the time of their union, could not be publicly or legally married by their own pastors, and that the ceremony was clandestine. The liberal opinions of his family did not, however, save it from the sanguinary intolerance of the Reign of Terror, and on the 8th April 1794 his father perished at Nîmes upon the scaffold. Thenceforth the education of the future minister devolved entirely upon his mother, a woman of slight appearance and of homely manners, but endowed with great strength of character and clearness of judgment. Madame Guizot was a living type of the French Huguenots of the 16th century, stern in her principles and her faith, immovable in her convictions and her sense of duty. She formed the character of her illustrious son and shared every vicissitude of his life. In the days of his power her simple figure, always clad in deep mourning for her martyred husband, was not absent from the splendid circle of his political friends. In the days of his exile in 1848 she followed him to London, and there at a very advanced age closed her life and was buried at Kensal Green. Driven from Nimes by the Revolution, Madame Guizot and her son repaired to Geneva, where he received his education. In spite of her decided Calvinistic opinions, the theories of Rousseau, then much in fashion, were not without their influence on Madame Guizot. She was a strong liberal, and she even adopted the notion inculcated in the *Emile* that every man ought to learn a manual trade or craft. Young Guizot was taught to be a carpenter, and he so far succeeded in his work that he made a table with his own hands, which is still preserved at Val Richer by his children. Of the progress of his graver studies little is known, for in the work which he entitled *Memoirs of my own Times* Guizot omitted all personal details of his earlier life. But his literary attainments must have been precocious and considerable, for when he arrived in Paris in 1805 to pursue his studies in the faculty of laws, he entered at eighteen as tutor into the family of M. Stapfer, formerly Swiss minister in France, and he soon began to write in a journal edited by M. Suard, the *Publiciste*. This connexion introduced him to the literary society of Paris. In October 1809, being then twenty-two, he wrote a review of M. de Chateaubriand's *Martyrs*, which procured for him the approbation and cordial thanks of that eminent person, and he continued to contribute largely to the periodical press. At Suard's he had made the acquaintance of Mademoiselle de Meulan, an accomplished lady of good family, some fourteen years older than himself, who also was engaged to contribute a series of articles to Suard's journal. These contributions were interrupted by her illness, but immediately resumed and continued by an unknown hand. It was discovered that François Guizot had quietly supplied the deficiency on her behalf. The acquaintance thus begun ripened into friendship and love, and in 1812 Mademoiselle de Meulan consented to marry her youthful ally. She was the mother of his eldest son, a young man of great promise, who died of consumption in 1837. Madame Guizot, his first wife, died in 1827; she was the authoress of many esteemed works on female education.

During this period of his life Guizot, entirely devoted to literary pursuits, published a collection of French synonyms (1809), an essay on the fine arts (1811), and a translation of Gibbon with additional notes in 1812. These works recommended him to the notice of M. de Fontanes, then grand-master of the university of France, and there was some question of attaching him in a subordinate office to the council of state. But on political subjects a radical antagonism existed between the young constitutional publicist and the spirit of the empire. This did not prevent M. de Fontanes from selecting Guizot for the chair of modern history in Paris in 1812. His first lecture (which is reprinted in his *Mémoires*) was delivered on the 11th December of that year. The customary compliment to the all-powerful emperor he declined to insert in it, in spite of the hints given him by his patron. He had now acquired a considerable position in the society of Paris, and the friendship of Royer-Collard and the leading members of the liberal party, including the young Duc de Broglie. Absent from Paris at the moment of the fall of Napoleon in 1814, he was at once selected, on the recommendation of Royer-Collard, to serve the Government of Louis XVIII. in the capacity of secretary-general of the ministry of the interior, under the Abbé de Montesquiou. Upon the return of Napoleon from Elba he immediately resigned, on the 25th March 1815 (the statement that he retained office under General Carnot is incorrect), and returned to his literary pursuits. The liberal professions of the emperor during the Hundred Days, though backed by Benjamin Constant, did not for a moment impose on Guizot. He was convinced that Napoleon would never govern on liberal principles, and that his power could not last. He was equally convinced that a second restoration of the Bourbons was the only mode by which constitutional monarchy could be established in France. He therefore applied himself to promote that object, and repaired to Ghent, where he saw Louis XVIII., and in the name of the liberal party pointed out to his majesty that a frank adoption of a liberal policy could alone secure the duration of the restored monarchy—advice which was ill-received by M. de Blacas and the king's confidential advisers. This visit to Ghent, at the time when France was a prey to a second invasion, was made a subject of bitter reproach to Guizot in after life by his political opponents, as an unpatriotic action. "The Man of Ghent" was one of the terms of insult frequently hurled against him in the days of his power. But the reproach appears to be wholly unfounded. The true interests of France were not in the defence of the falling empire, but in establishing a liberal policy on a monarchical basis and in combating the reactionary tendencies of the ultra-royalists. It is at any rate a remarkable circumstance that a young professor of twenty-seven, with none of the advantages of birth or political experience, should have been selected to convey so important a message to the ears of the king of France, and a proof, if any were wanting, that the Revolution had, as Guizot said, "done its work."

On the second restoration Guizot resumed office as secretary-general of the ministry of justice under M. de Marbois, but this minister resigned in 1816, and the young statesman was promoted to the council of state and to the general directorship of the departmental and communal administration of the kingdom. But the reactionary spirit of the chamber of deputies, of the royalist party, and of the successive Governments of Louis XVIII., was extremely opposed to the views of Guizot and his friends. Then it was that they endeavoured by their writings and by their speeches to apply broader principles of parliamentary government to France, and to found the party which was known by the title of the "Doctrinaires." The opinions of the doctrinaires had more of the rigour of a sect than the elasticity of a political party. Adhering to the great principles of liberty and toleration, they were sternly opposed to the anarchical traditions of the Revolution. They knew that the elements of anarchy were still fermenting in the country; these they hoped to subdue, not by reactionary measures, but by the firm application of the power of a limited constitution, based on the suffrages of the middle class and defended by the highest literary talent of the times. Their motives were honourable. Their views were philosophical. But they were opposed alike to the democratical spirit of the age, to the military traditions of the empire, and to the bigotry and absolutism of the court. The fate of such a party might be foreseen. They lived by a policy of resistance; they perished by another revolution. They are remembered more for their constant opposition to popular demands than by the services they undoubtedly rendered to the cause of temperate freedom.

In the eyes of this celebrated party, and in the sanguine spirit of the times, the French Revolution had run its course. It had exhausted the popular excesses of the convention and the military despotism of the empire. The victory of the Revolution over the arbitrary powers of the crown and the unjust privileges of the aristocracy was complete. Power was transferred to the middle classes of society, and their leaders hoped to establish on the basis of a limited suffrage all the essential rights and liberties of a free people. They hoped at the same time, by the diffusion of education amongst the people, to qualify them more and more for the exercise of these rights. They combated the reactionary and intolerant influence of the church. They opposed the high prerogative doctrines of the ministers of the crown. Their policy was described by the term "juste milieu"—a *via media* between royal authority and popular government. In those days none foresaw that they were building on the sand, and that before another generation had passed away, their scientific structure of government would crumble into ruins, and France would again traverse the dreary cycle of popular revolutions and imperial despotism. In 1821, when the reaction was at its height after the murder of the Duc de Berri, and the fall of the ministry of Duc Decazes, Guizot's relations to the Government of M. de Villèle became decidedly hostile. He was deprived of all his offices, and in 1825 even his course of lectures was interdicted. During the five succeeding years he played an important part among the leaders of the liberal opposition to the Government of Charles X., although he had not yet entered parliament, and this was also the time of his greatest literary activity. Within this period he published his lectures on representative government; a work on capital punishment for political offences; a collection of memoirs of the history of England in 26 volumes, and of memoirs of the history of France in 31 volumes; and a revised translation of Shakespeare. The most remarkable work from his own pen was the first part of his *History of the English Revolution from the Accession of Charles I. to that of Charles II.*,—a book of great merit and impartiality, which he resumed and completed during his exile in England after 1848. The Martignac administration restored Guizot in 1828 to his professor's chair and to the council of state. Then it was that he delivered the celebrated courses of lectures which raised his reputation as an historian to the highest point of fame, and placed him amongst the best writers of France and of Europe. These lectures formed the basis of his general *History of Civilization in Europe*, and of his *History of Civilization in France*. Our space does not allow us to offer any remark on these well-known publications. But they must ever be regarded as classics of modern historical research, and precursors of the great advance in the treatment of modern history which has marked the last half century.

Hitherto Guizot's fame rested on his merits as a writer on public affairs and as a lecturer on modern history. He had attained the age of forty-three before he entered upon the full display of his oratorical strength. In January 1830 he was elected for the first time by the town of Lisieux to the chamber of deputies, and he retained that seat during the whole of his political life, that is, for eighteen years. The moment was critical for a representative of liberal principles and an aspirant for power. The Polignac ministry had engaged in a mortal contest between Charles X. and the national legislature, and the election of a popular man of letters by an important constituency was hailed as a triumph of the liberal cause.

Guizot immediately assumed an important position in the representative assembly, and the first speech he delivered was in defence of the celebrated address of the 221, in answer to the menacing speech from the throne, which was followed by the dissolution of the chamber, and was the precursor of another revolution. On his returning to Paris from Nîmes on the 27th July, the fall of Charles X. was already imminent. Guizot was called upon by his friends Casimir Périer, Laffitte, Villemain, and Dupin to draw up the protest of the liberal deputies against the royal ordinances of July, whilst he applied himself with them to control the revolutionary character of the late contest. Personally, Guizot was always of opinion that it was a great misfortune for the cause of parliamentary government in France that the infatuation and ineptitude of Charles X. and Prince Polignac rendered a change in the hereditary line of succession inevitable. The chamber of deputies assumed the powers of a convention, and placed the duke of Orleans on the throne. A ministry was formed under M. Laffitte, and although it comprised the great names of Count Molé, Marshal Gérard, Casimir Périer, and the Duc de Broglie, the department of the interior, then the most difficult and important in the state, was allotted to Guizot. Nor was his an inactive administration. The waves of the great tempest which had just passed over France were to be stilled, the lives of the fallen ministers to be saved, stability to be given to the throne, confidence in the maintenance of peace to Europe; and, although the Laffitte cabinet was of short duration, these objects were attained. In 1831 Casimir Périer formed a more vigorous and compact administration, which was terminated in May 1832 by his death; the summer of that year was marked by a formidable republican rising in Paris, and it was not till the 11th October 1832 that a stable Government was formed, in which Marshal Soult was first minister, the Duc de Broglie took the foreign office, Thiers the home department, and Guizot contented himself with the department of public instruction. This ministry, which lasted for nearly four years, was by far the ablest and most comprehensive that ever served Louis Philippe; it combined men of the highest talents and character, and it rendered incalculable services to the nation and the crown. Guizot, however, was already marked with the stigma of unpopularity by the more advanced liberal party. He remained unpopular all his life, "not," said he, "that I court unpopularity, but that I think nothing about it." Yet never were his great abilities more useful to his country than whilst he filled this office of secondary rank but of primary importance in the department of public instruction. The duties it imposed on him were entirely congenial to his literary tastes, and he was master of the subjects they concerned. He applied himself in the first instance to carry a large measure for the education of the people, and to a great extent founded the existing educational establishments of the people of France. In fifteen years, under the influence of this law, the number of primary schools rose from ten to twenty-three thousand; normal schools for teachers, and a general system of inspection, were introduced; and boards of education, under mixed lay and clerical authority, were created. The secondary class of schools and the university of France were equally the subject of his enlightened protection and care, and a prodigious impulse was given to philosophical study and historical research. The branch of the Institute of France known as the "Académie des Sciences Morales et Politiques," which had been suppressed by Napoleon, was revived by Guizot. Some of the old members of this learned body—Talleyrand, Siéyès, Rœderer, and Lakanal—again took their seats there, and a host of more recent celebrities were added by election for the free discussion of the great problems of political and social science. The "Société de l'Histoire de France" was founded for the publication of historical works; and a vast publication of mediæval chronicles and diplomatic papers was undertaken at the expense of the state.

The object of the cabinet of October 1832 was to organize a conservative party, and to carry on a policy of resistance to the republican faction which threatened the existence of the monarchy. It was their pride and their boast that their measures never exceeded the limits of the law, and by the exercise of legal power alone they put down an insurrection amounting to civil war in Lyons and a sanguinary revolt in Paris. The real strength of the ministry lay not in its nominal heads, but in the fact that in this Government and this alone Guizot and Thiers acted in cordial cooperation. The two great rivals in French parliamentary eloquence followed for a time the same path; but neither of them could submit to the supremacy of the other, and circumstances threw Thiers almost continuously on a course of opposition, whilst Guizot bore the graver responsibilities of power.

Once again indeed, in 1839, they were united, but it was in opposition to M. Molé, who had formed an intermediate Government, and this coalition between Guizot and the leaders of the left centre and the left, Thiers and Odilon Barrot, is justly regarded as one of the chief inconsistencies of his life. Victory was secured at the expense of principle; but none of the three chiefs of that alliance took ministerial office, and Guizot was not sorry to accept the post of ambassador in London, which withdrew him for a time from parliamentary contests. This was in the spring of 1840, and Thiers succeeded shortly afterwards to the ministry of foreign affairs.

Guizot was received with marked distinction by the queen and by the society of London. His literary works were highly esteemed, his character was respected, and France was never more worthily represented abroad than by one of her greatest orators. He was known to be well versed in the history and the literature of England, and sincerely attached to the alliance of the two nations and the cause of peace. But, as he himself remarked, he was a stranger to England and a novice in diplomacy; and unhappily the unsettled state of the Syrian question, on which the French government had separated itself from the common policy of Europe, and possibly the absence of entire confidence between the ambassador and the minister of foreign affairs, placed him in an embarrassing and even false position. The warnings he transmitted to Thiers were not believed. The warlike policy of Thiers was opposed to his own convictions. The treaty of the 15th July was signed without his knowledge and executed in the teeth of his remonstrances. For some weeks Europe seemed to be on the brink of war, until the king put an end to the crisis by refusing his assent to the military preparations of Thiers, and by summoning Guizot from London to form a ministry and to aid his Majesty in what he termed "ma lutte tenace contre l'anarchie." Thus began, under dark and adverse circumstances, on the 29th October 1840, the important administration in which Guizot remained the master-spirit for nearly eight years. He himself took the office of minister for foreign affairs, to which he added some years later, on the retirement of Marshal Soult, the ostensible rank of prime minister. His first care was the maintenance of peace and the restoration of amicable relations with the other powers of Europe. If he succeeded, as he did succeed, in calming the troubled elements and healing the wounded pride of France, the result was due mainly to the indomitable courage and splendid eloquence with which he faced a raging opposition, gave unity and strength to the conservative party, who now felt that they had a great leader at their head, and appealed to the thrift and prudence of the nation, rather than to their vanity and their ambition. In his pacific task he was fortunately seconded by the formation of Sir Robert Peel's administration in England, in the autumn of 1841. Between Lord Palmerston and Guizot there existed unhappily an incompatibility of character exceedingly dangerous in the foreign ministers of two great and in some respects rival countries. With Lord Palmerston in office, Guizot felt that he had a bitter and active antagonist in every British agent throughout the world; the combative element was strong in his own disposition; and the result was a system of perpetual conflict and counter-intrigues. Lord Palmerston held (as it appears from his own letters) that war between England and France was, sooner or later, inevitable. Guizot held that such a war would be the greatest of all calamities, and certainly never contemplated it. In Lord Aberdeen, the foreign secretary of Sir Robert Peel, Guizot found a friend and an ally perfectly congenial to himself. Their acquaintance in London had been slight, but it soon ripened into mutual regard and confidence. They were both men of high principles and honour; the Scotch Presbyterianism which had moulded the faith of Lord Aberdeen was reflected in the Huguenot minister of France; both were men of extreme simplicity of taste, joined to the refinement of scholarship and culture; both had an intense aversion to war and felt themselves ill-qualified to carry on those adventurous operations which inflamed the imagination of their respective opponents. In the eyes of Lord Palmerston and Thiers their policy was mean and pitiful; but it was a policy which secured peace to the world, and united the two great and free nations of the West in what was termed the *entente cordiale*. Neither of them would have stooped to snatch an advantage at the expense of the other; they held the common interest of peace and friendship to be paramount; and when differences arose, as they did arise, in remote parts of the world,—in Tahiti, in Morocco, on the Gold Coast,—they were reduced by this principle to their proper insignificance. The opposition in France denounced Guizot's foreign policy as basely subservient to England. He replied in terms of unmeasured contempt,—"You may raise the pile of calumny as high as you will, vous n'arriverez jamais à la hauteur de mon dédain!" The opposition in England attacked Lord Aberdeen with the same reproaches, but in vain. King Louis Philippe visited Windsor; the queen of England (in 1843) stayed at the

Château d'Eu. In 1845 British and French troops fought side by side for the first time in an expedition to the River Plate.

The fall of Sir Robert Peel's Government in 1846 changed these intimate relations, and the return of Lord Palmerston to the foreign office led Guizot to believe that he was again exposed to the passionate rivalry of the British cabinet. A friendly understanding had been established at Eu between the two courts with reference to the future marriage of the young queen of Spain. The language of Lord Palmerston and the conduct of Sir Henry Bulwer at Madrid led Guizot to believe that this understanding was broken, and that it was intended to place a Coburg on the throne of Spain. Determined to resist any such intrigue, Guizot and the king plunged headlong into a counter-intrigue wholly inconsistent with their previous engagements to England, and fatal to the happiness of the queen of Spain. By their influence she was urged into a marriage with a despicable offset of the house of Bourbon, and her sister was at the same time married to the youngest son of the French king, in direct violation of Louis Philippe's promises. This transaction, although it was hailed at the time as a triumph of the policy of France, was in truth as fatal to the monarch as it was discreditable to the minister. It was accomplished by a mixture of secrecy and violence. It was defended by subterfuges. By the dispassionate judgment of history it has been universally condemned. Its immediate effect was to destroy the Anglo-French alliance, and to throw Guizot into closer relations with the reactionary policy of Metternich and the Northern courts.

The history of Guizot's administration, the longest and the last which existed under the constitutional monarchy of France, bears the stamp of the great qualities and the great defects of his political character, for he was throughout the master-spirit of that Government. His first object was to unite and discipline the conservative party, which had been broken up by previous dissensions and ministerial changes. In this he entirely succeeded by his courage and eloquence as a parliamentary leader, and by the use of all those means of influence which France too liberally supplies to a dominant minister. No one ever doubted the purity and disinterestedness of Guizot's own conduct. He despised money; he lived and died poor; and though he encouraged the fever of money-getting in the French nation, his own habits retained their primitive simplicity. But he did not disdain to use in others the baser passions from which he was himself free. Some of his instruments were mean; he employed them to deal with meanness after its kind. Gross abuses and breaches of trust came to light even in the ranks of the Government, and under an incorruptible minister the administration was denounced as corrupt. *Licet uti alieno vitio* is a proposition as false in politics as it is in divinity.

Of his parliamentary eloquence it is impossible to speak too highly. It was terse, austere, demonstrative, and commanding,—not persuasive, not humorous, seldom adorned, but condensed with the force of a supreme authority in the fewest words. He has been heard to say that he seldom had occasion to address the chambers for more than twenty minutes at a time, except when despatches were read. The consequence was that the audience hung upon his words with breathless attention. Not a syllable, not an inflexion of the voice was lost,—nothing was repeated; and when he ceased, it seemed as if the waves of an ocean had been spell-bound by his voice. He was essentially a ministerial speaker, far more powerful in defence than in opposition. Like Pitt he was the type of authority and resistance, unmoved by the brilliant charges, the wit, the gaiety, the irony, and the discursive power of his great rival. Nor was he less a master of parliamentary tactics, and of those sudden changes and movements in debate, which, as in a battle, sometimes change the fortune of the day. His confidence in himself, and in the majority of the chamber which he had moulded to his will, was unbounded; and long success and the habit of authority led him to forget that in a country like France there was a people outside the chamber elected by a small constituency, to which the minister and the king himself were held responsible.

A Government based on the principle of resistance and repression and marked by dread and distrust of popular power, a system of diplomacy which sought to revive the traditions of the old French monarchy, a sovereign who largely exceeded the bounds of constitutional power and whose obstinacy augmented with years, a minister who, though far removed from the servility of the courtier, was too obsequious to the personal influence of the king, were all singularly at variance with the promises of the Revolution of July, and they narrowed the policy of the administration. Guizot's view of politics was essentially historical and philosophical. His tastes and his acquirements gave him little insight into the practical business of administrative government. Of finance he knew nothing; trade and commerce were strange to him, and he has been heard to express astonishment at the paramount importance Sir Robert Peel attached to his commercial policy; military and naval affairs were unfamiliar to him; all these subjects he dealt with by second hand through his friends Dumon, Duchâtel, or Marshal Bugeaud. The consequence was that few measures of practical improvement were carried by his administration. Still less did the Government lend an ear to the cry for parliamentary reform. On this subject the king's prejudices were insurmountable, and his ministers had the weakness to give way to them. Being asked after the Revolution of 1848 whether he thought the action and extra-constitutional influence of King Louis Philippe had been beneficial or injurious to the monarchy, Guizot replied that in the earlier years of the king's reign it had been of great use in strengthening the government and restoring order, but that in the later years it had been injurious to constitutional government and to the monarchy itself. It obviously drew down upon the king that responsibility which should have rested entirely on his ministers; and on the question of reform he was even more to be blamed than they were. It was impossible to defend a system which confined the suffrage to 200,000 citizens, and returned a chamber of whom half were placemen. Nothing would have been easier than to strengthen the conservative party by attaching the suffrage to the possession of land in France, but blank resistance was the sole answer of the Government to the just and moderate demands of the opposition. Warning after warning was addressed to them in vain by friends and by foes alike; and they remained profoundly unconscious of their danger till the moment when it overwhelmed them. It was the old old story of a hopeless conflict between a court, obstinately addicted to an effete theory of government, and the rising will of a nation, when a little timely and honest concession would have arrested the catastrophe. Strange to say, Guizot never acknowledged either at the time or to his dying day the nature of this error; and he speaks of himself in his memoirs as the much enduring champion of liberal government and constitutional law. He utterly fails to perceive that a more enlarged view of the liberal destinies of France and a less intense confidence in his own specific theory might have preserved the constitutional monarchy and averted a vast series of calamities, which were in the end fatal to every principle he most cherished. But with the stubborn conviction of absolute truth he dauntlessly adhered to his own doctrines to the end. The last scene of his political life was singularly characteristic of his inflexible adherence to a lost cause. In the afternoon of February 23, 1848, the king summoned his minister from the chamber, which was then sitting, and informed him that the aspect of Paris and the country during the banquet agitation for reform, and the alarm and division of opinion in the royal family, led him to doubt whether he could retain his ministry. That doubt, replied Guizot, is decisive of the question, and instantly resigned, returning to the chamber only to announce that the administration was at an end, and that Molé had been sent for by the king. Molé failed in the attempt to form a Government, and between midnight and one in the morning Guizot, who had according to his custom retired early to rest, was again sent for to the Tuileries. The king asked his advice. "We are no longer the ministers of your Majesty," replied Guizot; "it rests with others to decide on the course to be pursued. But one thing appears to be evident: this street riot must be put down; these barricades must be taken; and for this purpose my opinion is that Marshal Bugeaud should be invested with full power, and ordered to take the necessary military measures, and as your Majesty has at this moment no minister, I am ready to draw up and countersign such an order." The marshal, who was present, undertook the task, saying, "I have never been beaten yet, and I shall not begin to-morrow. The barricades shall be carried before dawn." After this display of energy the king hesitated, and soon added: "I ought to tell you that M. Thiers and his friends are in the next room forming a Government!" Upon this Guizot rejoined, "Then it rests with them to do what they think fit," and left the palace. Thiers and Barrot decided to withdraw the troops. The king and Guizot next met at Claremont. This was the most perilous conjuncture of Guizot's life, but fortunately he found a safe refuge in Paris for some days in the lodging of a humble miniature painter whom he had befriended, and shortly afterwards effected his escape across the Belgian frontier and thence to London, where he arrived on the 3d March. His mother and daughters had preceded him, and he was speedily installed in a modest habitation in Pelham Crescent, Brompton.

The society of England, though many persons disapproved of much of his recent policy, received the fallen statesman with as much distinction and respect as they had shown eight years before to the king's ambassador. Sums of money were placed at his disposal, which he declined. A professorship at Oxford was spoken of, which he was unable to accept. His old friends resumed their relations with him. For himself, serene and undisturbed by a catastrophe which had shaken Europe, he immediately collected a few books and resumed the narrative of the British commonwealth, until he brought it down to Monk and Richard Cromwell.

Guizot survived the fall of the monarchy and the government he had served twenty-six years. He passed abruptly from the condition of one of the most powerful and active statesmen in Europe to the condition of a philosophical and patient spectator of human affairs. He was aware that the link between himself and public life was broken for ever, and he never made the slightest attempt to renew it. He was of no party, a member of no political body; no murmur of disappointed ambition, no language of asperity, ever passed his lips; it seemed as if the fever of oratorical debate and ministerial power had passed from him and left him a greater man than he had been before, in the presence of letters, in the conversation of his friends, and as head of the patriarchal circle of those he loved. The greater part of the year he spent at his residence of Val Richer, an Augustinian monastery near Lisieux in Normandy, which had been sold at the time of the first Revolution. His two daughters, who married two descendants of the illustrious Dutch family of De Witt, so congenial in faith and manners to the Huguenots of France, kept his house. One of his sons-in-law farmed the estate. And here Guizot devoted his later years with undiminished energy to literary labour, which was in fact his chief means of subsistence. Proud, independent, simple, and contented he remained to the last; and these years of retirement were perhaps the happiest and most serene portion of his life.

Two institutions may be said even under the second empire to have retained their freedom—the Institute of France and the Protestant Consistory. In both of these Guizot continued to the last to take an active part. He was a member of three of the five academies into which the Institute of France is divided. The Academy of Moral and Political Science owed its restoration to him, and he became in 1832 one of its first associates. The Academy of Inscriptions and Belles Lettres elected him in 1833 as the successor to M. Dacier; and in 1836 he was chosen a member of the French Academy, the highest literary distinction of the country. In these learned bodies Guizot continued for nearly forty years to take a lively interest and to exercise a powerful influence. He was the jealous champion of their independence. His voice had the greatest weight in the choice of new candidates; the younger generation of French writers never looked in vain to him for encouragement; and his constant aim was to maintain the dignity and purity of the profession of letters.

In the consistory of the Protestant church in Paris Guizot exercised a similar influence. His early education and his experience of life conspired to strengthen the convictions of a religious temperament. He remained throughout life a firm believer in the truths of revelation, and a volume of *Meditations on the Christian Religion* was one of his latest works. But though he adhered inflexibly to the church of his fathers and combated the rationalist tendencies of the age, which seemed to threaten it with destruction, he retained not a tinge of the intolerance or asperity of the Calvinistic creed. He respected in the Church of Rome the faith of the majority of his countrymen; and the writings of the great Catholic prelates, Bossuet and Bourdaloue, were as familiar and as dear to him as those of his own persuasion, and were commonly used by him in the daily exercises of family worship.

In these literary pursuits and in the retirement of Val Richer years passed smoothly and rapidly away; and as his grandchildren grew up around him, he began to direct their attention to the history of their country. From these lessons sprang his last and not his least work, the *Histoire de France racontée à mes petits enfants*, for although this publication assumed a popular form, it is not less complete and profound than it is simple and attractive. The work extends to five large volumes, and has been brought down to the present time by his accomplished daughter Madame Guizot de Witt, from her father's notes.

Down to the summer of 1874 Guizot's mental vigour and activity were unimpaired. His frame, temperate and [illegible] blessed with a singular immunity from infirmity and disease, but in the month of September of that year the vital powers ebbed away, and he [illegible] quietly, reciting now and then a verse of Corneille or a text of Scripture, into his rest.

Public life, ambition, the love of power, and the triumph of debate no doubt shook and agitated his career, and sometimes misdirected it; but they produced no effect upon the solid structure of his character, which remained throughout perfectly simple, indifferent to wealth, and prouder of its own integrity than of all the honour the world could [illegible]. Guizot will be remembered in history less by what he did as a politician than by what he wrote as a man of letters, and by what he was as a man; and in these respects he takes rank amongst the most illustrious representatives of his nation and his age. (H. R.)

GUJARAT. See GUZERAT.

GUJRANWALA, a British district in the Punjab, lying between 31° 32′ and 32° 43′ N. lat., and between 73° 11′ 30″ and 74° 28′ 15″ E. long., with an area (1877) of 2563 square miles, and a population (1868) of 550,576. It is bounded on the N.W. by the river Chenab, on the S. and S.E. by the districts of Jhang and Lahore, and on the E. by the district of Siálkot. This district forms the central portion of the Rechna Doab, intermediate between the fertile submontane plains of Siálkot and the desert expanses of Jhang. On the northern frontier, a belt of alluvial land, some 2 to 6 miles in breadth, fringes the Chenáb throughout its course. The southern portion of the plateau has a rich soil, with accessible water; the villages here lie close together, while the people are careful and industrious cultivators. But further south the ground becomes harder and drier until in the extreme south the *bár*, a flat expanse of barren land, passes slowly into the desert of Jhang. In the south-east corner of the district, the little river Degh irrigates and fertilizes a tiny valley of its own. Two or three minor watercourses are used for the purposes of irrigation in the villages through which they pass. The country is very bare of trees, and the scenery throughout is tame and in the central plateau becomes very monotonous.

The district of Gujránwála is essentially a modern one; yet it can claim considerable relics of the past, constructed during an early period of prosperity. It seems likely that the district once contained the capital of the Punjab, at an epoch when Lahore had not begun to exist. We learn from the Chinese Buddhist pilgrim, Hiouen Thsang, that about the year 630 he visited a town known as Tse-kia (or Taki), the metropolis of the whole country of the five rivers. A mound near the modern village of Asarur has been identified as the site of the ancient capital. Until the Mahometan invasions little is known of Gujránwála except that Taki had fallen into oblivion and Lahore had become the chief city. Under Mahometan rule the district flourished for a time; but a mysterious depopulation fell upon the tract, and the whole region seems to have been almost entirely abandoned. At the first beginning of the Sikh war, the waste plains of Gujránwála were seized by various military adventurers. Charat Sinh took possession of the village of Gujránwála, and here his grandson the great mahárájá Ranjít Sinh was born. The Sikh rule, which was elsewhere so destructive, appears to have been an unmitigated benefit to this district. Ranjít Sinh settled large colonies in the various villages, and encouraged cultivation throughout the depopulated plain. In 1847 the district came under British influence, in connexion with the regency at Lahore, and in 1849 it was included in the territory annexed after the second Sikh war. Since that time Gujránwála has enjoyed an immunity from the catastrophes of history, with the exception of the events of 1857, which belong to the general annals of India.

The population in 1868 numbered 550,576 persons,—306,296 males and 244,280 females. In religion, the district is mainly Mahometan. There are [illegible] towns, Gujránwála, Wazírábád, Rámnagar, Eminábád, and [illegible], with a population aggregate 54,456 persons. The total cultivated area of the district amounts to [illegible] acres, while the [illegible] the total area of 7[illegible] acres. The staple crop is wheat, which occupies one-third of the cultivated area. The other crops are [illegible], gram, tobacco, [illegible], vegetables, [illegible], Indian corn, pulses, cotton and sugarcane. [illegible] The [illegible] The chief exports are agricultural produce, brass vessels, leathern bottles, and [illegible]. The imports consist of salt, iron, [illegible], spices, and English piece-goods. A great religious fair is held at Dhonkal. The principal means of communication is the Northern State Railway from Lahore to Peshawar. The Grand Trunk road, connecting the same places, traverses the district for 42 miles. There are [illegible] miles of unmetalled road in Gujránwála, besides a number of small byways. The Chenáb is navigable throughout for the length of the country. The revenue in 1871 was £55,560. In 1872-73 the district contained 12 civil and 19 magisterial courts. The total police force numbered [illegible] men, supplemented by 1092 village watchmen. Education is still very backward; the pupils in 1872 numbered in all 5818, instructed at a cost of £2300. The mean monthly temperature in 1867 ranged from 53° in January to [illegible] in June. The average rainfall for the eleven years ending 1867 was 24 inches. The prevalent diseases are intermittent fever and small pox. The death-rate in 1872 amounted to 12,492, or 23 per thousand of the population.

Gujránwála, the chief town and administrative headquarters of the above district, in 32° 9′ 30″ N. lat. and 74° 14′ E. long., with a population in 1868 of 19,381. The town is situated on the Grand Trunk road and Northern State Railway, 40 miles north of Lahore. It is of modern creation, and owes its importance to the father and grandfather of Mahárájá Ranjít Sinh, whose capital it formed during the early period of the Síkh power. There is a mausoleum to Mahán Sinh, father of Ranjít Sinh, and a lofty cupola covers a portion of the ashes of the mahárájá himself. The civil station lies a mile south-east of the native town. It contains the court-house, treasury, jail, dispensary, post-office, staging bungalow, and church.

GUJRÁT, or GOOJRAT, a British district in the Punjab, lying between 32° 10′ 30″ and 33° N. lat., and between 73° 20′ and 74° 31′ E. long.; area (1877), 2029 square miles; population (1868), 616,347 souls. It is bounded on the N.E. by the native state of Kashmir, on the N.W. by the river Jhilam, on the W. by Shahpur district, and on the S.E. by the rivers Távi and Chenáb. The district of Gujrat comprises a narrow wedge of sub-Himálayan plain country, possessing few natural advantages. From the basin of the Chenáb on the south the general level rises rapidly towards the interior, which, owing to the great distance of the water beneath the surface, assumes a dreary and desert aspect. A range of low hills, known as the Pabbi, traverses the northern angle of Gujrát. They are composed of a friable Tertiary sandstone and conglomerate, totally destitute of vegetation, and presenting to the view a mere barren chaos of naked rock, deeply scored with precipitous ravines. Immediately below the Pabbi stretches a high plateau, terminating abruptly in a precipitous bluff some 200 feet in height. At the foot of this plateau is a plain, which forms the actual valley of the Chenab and participates in the irrigation from the river bed. The district as a whole is well wooded, and great attention has been paid to arboriculture.

Numerous relics of antiquity stud the surface of Gujrát district. Mounds of ancient construction yield numbers of early coins, and bricks are found whose size and type prove them to belong to the prehistoric period of Hindu architecture. A mound now occupied by the village of Moga or Mong has been identified as the site of Nicæa, the city built by Alexander the Great on the field of his victory over Porus. The Delhi empire established its authority in this district under Bahlol Lodi (1450–1488). A century later it was visited by Akbar, who founded Gujrát as the seat of government. During the decay of the Mughal power, the Ghakkars of Rawal Pindi overran this portion of the Punjab and established themselves in Gujrát about 1741. Meanwhile the Sikh power had been asserting itself in the eastern Panjab, and in 1765 the Ghakkar chief was defeated by Sardar Gujar Sinh, chief of the Bhangi confederacy. On his death, his son succeeded him, but after a few months' warfare, in 1798, he submitted himself as vassal to the mahárájá Ranjít Sinh. In 1846 Gujrát first came under the supervision of British officials. Two ye..

later the district became the theatre for the important engagements which decided the event of the second Sikh war. After several bloody battles in which the British were unsuccessful, the Sikh power was irretrievably broken at the engagement which took place at Gujrát on the 22d of February 1849. The Punjab lay at the feet of the conquerors, and passed by annexation under British rule.

The census of 1868 disclosed a population of 616,347 persons,—331,919 males, and 284,428 females,—of whom 537,696 were Muhammadans, 53,174 Hindus, and 29,653 Sikhs. In 1875-76 the district contained four municipal towns with a population exceeding 5000—Gujrát, 17,391; Jalalpur, 14,022; Kunjah, 5354; and Dinga, 5977. Wheat forms the staple product of the district, while barley, gram, rice, pulses, oil-seeds, and cotton also cover considerable areas. Of the 708,863 acres under cultivation, 267,393 acres are provided with artificial irrigation. The chief exports are grain, *ghi*, wool, and other agricultural produce. The imports come chiefly from Lahore, Amritsar, Jammu, and Pind Dádan Khan. The Northern State Railway passes through the district from south-east to north-west, and affords a new outlet for traffic. Good branch lines of road connect Gujrát with all surrounding centres. The revenue in 1875-76 was £64,425. In the same year there were 11 civil and revenue judges. The police force (1875-76) numbered 514 men, supplemented by a body of 620 village watchmen. The number of state-supported schools amounted to 47 in 1875-76, having a joint roll of 3600 pupils. The cost of education is returned at £1613. The district school at Gujrát ranks as one of the eight "higher class" schools of the Punjab. Gujrát bears the reputation of being a healthy district; small-pox, fever, and ague occasionally prevail. The death rate (1875-76) was 18 per thousand of the population. The district contains 6 charitable dispensaries, giving relief in 1875 to 31,788 persons. The annual average rainfall during eight years ending 1873-74 was 28·5 inches. The fall is regular, and the district on the whole does not suffer much from drought.

GUJRÁT, the chief town and administrative headquarters of the above district, in 32° 34′ 30″ N. lat. and 74° 7′ 15″ E. long., with a population of 17,391, stands upon an ancient site, formerly occupied, according to tradition, by two successive cities, the second of which is supposed to have been destroyed in 1303, the year of an early Mughal invasion of Delhi. Nearly 200 years later Sher Sháh turned his attention to the surrounding country, and either he or Akbar founded the existing town. Though standing in the midst of a Ját neighbourhood, the fort was first garrisoned by Gujars, and took the name of Gujrát Akbarábád. The town was rendered memorable during the second Sikh war by the battle which takes its name from this site, and which decided the fate of the campaign, bringing the whole Punjab at once under British rule. Akbar's fort, largely improved by Gújar Sinh, stands in the centre of the town. The civil station lies to the north of the native city, and contains the court-house, treasury, jail, dispensary, police-lines, staging bungalow, and post-office. The trade of Gujrát is inconsiderable.

GULF STREAM. See ATLANTIC.

GULL (Welsh, *Gwylan*; French, *Goëland*), the name commonly adopted, to the almost entire exclusion of the old English Mew (Icelandic, *Máfur*; Danish, *Maage*; Swedish, *Måse*; German, *Möve*; Dutch, *Meeuw*; French, *Mouette*), for a group of Sea-birds widely and commonly known, all belonging to the genus *Larus* of Linnæus, which subsequent systematists have broken up in a very arbitrary and often absurd fashion. The Family *Laridæ* is composed of two chief groups, *Larinæ* and *Sterninæ*—the Gulls and the Terns, though two other Subfamilies are frequently counted, the Skuas (*Stercorariinæ*), and that formed by the single genus *Rhynchops*, the Skimmers; but there seems no strong reason why the former should not be referred to the *Larinæ* and the latter to the *Sterninæ*.

Taking the Gulls in their restricted sense, Mr Howard Saunders, who has lately subjected the group to a rigorous revision (*Proc. Zool. Society*, 1878, pp. 155-211), admits forty-nine species of them, which he places in five genera instead of the many which some prior investigators had sought to establish. Of the genera recognized by him, *Pagophila* and *Rhodostethia* have but one species each, *Rissa* and *Xema* two, while the rest belong to *Larus*. The *Pagophila* is the so-called Ivory-Gull, *P. eburnea*, names which hardly do justice to the extreme whiteness of its plumage, to which its jet-black legs offer a strong contrast. The young, however, are spotted with black. An inhabitant of the most northern seas, examples, most commonly young birds of the year, find their way in winter to more temperate shores. Its breeding-place has seldom been discovered, and the first of its eggs ever seen by ornithologists was brought home by Sir L. M'Clintock in 1853 from Cape Krabbe (*Journ. R. Dubl. Society*, i. p. 60, pl. 1); others were subsequently obtained by Dr Malmgren in Spitsbergen. Of the species of *Rissa*, one is the abundant and well-known Kittiwake, *R. tridactyla*, of circumpolar range, breeding, however, also in comparatively low latitudes, as on the coasts of Britain, and in winter frequenting southern waters. The other is *R. brevirostris*, limited to the North Pacific, between Alaska and Kamchatka. The singular fact requires to be noticed that in both these species the hind toe is generally deficient, but that examples of each are occasionally found in which this functionless member has not wholly disappeared. We have then the genus *Larus*, which ornithologists have hitherto attempted most unsuccessfully to subdivide. It contains the largest as well as the smallest of Gulls. In some species the adults assume a dark-coloured head every breeding-season, in others any trace of dark colour is the mark of immaturity. The larger species prey fiercely on other kinds of birds, while the smaller content themselves with a diet of insects and worms. But however diverse be the appearance, structure, or habits of the extremities of the series of species, they are so closely connected by intermediate forms that it is hard to find a gap between them that would justify a generic division. Of the forty-three species of this genus recognized by Mr Saunders it would be impossible within the limits of this article to attempt to point out the peculiarities. About fifteen belong to Europe and fourteen to North America, of which (excluding stragglers) some five only are common to both countries. Our knowledge of the geographical distribution of several of them is still incomplete. Some have a very wide range, others very much the reverse, as witness *L. fuliginosus*, believed to be confined to the Galapagos, and *L. scopulinus* and *L. bulleri* to New Zealand,—the last indeed perhaps only to the South Island. The largest species of the group are the Glaucous and Greater Black-backed Gulls, *L. glaucus* and *L. marinus*, of which the former is circumpolar, and the latter nearly so—not being hitherto found between Labrador and Japan. The smallest species is the European *L. minutus*, though the North-American *L. philadelphia* does not much exceed it in size. Many of the Gulls congregate in vast numbers to breed, whether on rocky cliffs of the sea-coast or on heathy islands in inland waters. Some of the settlements of the Black-headed or "Peewit" Gull, *L. ridibundus*, are a source of no small profit to their proprietors,—the eggs, which are rightly accounted a great delicacy, being taken on an orderly system up to a certain day, and the birds are fully protected. Ross's or the Roseate Gull, *Rhodostethia rosea*, forms a well-marked genus, distinguished not so much by the pink tint of its plumage (for that is found in other species) but by its small Dove-like bill and wedge-shaped tail. It is an exceedingly scarce bird, little more than a dozen examples being known to exist in collections. Beyond its having an Arctic habitat, little has yet been ascertained about it. More rare still is one of the species of *Xema*, *X. furcatum*, of which only two specimens, both believed to have come from the Galapagos, have been seen. Its smaller congener Sabine's Gull, *X. sabinii*, is more common, and has been found breeding both in Arctic America and in Siberia, and several examples, chiefly immature birds, have been obtained in the British Islands. Both species of Xema are readily distinguished from all other Gulls by their forked tails. (A. N.)

GUM exists in the juices of almost all plants, but is produced in its purest form by various species of *Acacia*, e.g., *Acacia Verek* (Guil. and Perrottet), *A. horrida*, *A. arabica* (Wildenow), *A. Seyal* (Delile), and *A. stenocarpa* (Hochst.). The name is applied to those exudations from plants, stems, branches, or fruits which are entirely soluble or soften in water, and form with it a thick glutinous liquid or mucilage insoluble in alcohol of 60 per cent., and yield mucic and oxalic acids when treated with nitric acid. In structure gum is quite amorphous, being neither organized like starch nor crystallized like sugar. According to Trécul, the acacias and the *Rosaceæ* yield their gums most abundantly when sickly and in an abnormal state, caused by a fulness of sap in the young tissues, whereby the new cells are softened and finally disorganized; the cavities thus formed fill with liquid, which exudes, dries, and constitutes the gum.

The chief varieties have hitherto been divided as follows:—(1) gum arabic, (2) gum tragacanth, (3) cherry tree gum, (4) gum of Bassora, (5) mucilage. The artificial gum dextrin has been already treated of, vol. vii. p. 146.

Gum Arabic may be taken as the type of the gums entirely soluble in water. The principal kinds are distinguished as Turkey Picked Gum, Gedda, Amrad, Gheziri, Senegal, Talca, Australian, Barbary, Cape, and East India (from Bombay and Aden). Another variety, spoken of as likely, from its abundance, to be soon in the market, is obtained from the *Prosopis dulcis*, a leguminous plant, and is called gum mesquite or mezquite; it comes from Western Texas and Mexico, and is yellowish in colour, very brittle, and quite soluble in water (*Pharm. Journ.* (3) vol. vi. p. 942).

Gum arabic occurs in pieces of varying size, and some kinds are full of minute cracks. The specific gravity of Turkey picked gum (the purest variety) is 1·487, or, when dried at 100° C., 1·525. It is soluble in water to an indefinite extent; boiled with dilute sulphuric acid it is converted first into dextrin, and then into a fermentable variety of sugar. Moderately strong nitric acid changes it into mucic, saccharic, tartaric, and oxalic acids. Under the influence of yeast it does not enter into the alcoholic fermentation, but Berthelot, by digesting with chalk and cheese, obtained from it 12 per cent. of its weight of alcohol, along with lactate of calcium, but no appreciable quantity of sugar. According to Frémy, gum arabic may be regarded as a potassium and calcium salt of gummic or arabic acid, of the formula $CaK_2C_{12}H_{20}O_{11}.6C_{12}H_{22}O_{11}$. Graham (*Chemical and Physical Researches*) gives dialysis as the simplest and best mode of preparing gummic acid, and states that the power of gum to penetrate the colloid septum is 400 times less than that of chloride of sodium, and further that by mixing the gum with substances of the crystalloid class the diffusibility is lowered, and may be even reduced to nothing. The mucilage must be acidulated with hydrochloric acid before dialysing, to set free the gummic acid. Gummic acid reddens litmus, its reaction being about equal to carbonic acid. When solutions of gum arabic and gelatin are mixed, oily drops of a compound of the two are precipitated, which on standing form a nearly colourless jelly, melting at 25° C., or by the heat of the hand. This substance can be washed without decomposition. Gummic acid is soluble in water; when well dried at 100° C., it becomes transformed into metagummic acid, which is insoluble, but swells up in water like gum tragacanth.

Gum arabic, when heated to 150° C. with two parts of acetic anhydride, swells up to a mass which, when washed with boiling water, and then with alcohol, gives a white amorphous insoluble powder called acetyl arabin $C_6H_7(C_2H_3O)_3O_5$. It is saponified by alkalies, with reproduction of soluble gum. Gum arabic is not precipitated from solution by iron, stannous chloride, sulphate or nitrate of copper, or neutral lead acetate; with basic lead acetate it forms a white jelly, with ferric chloride it yields a stiff clear gelatinoid mass, and its solutions are also precipitated by borax.

The finer varieties are used as an emollient and demulcent in medicine, and in the manufacture of confectionery; the commoner qualities are used as an adhesive paste, for giving lustre to crape, silk, &c., in cloth finishing to stiffen the fibres, and in calico-printing. For labels, &c., it is usual to mix sugar or glycerin with it to prevent it from cracking.

Physiologically nothing is yet definitely known of gum as a food material. Animals fed thereon soon die of inanition. Lehmann says it is not absorbed by the system, but according to Pavy, it is to a slight extent, as shown by the formation of amyloid substance in the liver of subjects fed on gum.

Gum senegal, a variety of gum arabic produced by *A. Verek*, occurs in pieces generally rounded, of the size of a pigeon's egg, and of a reddish or yellow colour, and specific gravity 1·436. It gives with water a somewhat stronger mucilage than gum arabic, from which it is distinguished by its clear interior, fewer cracks, and greater toughness. It is imported from the river Gambia, and from Senegal and Bathurst, and is collected in December and March yearly.

Chagual gum, a new variety brought from St Iago de Chili, resembles gum senegal. About 75 per cent. is soluble in water. Its solution is not thickened by borax, and is precipitated by neutral lead acetate; and dilute sulphuric acid converts it into dextro-glucose.

The imports of gum arabic into England during 1878 (including all the varieties) may be estimated as follows:—

	Tons.	Value
Imports to London, about.........	1064	£40,000
„ Liverpool, „	1554	77,000
	2618	£117,000

Of this about one-half is exported. These figures are only approximate, as, since the repeal of the duties in 1845, the returns do not discriminate between the various descriptions which are all classed together under the head of gum.[1]

Gum Tragacanth, familiarly called gum dragon, exudes from the stem, the lower part especially, of the various species of *Astragalus*, and is collected in Asia Minor, the chief port of shipment being Smyrna. Formerly only what exuded spontaneously was gathered; this was often of a brownish colour; but now the flow of the gum is aided by incisions cut near the root, and the product is the fine, white, flaky variety so much valued in commerce. The chief flow of gum takes place during the night, and hot and dry weather is the most favourable for its production.

In colour gum tragacanth is of a dull white; it occurs in horny, flexible, and tough, thin, twisted flakes, translucent, and with peculiar wavy lines on the surface. When dried at temperatures under 100° C. it loses about 14 per cent. of water, and is then easily powdered. Its specific gravity is 1·384. With water it swells by absorption, and with even fifty times its weight of that liquid forms a thick mucilage. Part of it only is soluble in water, and that resembles gummic acid in being precipitated by alcohol and ammonium oxalate, but differs from it in giving a precipitate with neutral lead acetate and none with borax. The insoluble part of the gum is a calcium salt of bassorin ($C_{12}H_{20}O_{10}$), which is devoid of taste and smell, forms a gelatinoid mass with water, but by continued boiling is rendered soluble, owing, according to M. Giraud, to its being changed into pectin. A small quantity of starch is always naturally present in gum tragacanth. The composition of gum tragacanth is generally given as arabin 53 per cent., bassorin and starch 33, water 11 (but M. Giraud considers its composition to be water 20 per cent.), mineral matter 3, a pectinous principle (apparently identical with the pectose of Frémy) 60, soluble gum 10, cellulose 3, starch 3, mineral matter 3, with traces of nitrogenous matter. Graham (*Chemical and Physical Researches*, p. 589) speaks of its being likely that native gums insoluble in water are the pectous form of soluble gum, and Giraud's experiments point to the correctness of that surmise.

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[1] For varieties of gum arabic, see *Pharmacographia*, pp. 209, 210; *Catalogue Museum Pharm. Soc.*, pp. 37, 38; also Pereira, *Mat. Med.*, vol. ii., pt. ii., p. 334; for physiological properties, Pavy, *Foods and Dietetics*, 2d ed., pp. 112, 433; and for chemistry, Watts's *Dictionary*, vol. ii. p. 953.

Gum tragacanth is used in calico-printing as a thickener of colours and mordants; in medicine as a demulcent and vehicle for insoluble powders, and as an excipient in pills; and for setting and mending beetles and other insects. The imports during 1878 were—

	Packages.	Value.
To London	2570	£46,200
To Liverpool, about	1200	21,600
	3770	£67,800

Gum kuteera resembles in appearance gum tragacanth, for which the attempt has occasionally been made to substitute it. It is said to be the product of *Sterculia urens*, a plant of the natural order *Sterculiaceæ*, and is unknown to British commerce.

Cherry Tree Gum is an exudation from trees of the genera *Prunus* and *Cerasus*. It occurs in shiny reddish lumps, resembling the commoner kinds of gum arabic. With water, in which it is only partially soluble, it forms a thick mucilage. The soluble portion is arabin, the insoluble cerasin, which according to Frémy is a calcium salt of metagummic acid ($C_{12}H_{22}O_{11}$). It is not used commercially.

Gum of Bassora, from Bassora or Bussorah in Asia, is sometimes imported into the London market under the name of the hog tragacanth. It is insipid, crackles between the teeth, occurs in variable-sized pieces, is tough, of a yellowish-white colour, and opaque, and has properties similar to gum tragacanth. Its specific gravity is 1·3591. It contains only 1 per cent. of soluble gum or arabin. Under the name of Caramania gum it is mixed with inferior kinds of gum tragacanth before exportation.

Mucilage.—Very many seeds, roots, &c., when infused in boiling water, yield mucilages which, for the most part, consist of bassorin. Linseed, quince seed, and marshmallow root yield it in large quantity (see also GUMBO). In their reactions the different kinds of mucilage present differences; *e.g.*, quince seed yields only oxalic acid when treated with nitric acid, and with a solution of iodine in zinc iodide it gives, after some time, a beautiful red tint. Linseed does not give the latter reaction; by treatment with boiling nitric acid it yields mucic and oxalic acids.

Gum Resins.—This term is applied to the inspissated milky juices of certain plants, which consist of gum soluble in water, resin and essential oil soluble in alcohol, other vegetable matter, and a small amount of mineral matter. They are generally opaque and solid, and often brittle. Their chief uses are in medicine. They include the following:—ammoniacum, asafœtida, bdellium, euphorbium, frankincense or olibanum, galbanum, gamboge, myrrh, opoponax, sagapenum, and scammony. Several of the resins are often improperly called gums; *e.g.*, benzoin or benjamin, copal, dammar, elemi or animi, kawrie or cowdie or Australian copal, mastic, sandrac, and shellac. (J. ST.)

GUMBINNEN, the chief town of a government district of the same name in the Prussian province of East Prussia, is situated on the Pissa, an affluent of the Pregel, and on the Eastern Railway, 22 miles south-west of Eydtkuhnen on the Russian boundaries. The surrounding country is pleasant and fertile, and the town is well built, with spacious and regular streets shaded by linden trees. It has three Evangelical churches, a synagogue, a gymnasium, a higher burgher school, a public library, a hospital, and an infirmary. In the market square there is a statue by Rauch of Frederick William I., who in [illegible] raised Gumbinnen to the rank of a town, and in [illegible] brought to it a number of persons who had been driven from Salzburg by religious persecution. On the bridge over the Pissa a monument has been erected to those of the inhabitants who fell in the Franco-German war of 1870–71. Iron founding and the manufacture of machinery, wool, cotton, and linen weaving, stocking-making, tanning, brewing, and brandy-making are the principal industries. There are horse and cattle markets, and some trade in corn and linseed. The population in 1875 was, including the garrison, 9114.

GUMBO, or OKRA, termed also *Okro*, *Ochro*, *Ketmia*, *Gubbo*, and Syrian Mallow (Sanskrit, *Tindisa*; Bengali, *Dheras*; Persian, *Bámiyah*—the *Bammia* of Prosper Alpinus; French, *Gombaut*, or better *Gombo*, and *Ketmie comestible*), *Hibiscus esculentus*, L. (*H. longifolius*, Roxb., *Abelmoschus esculentus*, Guill. and Perr.), an herbaceous hairy annual plant of the natural order *Malvaceæ*, a native of the Old World, and now naturalized or cultivated in all tropical countries. The leaves are cordate, and 3 to 5-lobed, and the flowers yellow, with a crimson centre; the ovary is 5-celled, and the fruit or pod, the *Bendi-Kai* of the Europeans of southern India, is a tapering, 10-angled, loculicidal capsule, 4 to 10 inches in length, except in the dwarf varieties of the plant, and contains numerous oval dark-coloured seeds, hairy at the base. Three distinct varieties of the gumbo (*Quiabo* and *Quimgombo*) in Brazil have been described by Pacheco. The unripe fruit is eaten either pickled, or prepared like asparagus. It is also an ingredient in various dishes, *e.g.*, the *gumbo* of the Southern United States, and the *calalou* of Jamaica; and on account of the large amount of mucilage it contains, it is extensively consumed, both fresh and in the form of the prepared powder, for the thickening of broths and soups. For winter use it is salted, or sliced and dried. The fruit is grown on a very large scale in the vicinity of Constantinople. It was one of the esculents of Egypt in the time of Abul-Abbas el-Nebâti, who journeyed to Alexandria in 1216 (Wüstenfeld, *Gesch. d. Arab. Aerzte*, p. 118, Gött., 1840), and, according to Popp, is still cultivated by the Egyptians, who call it *Bammyé*.

The seeds of the gumbo are used as a substitute for coffee. From their demulcent and emollient properties, the leaves and immature fruit have long been in repute in the East for the preparation of poultices and fomentations. Alpinus (1592) mentions the employment of their decoction in Egypt in ophthalmia, and in uterine and other complaints. In the *Pharmacopœia of India* the decoction of the fruit is recommended in catarrh, and in diseases of the genito-urinary tract, and its hot vapour in affections of the throat and fauces.

The Musk Okra (Sanskrit, *Latakasturika*, cf. the Greek κάστωρ; Bengali, *[illegible]*; German, *[illegible]*; French, *Ketmie musquée*), *Hibiscus Abelmoschus*, L. (*[illegible]*), [illegible] native to India, and, it is said, to Guiana and Central America, and cultivated in most warm regions of the globe, is a suffruticose plant, bearing a [illegible] pod about 3 inches in length, within which are [illegible] seeds, smaller than those of *H. esculentus*. The seeds possess a musky odour, due to an [illegible] present in the integument, and are known to perfumers under the name of [illegible] as a substitute for musk, [illegible] it has been proposed to employ them medicinally. They are stated to be used by the Arabs for scenting coffee. In India they are employed for perfuming medicinal oils, and being [illegible] form part of sundry pharmaceutical preparations. The seeds, in the Fantee language, [illegible], as we learn from Mr E. M. Holmes, are used in Africa as beads, and powdered and steeped in rum they are valued in the West Indies as a remedy for snake-bites. The plant yields an [illegible] fibre, and, [illegible] in mucilage, is employed in Upper India for the clarifying of sugar. The best perfumed seeds are reported to come from Martinique.

[illegible] *Macfadyen*, [illegible] Hooker, [illegible] *Pharmacopœia of India* [illegible]

GUMRI, or as it is now more frequently called ALEXANDROPOL, in honour of the empress Alexandra, a town of Russian Armenia in the province of Erivan, on the old frontier of the Turkish territory which was formed by the river Arpachai. It is situated at a height of 5268 (according to Abich, 4819) feet above the sea, on an eminence which commands the environs but is somewhat defective in a military point of view because the neighbouring valleys form a kind of screened approaches. The fortifications, erected in 1837 by command of Nicholas I., are the strongest in that part of Asia with the exception of those of Kars, and would be quite impregnable to an Eastern army. Like the ordinary houses of the town, they are built of limestone; and they consist of regular bastions casemated and mounted with guns and surrounded with a ditch. There are several handsome Armenian churches in Gumri, one of the finest of which was built in 1872. The town passed to Russia by the peace of Adrianople. In 1840 it was made a district town of the Gruzeno-Imeritian government, and in 1849 it was incorporated with the Erivan government. In 1832 it contained only about 60 houses, but they had increased to 1200 in 1838. At present its population is about 16,000.

GUM-TREE. See EUCALYPTUS.

GUN-COTTON (*Pyroxilin*, *Coton poudre*, *Fulmi coton*, *Schiessbaumwolle*). In 1838 Pélouze observed that when cotton fabrics or paper were immersed in cold concentrated nitric acid for a short time, the free acid being subsequently removed by washing, these materials became, without important alteration of structure, converted into substances possessed of explosive properties. These were at the time accepted as closely allied to the substance named *xyloidin*, described some years previously by Braconnet, which is obtained by adding water to a solution of starch in cold nitric acid. But subsequent observation established the identity of these explosive products with the explosive cotton, or gun-cotton, of which in 1845 Schönbein announced the discovery, and which he at once proposed as a substitute for gunpowder. Soon after this announcement Böttger and Otto published the method of producing gun-cotton by immersing carded cotton in cold concentrated nitric acid, and subsequently Knop introduced the more advantageous method of treating the cotton wool with a mixture of nitric and sulphuric acids, the latter being used as a dehydrater of the nitric acid, and as an absorbent of the water eliminated by the nitrification of the cellulose or cotton fibre. The composition of gun-cotton was subsequently made the subject of study by Böttger, Pélouze, Payen, Von Kirchhoff, Sobrero, Béchamp, Porret, Crum, Gladstone, Hadow, and others, and various formulæ were proposed as representing its composition. The divergence of opinion on this point arose partly from difficulties attending the preparation of uniform products, and the obtaining of trustworthy analytical results with these, and partly from differences of opinion regarding the nature of the chemical reaction, whereby the cellulose becomes converted into an explosive body. The products obtained in the earlier investigations differed very much as regards their solubility in mixtures of alcohol and ether, and also with respect to the proportion which their weight bore to that of the cotton wool employed in the experimental operations. Crum was the first to entertain the view that gun-cotton might be regarded as cellulose, in which the two or three atoms of hydrogen are replaced by their equivalent of nitric peroxide. This view was afterwards also advanced by Gerhardt, and it received strong support from the researches of Hadow, whose results established the fact that several distinct varieties of pyroxilin could be produced by varying the proportions of nitric and sulphuric acids used, and who definitely established the composition of three of these, the most explosive of which constituted the chief proportion of the product ordinarily obtained as gun-cotton, and had the composition expressed by the name trinitrocellulose. This highest nitro-product in its pure state is insoluble in mixtures of ether and alcohol, whereas the lower products (one of which is the so-called *collodion gun-cotton*, used for photographic purposes, see COLLODION, vol. vi. p. 149) differed in regard to their ready solubility in different mixtures of those solvents. Crum's formula for pyroxilin, thus confirmed by Hadow, was afterwards strongly supported by Schrötter, Redtenbacher, and Schneider, in their joint investigation of gun-cotton manufactured in Austria by the improved process of Von Lenk, and though again disputed by Pelouze and Maury, and by Champion and Pellet, the correctness of the formula $C_6H_7N_3O_{11}$ (or $C_6H_7O_5 3N_2$), originally proposed by Crum, was conclusively established in 1866 by the exhaustive analytical and synthetical experiments of Abel. In the manufacture of gun-cotton, even when most carefully conducted, the most explosive product, trinitrocellulose, is never obtained in a condition even approaching purity; it always contains an admixture (ranging from 4 to 10 per cent. in the products of highest quality) of the lower nitrocellulose products, *i.e.*, the soluble varieties of gun-cotton. In addition to these impurities it contains, even when the cotton employed has been submitted to purification by treatment with alkali, small proportions of nitrogenized matters, soluble in alcohol, formed from resinous or fatty substances retained within the cotton fibre. These substances are very much more prone to undergo decomposition (with development of nitrogen acids) by exposure to heat or light than the cellulose derivatives themselves; and Abel's experiments demonstrated that the uncertain stability of gun-cotton, which brought this material into bad repute not long after its discovery, from the occurrence of disastrous explosions arising apparently from its spontaneous decomposition, was ascribable primarily to the development of free acid in the gun-cotton by the action of comparatively moderate heat or of light upon these impurities.

The occurrence of a violent explosion at the works of Messrs Hall of Faversham, not long after they had commenced the manufacture of Schönbein's gun-cotton wool, followed by a similar casualty in France, led to the abandonment of endeavours to apply this substance, within a brief period of its discovery, except in Austria, where Von Lenk persevered in attempts to devise means for obtaining it in a purer and therefore more stable condition, as well as for bringing its explosive action sufficiently under control to permit of its advantageous employment as a substitute for gunpowder, not only for destructive but also for projectile purposes. The system of manufacture elaborated by Von Lenk consisted in loosely spinning long staple cotton into yarn of various sizes and different compactness; this yarn was converted into gun-cotton by very careful treatment with a large excess of the strongest nitric and sulphuric acids, the product being immersed for many weeks in running water, and then treated with weak alkali; the gun-cotton yarn and thread were either wound more or less compactly on reels or cores, for employment in firearms, or made up into very compact ropes with hollow cores, or into plaits, of lamp-wick form, for employment in shells or mines. The rapidity of explosion of the gun-cotton, in *open air*, or under slight confinement, was thus brought to a great extent under control, but if the resistance opposed to the expansion of the highly heated gases upon the first ignition of the confined gun-cotton developed sufficient pressure to cause them at once to penetrate the inner structure of gun-cotton fibre which composed a charge, a sudden and violent explosion was thus brought about. Hence no practical advance was made in the reduction of the violence of action of gun-cotton by Von Lenk's researches. By the system which Abel has more recently elaborated the fibre after its conversion into gun-cotton is reduced to a very fine state of division; when in this condition the explosive substance is readily converted into sheets or granules, or by compression into homogeneous masses of various degrees of compactness, and of any desired form. In this manner the rapidity of action or explosion of gun-cotton may be regulated to a nicety, [illegible] are rendered very [illegible] with it. As the reduction of the gun-cotton pulp to a very fine state of division greatly facilitates the removal by washing, and by alkaline treatment, of the small quantities of unstable impurities already spoken of, the stability of gun-cotton as now manufactured is much greater than that of former products. Compressed gun-cotton needs, like the other forms in which the explosive has been used, very strong confinement for the development of violent explosion, but this can be readily accomplished without any confinement of the substance, through the agency of an initiative detonation, the explosion of 2 grains of strongly confined mercuric fulminate in close contact with the compressed material sufficing to ensure this result (see *Detonation*, art. Explosives, vol. viii. p. 809). Gun-cotton contains in the normal (air dry) condition 2 per cent. of water. The compressed material of the ordinary density (= about 1) absorbs from 25 to 30 per cent. of water when saturated; even with 15 per cent. it is uninflammable, and when containing 17–20 per cent. it may be cut and drilled with perfect safety. If gun-cotton contains more than the normal 2 per cent. of water it can no longer be detonated by the minimum quantity of fulminate, and the strength of the initiative detonation has to be increased in proportion to the amount of water it contains; when it contains 17 per cent. of water, its detonation cannot be accomplished with less than 200 grains of confined fulminate. An initiative charge of 1 ounce of air dry gun-cotton (detonated by means of an ordinary fulminate fuze) suffices, however, to ensure the detonation of wet gun-cotton (as used in mines, torpedoes, rockets, &c.). The susceptibility of gun-cotton to detonation when wet (and therefore perfectly uninflammable) gives this substance a great advantage over other explosive agents, as it may be stored in a perfectly harmless condition (wet gun-cotton being quite uninflammable) and at once used in that state as a powerful destructive agent through the agency of a detonating charge. The explosive action of wet gun-cotton is somewhat sharper than that of the dry material, the detonation being transmitted through its mass with greater rapidity in consequence of the displacement of air in its pores by the incompressible liquid. Gun-cotton, if it consists entirely of trinitrocellulose, does not contain sufficient oxygen for the complete oxidation of its carbon; hence more work can be accomplished with a given weight of gun-cotton if a solid oxidizing agent (a nitrate or a chlorate) be incorporated with it in a proportion sufficient for complete oxidation. The compressed preparations (chlorated or nitrated gun-cotton) are as sensitive to detonation as gun-cotton itself, but are less sudden or sharp in their action. These preparations, first manufactured by Abel, were extensively experimented with some years ago, and one of them, prepared with barium nitrate, is now manufactured under the name of *Tonite* for blasting purposes. Preparations allied to gun-cotton, in the production of which wood-fibre is used as the starting point, are manufactured for sporting and blasting purposes under the name of Schultze's powder, sawdust powder, and patent gunpowder. (F. A. A.)

GUNDULITSCH, IVAN (1588–1638), called GIOVANNI GONDOLA, one of the most celebrated Dalmatian poets, was born August 8, 1588, at Ragusa. His early education was superintended by two Jesuits, S. Muzzi and R. Ricasch, the latter of whom instructed him in philosophy. At the age of twenty Gundulitsch applied himself to the study of jurisprudence; and three years afterwards he was entrusted with a high official post in the Ragusan republic. Farther particulars of his life are not known; he died December 8, 1638. Among his numerous poems the greatest is an epic entitled *Osman u dvadeset pjevanjah* (Osman in twenty cantos), printed for the first time at Ragusa in 1826, and reprinted at Agram in 1854, with a biographical sketch of the author by A. T. It was written to celebrate the victory of the Poles over the Turks and Tartars in the campaign of 1621. Cantos 14 and 15 are lost, having been suppressed by the Government of Ragusa on account of their writer's animosity against the Turks, but in their place others have been added by P. Sorgo. An Italian version of this poem appeared in 1827. Of Gundulitsch's other poems, the *Hymn on the Greatness of God* and the *Tears of the Afflicted Son*, and his dramas the *Rape of Proserpine* and the *Sacrifice of Love*, deserve notice. He also made several metrical translations from the Italian poets. Gundulitsch's poems, besides their literary value, are specially interesting to a student of history, as they give a faithful picture of the time in which they were composed. A complete edition of his works, edited by V. Babukich, was published by the Illyrian university in 2 vols., Agram, 1847.

GUNDWANA, a form of the name GONDWANA (q.v.).

GUNMAKING

UNDER this head falls the manufacture of every description of firearm, from the pistol to the 100-ton gun. The term "small arms" includes sporting and military weapons carried by the shooter; instruments fitted for firing a rapid succession of bullets through one or more barrels from a rest are termed "machine guns," while the heavier pieces, used exclusively in war, are denominated "ordnance."

SMALL ARMS.

The date and circumstances of the introduction of portable firearms are involved in obscurity. No doubt many attempts were made and failed previously, but gunpowder does not appear to have come into practical use as a rival to the crossbow for the propulsion of bolts or bullets till the reign of Edward III.; in 1375 mention is made of men armed with "gonnes" at an attack made on a Yorkshire manor-house. The arquebus or match-lock was employed in Germany in 1478, and it is therefore probable that some rough weapon was introduced much earlier. The hand gun (fig. 1) was used by both infantry and cavalry; it consisted of a simple iron or brass tube with touch hole at the top, fixed on a straight stock of wood; when used on foot, the soldier held it firmly by passing the stock under the arm; when used on horseback the stock was shortened to butt against the breast, the barrel resting on a fork secured to the saddle bow. About the beginning of the reign of Henry VII. the hand gun was improved by the addition of a cock, which was brought down by a trigger to a pan at the side of the barrel; this cock held a match which ignited a priming in the pan, the priming communicating with the charge by a small hole. The next alteration consisted in the introduction of the wheel-lock, in which a steel wheel, roughed at the edge, protruded into the priming pan. Into the cock was fitted a piece of sulphuret of iron (pyrites) instead of a match. This was kept close to the priming pan by a spring; another spring, [illegible] the wheel, which, when released by the trigger, span round, rubbing against the pyrites and causing sparks, which set fire to the powder. The wheel-lock was, however, found to be complicated, expensive, and uncertain, so that the match-lock remained in use till the middle of the 17th century, when it was displaced by the flint-lock, the earliest form of which, the "snaphaunce," seems to have been invented about the end of the 16th century in Germany. In this lock the priming pan was provided with a steel cover and the cock held a flint; on pulling the trigger the cock fell, the flint struck the steel cover, forcing it back from the pan, evolving at the same time sparks, which fired the priming. During these developments of the lock the shape of the barrel was gradually changed; in 1621 the length of that of the musket was 4 feet, and the size of the bore such that twelve bullets weighed 1 lb. Soon after this the infantry soldier was supplied with a dagger, which fitted into the muzzle and served as a pike. This was improved at Bayonne into the bayonet, and during the latter part of the 17th century was still farther improved by the addition of a socket, so that the musket could be fired while the bayonet was fixed ready for use. Little change in firearms took place in the 18th century, but in 1807 a Scotch clergyman named Forsyth obtained a patent for priming with fulminating powder, an invention which, though it slumbered till 1834, was destined to cause a complete revolution in the mechanism of firearms. Early in the present reign its value was fully recognized; the magazine of detonating composition and the priming pan used by Mr Forsyth were improved into the cap and nipple, and the flint-lock was entirely superseded. At this point, the progress of invention renders it necessary for us to treat separately the two branches of the subject, and to divide sporting from military arms.

Fig. 1.—Hand-Gun.

Sporting guns.

For sporting purposes smooth-bored shot-guns and grooved rifles are employed. Both are nearly always double-barrelled, and of late years the old muzzle-loaders have been almost entirely supplanted by the many breech-loading systems recently invented, which enable the sportsman to reload with greatly increased rapidity and uniformity, the latter quality being specially important in rifle shooting.

Barrels.

The chief parts composing the arm are the barrel, the lock, and the stock. Barrels for sporting arms are made of four different kinds of material—Damascus twist, laminated steel, stub iron, and mild cast-steel; besides these, common material is worked up into cheap barrels for exportation. Damascus twist consists of alternate rods of iron and steel placed one upon another; usually six of each kind are thus arranged; they are then forged and thoroughly welded together into a solid bar, which is afterwards rolled into rods, having a section about ⅜ inch square. The rod thus formed is raised to a brightish red heat, and one end of it is placed in a revolving chuck, while the other remains fixed; the turning of the chuck subjects the rod to a severe twisting throughout its whole length, so that at last it acquires the appearance of a screw having a very fine thread. Three of these rods are then placed together, the twist of one being in a contrary direction to that of the other two. They are then welded together into a bar, and rolled into a strip about ¾ inch in width. The thickness of this strip depends on the part of the barrel it is intended to form; if for the breech end it is made ¼ inch thick, if for the centre $\frac{3}{16}$ inch, if for the muzzle ⅛ inch. These strips are now ready for coiling, which is performed by raising the strip to a bright red heat, fixing one end of it to a hook projecting from a taper mandril, which is placed in a machine and provided with a handle. On turning the handle the strip is wound round the mandril into a coil about 10 inches in length. The coil is then welded by about 3 inches at a time till the spirals unite to form a hollow cylinder; it is then hammered on a small mandril till the welding is complete. Three coils welded together end to end form a barrel, to which the three different thicknesses of metal above mentioned give a slightly conical form, approximating to the ultimate shape. About three-fourths of the material is cut away in the making; 16 lb of iron are used in the first instance to make a pair of barrels, which weigh only 8 lb when the welding is finished, and only between 3 and 4 lb after boring and grinding. In the manufacture of laminated steel barrels the best quality of steel scrap, after thorough cleaning in a revolving drum, is mixed with a small proportion of charcoal iron. The mixture is heated in a furnace, and puddled into a ball, which is well worked up under a forge hammer. It is then drawn out under a tilt hammer, and rolled into strips of the required length and thickness, after which it is treated as above described. This material is much esteemed for its hardness and closeness of grain, but it does not possess the elegant marking and appearance of the Damascus twist. Stub iron for barrels was formerly made by putting a quantity of old horse-shoes or stubs into an iron ring, welding them into a solid mass, and then rolling them out to strips of the requisite dimensions. Now a mixture of best wrought scrap, and sometimes steel scrap with stubs, is preferred, as giving more hardness and durability to the barrels. A description of the manufacture of cast-steel barrels will be found below, in connexion with military rifles. A sham twist barrel is apt to impose on the purchaser; plain iron is cheaper than twisted iron, and sometimes a thin coil of twist is rolled round a plain inner tube; the whole is then welded together, and has all the appearance of a genuine twisted barrel. Other cheap barrels are made by rolling up strips of iron plate, and welding them together so that each barrel has a weld running down its whole length. As the breech end is thicker than the muzzle end, these barrels are usually made in two lengths.

Boring and stripping.

In the rough state just described the barrels are sent from the forge to the gunmaker, who bores them carefully out to nearly the finished size. He then turns them down at intervals, obtaining correct surfaces by means of inside and outside gauges. The barrels are then "stripped"—that is, turned down the whole length to correspond with the bore. For double guns two barrels are now brazed together, near the muzzle and near the middle. At the breech the barrels are separated by a "steel lump." The axes of the barrels are not quite parallel to each other, but are usually adjusted to cross at about 40 yards from the gun. When packed together, a rib is soldered on down the entire length, and they are sent to be proved at the proof-

Proof. house of the Company of Gunmakers at Whitechapel or Birmingham. The scale of proof is fixed by Act of Parliament, according to the size of the bore; it is considerably more than double the ordinary shooting charge. For the provisional proof, muzzle-loaders have the breech screwed in before firing; breech-loading barrels are pressed against a false breech. The second or definitive proof is less severe, and is carried out at a later stage, when the action of the breech-loader, or the percussion fitting of the muzzle-loader, is completed.

Stocks. The best stocks are made of English or Italian walnut, pieces of which reach the gunmaker roughly shaped. They are so cut that the grain shall run lengthways down the stock, and the wood is dried and seasoned to prevent warping. For expensive guns, much attention is paid to beauty of mottling and depth of colour. A considerable variety of tools is employed in shaping the stocks and cutting out the beds for locks, processes which, for sporting pieces, are performed by hand. Locks. All parts of the lock except the plate are of steel, and reach the gunmaker hammered into shape. The lock-plate is of wrought iron, case-hardened. The parts are worked to fit by hand with a number of special tools. Bar locks are those which have a forward action, arranged so that the main spring fits under the bar below the breech end of the barrels; back-action locks have the spring reversed, so as to extend down the hand or grip of the stock. The remaining portions Furniture. of the gun are termed the furniture. They are the heel-plate which covers the butt, the break-off into which the breeching hooks for muzzle-loaders, the trigger plate, the trigger guard, the hammers, the ramrod-pipes, and bolt fastening the barrel to the stock, &c. For breech-loaders the action is a most important part of the furniture. The ingenuity of gunmakers has devised an immense variety of actions, and every day sees progress made in strength and simplicity.

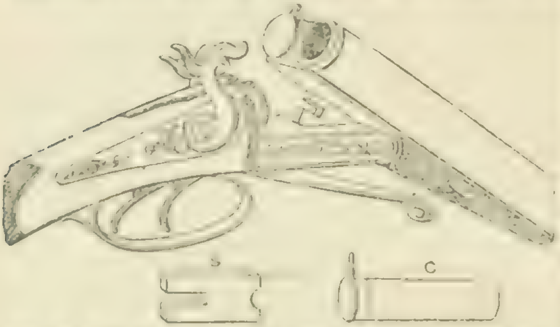

FIG. 2.—Early breech-loader. C, pinfire cartridge; S, swivel grip.

Breech-loaders. M. Lefaucheux is entitled to the credit of inventing the modern sporting breech-loader. He first hit on the combination of a pair of barrels open at the breech, pivoting on a hinge and abutting against a false breech (fig. 2), with a strong-based cartridge case containing powder and shot ready for firing, and supplied with its own means of ignition. His early gun was found weak in the fastenings of the barrels to the stock, while the means of igniting the charge was far from perfect. It consisted of a pin passing through the upper part of the cartridge case, the point resting just above a percussion cap placed at the centre of the base of the charge; the hammer fell on the head of the pin, driving the point into the cap, and exploding the detonating composition. The gas was found to escape through the pin hole, the extraction was sometimes difficult, and a fall on hard ground would occasionally explode the cartridge; for these reasons the pin system was superseded by the central-fire method (fig. 3), in which the base of the cartridge case was made to hold a small anvil, on to which the cap was driven by a needle or striker passing through the false breech, and receiving the blow of the hammer. Fig. 4 shows a central-fire gun, having the action considerably strengthened by the double grip. In this system the extraction is accomplished automatically, by a piece of steel fitting between the two barrels, and so cut as to clip the rims of both cartridges. To this extractor is attached a rod which runs down between the barrels through a hole in the steel lump as far as the hinge; on opening the joint the rod is driven backward, carrying with it the head and forcing the cartridge cases out of the barrels. Guns on the central-fire system afford no indication of being loaded; extraction and loading are, however, so rapid and easy that every sportsman should invariably withdraw the cartridges on laying down his gun, and reload on again taking the field. Hammers sometimes catch in the branches, or even in the clothes of the shooter; even the double grip has been known to yield under the effect of the heavy charges now used. The latest guns have little room for improvement in respect to the action. Fig. 5 shows one of the newest developments. The hammers are abolished altogether, the striker being a needle in the interior, which is driven against the cap of a central-fire cartridge by a spring when the trigger is pressed; a lever on the top is pushed aside by the thumb, loosening the catch which holds the barrels against the false breech; the barrels then drop from the hinge, and are open for loading. On raising the barrels, the action snaps to and holds them fast; the dropping of the barrels causes the extractor to withdraw the empty cartridge cases. A key at the side regulates the cocking and safety of the lock and striker.

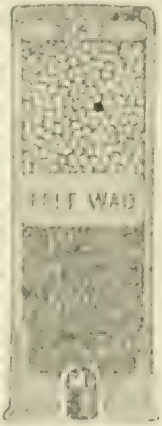

FIG. 3.—Central-fire cartridge.

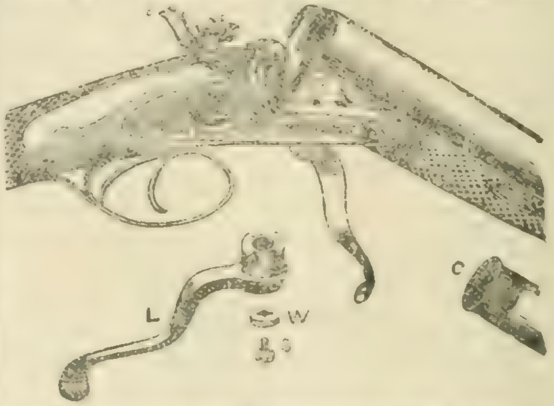

FIG. 4.—Central-fire Gun. C, central-fire cartridge; L, lever; W, washer; S, screw.

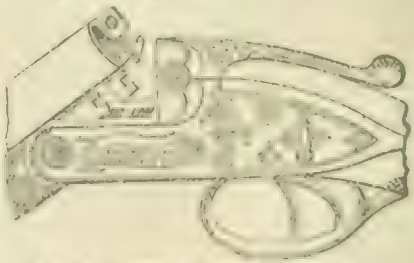

FIG. 5.—Improved hammerless breech-loader.

The sizes of bores are designated according to the weight of the round spherical lead balls which will exactly fit them, and hence their diameters vary inversely as the cube roots of the numbers. In the case of No. 12 bore, the ball fitting it weighs 12 to the pound, and measures ·729 in. in diameter. Ounce bullets (No. 16) fit a bore of ·662 in. in diameter.

Forms of barrel bore in shot-guns.

Barrels were formerly bored cylindrically, but the experiments of gunmakers led them to suppose that better shooting could be obtained by boring to shapes departing in various ways from the simple cylinder. The first modification introduced consisted in enlarging the breech end slightly for about 10 inches; subsequently the last few inches at the muzzle were enlarged also, so that the barrel really consisted of two frusta of cones, having the smaller ends together,—the position of the narrowest part, like many other matters, was dependent on the fancy of the gunmaker. Of late an attempt has been made to reduce the internal form of the barrel to something like a system, and several kinds of "choke" boring have been introduced. The object to be attained with a shot gun is to so arrange the charge that the pellets shall be uniformly and thickly distributed round the mean trajectory, and shall also occupy a small space longitudinally. In fig. 6 a side view of the charge as it passes through the air is given, *ab* being the mean trajectory. Exact experiments to determine the proportions of the cloud of shot fired from different guns do not exist, but, judging from observation, they will probably not depart greatly from those of the figure. In fig. 7 is seen the appearance of the target after being struck by the charge. The test of excellence is regularity of pattern, combined with penetration; that is, a circle of 30 inches diameter should be so pitted by the shot at 40 yards range that gaps of the size of a small bird should nowhere exist, while the individual pellets should retain force enough to penetrate a certain number of sheets of brown paper. As the shot pass along a barrel driven violently forward by the powder gas, it is probable that the edges of the charge are retarded by friction against the sides of the bore, so that the centre portion extricates itself rather sooner than the edges, and travels with a slightly higher velocity. Supposing the charge to retain an average velocity, on reaching the object fired at, of 300 feet per second, and the leading pellets to have gained 10 feet on the hindmost ones, so that the charge is distributed over a length of 10 feet, a period of time of $\frac{1}{30}$th of a second will elapse between the blows of the first and last pellet. If the object be stationary, this interval will be almost imperceptible, and the pattern made on the target by the impact of the shot will exhibit no trace of it. But if the object be a bird flying across at the rate of 60 feet per second (about 40 miles an hour), it will traverse a space of 2 feet in the interval, and so will not receive the charge at all in the manner shown on the target. Figs. 8, 9, 10 show some of the choke bores fancied by different makers.[1]

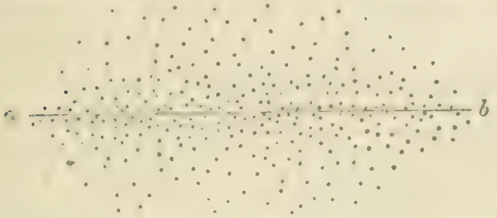

Fig. 6.

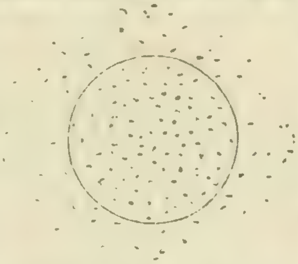

Fig. 7.

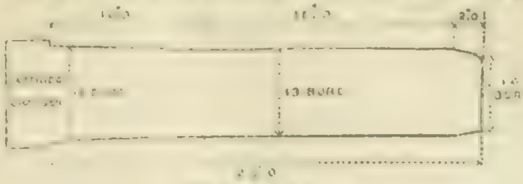

FIG. 8.—Plain choke.

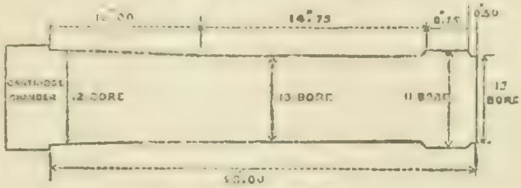

FIG. 9.—Double choke.

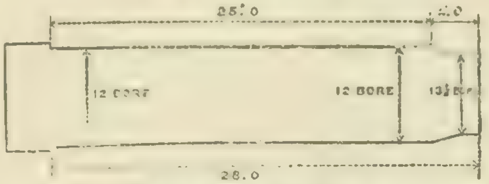

FIG. 10.—Greener's choke.

Sporting rifles.

The manufacture of sporting rifles does not greatly differ from that of shot guns. Greater strength and weight of barrel are necessary to resist the pressure of the charge, withstand the wedging action of the bullet, and deaden the recoil. The breech-closing action also demands greater strength, but the general arrangements are not different in principle. Rifles for sporting purposes differ from military pieces in being double-barrelled, and in requiring accuracy and penetration at short ranges, instead of a flat trajectory at very considerable distances. Hence they generally resemble the shot-guns in their action, and fire more powder in proportion to the weight of the bullet than military rifles.

In fig. 11 the treble grip snap action is shown as specially devised for rifles firing heavy charges. In addition to the holding power thus provided, a piece is sometimes made to extend from the rib between the barrels, terminating in a projection which catches in a recess in the top of the false

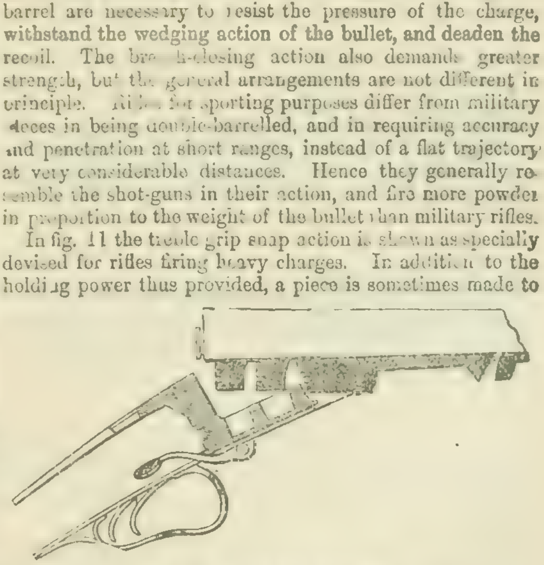

FIG. 11.—Treble grip snap action.

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[1] No accurate or crucial experiments have as yet been carried out to determine the true action of these forms, but the editor of *The Field* is now preparing instruments and endeavouring to approach the subject in a scientific manner. The general principles, as far as they can be gathered at present, are, that enlarging or relieving the barrel slightly reduces the friction and allows the shot to acquire greater velocity, while choking the barrel at the muzzle has the effect of directing the outer pellets inwards, and so concentrating the charge.

breech, when the barrels are closed; or the catch shown in fig. [illegible] may be adopted. Some makers, instead of using the hinge principle introduced by Lefaucheux, close the breech in other ways; thus in the Henry action the barrel does not move, but is closed at the breech end by a sliding vertical block, which is depressed for the admission of the cartridge by a lever underneath the trigger guard; the striker passes through the block, which on being lowered extracts the cartridge. The power of a modern rifle is limited only by the power of the shooter to withstand the effect of recoil and to use a heavy piece. The momentum of the bullet forwards up to the time of its leaving the muzzle is equal (neglecting the weight and motion of the gas generated by the powder charge) to that of the gun backwards at any instant. Supposing the gun to weigh 150 times as much as the bullet, it will acquire a velocity against the shoulder equal to the 150th part of that acquired by the bullet. Practically it is this velocity which measures the severity of the recoil, and the heavier the gun and the more powerful the shooter the more momentum can he afford to impart to his bullet. This momentum may be composed of high speed and low weight, or of low speed and high weight. A light bullet starting with a high velocity travels fast at first and drops but little at a short range; it speedily, however, suffers retardation by the resistance of the air, and would soon be beaten by a heavier bullet of the same diameter starting with the same momentum. The Express rifles carry out this principle with great completeness, employing heavy powder charges and imparting very high speed to a light bullet, so that a range of about 130 to 150 yards is traversed with a drop not exceeding 1 foot. Fig. 12 shows the nature of bullet generally used for these pieces; the hollow in the centre permits the lead to expand and flatten out on striking, inflicting a wound of great severity. Explosive bullets are also employed by some sportsmen. In fig. 13 are shown rifle cartridges loaded ready for use. The solid brass drawn case is now almost universally adopted, both for sporting and military purposes. The Martini-Henry rifles used by the British army, however, still use the soft brass-crimped case.

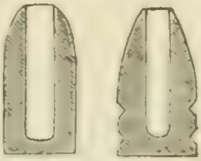


Fig. 12.

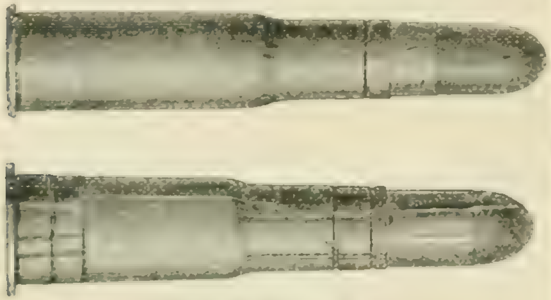


Fig. 13.—Rifle cartridges.

Military rifles. *Military Rifles.*—The principle of rifling small arms seems to have been discovered about the beginning of the 16th century, but does not appear to have been employed for warlike purposes till the middle of the 17th. In 1680 each troop of lifeguards was supplied with eight rifled carbines. In 1800 the 95th regiment, now the rifle brigade, was armed with a 20 bore muzzle-loading rifle. The difficulty of loading a rifle after firing a few rounds was the great obstacle to its use in the field. Several methods were devised of providing means at the bottom of the bore on which a loose ball dropped in could be hammered to fit the grooves, but the principle of expansion by the action of the powder was not brought forward till 1836, when Mr Greener submitted an egg-shaped bullet, having an opening at one end to receive a conical plug, which when driven home by the gas expanded the bullet into the grooves. Shortly after this the French chasseurs were armed with a rifle throwing an elongated bullet with a hollow-coned base. This was improved by Captain Minié, who added an iron cup to fit into the cone and expand it when forced home by the gas. For this cup a wooden plug was substituted in the three-grooved Enfield rifle in 1855. About this time Sir J. Whitworth brought forward his hexagonal rifling, the guiding idea of which was that every part of the hexagon except the actual corner should do its share of the work of giving rotation. He proposed for a barrel 39 inches long a bore of ·45 inch, having one turn in 20 inches. This was intended to be suitable either for an expanding bullet, or for one possessing an easy mechanical fit. The length of the bullet was increased, and the form thus modified suffered much less from the resistance of the air than the previous patterns. The question of breech-loading for military weapons now began to assume importance. About 1841 the Prussians had adopted the needle gun, a breech-loader on the bolt principle. It was a rough weapon compared with the pieces lately introduced, but a great advance on any known at the time. A conical bullet rested on a thick wad, behind which was packed the powder, the whole being enclosed in strong lubricated paper. The detonator was in the centre of the hinder surface of the wad, so that to explode it a needle had to be driven forward from the breech through the base of the cartridge and through the powder. This was accomplished by the action of a spiral spring, when set free by the pulling of the trigger. This arrangement possessed many defects: the gas escaped freely at the breech; the long needles rusted and broke; the springs failed; and the weight of the piece was excessive. Such failings caused the sterling merit of the principle to be underrated, and it was not till 1864 that a committee of officers recommended the introduction of breech-loading arms for general adoption in the British army. The triumph of Prussia in the Seven Weeks' War with Austria in 1866 at once drew attention to the urgency of the case, and caused all civilized powers to re-arm their troops. In England the Enfield rifles (three-grooved expanding bullet muzzle-loaders) were converted into breech-loaders by the adoption of the Snider method, which consisted in cutting away 2 inches of the upper part of the breech end of the barrel so as to admit the cartridge, which was pushed forward into a chamber formed by enlarging the end of the bore. A block, opening on a hinge, was then shut down to fill up the space behind, forming a false breech against which the base of the cartridge abutted. The striker consisted of a needle passing through this breech block; when struck from behind by the hammer it was driven against a cap in the base of the cartridge, exploding the charge. By this means the existing rifles were rapidly converted, and the army was provided with a breech-loader of satisfactory efficiency should any emergency arise. Proposals were then invited, and a number of inventions submitted, the result of which was that in 1869 the combination of the Martini breech action with the Henry barrel was decided on for future manufacture, and the whole of the British army is now provided with these weapons (see figs. 14, 15, 16, 17). The general principles of manufacture are the same for all kinds of military breech-loading rifles. It will be sufficient to give the details of one *in extenso*.

The manufacture of the Martini-Henry rifle, as carried out at the Government factory near Enfield, involves 2004 separate operations which have to be performed on each rifle before it is complete for issue. This number is subject to slight variations caused by changes of pattern from time o time. It will be sufficient if the principle of these operations are described, without entering minutely into details.

The rifle is composed of three parts :—the barrel, carrying the sights ; the stock, into which fits the cleaning rod ; the body, containing the lock and breech action. The soldier is also provided with a bayonet to fit on the muzzle.

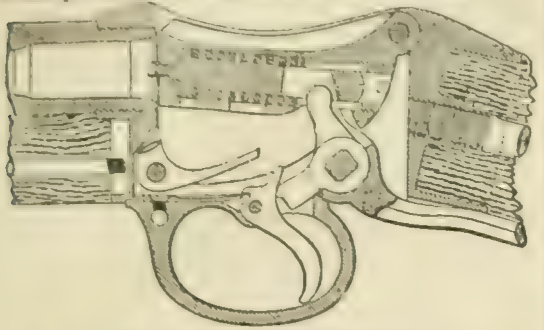


Fig. 14.—Martini breech action (closed).

Barrel. The *barrel* is made of mild steel manufactured on the Siemens principle. Cylinders of this material, 16 inches long and $1\frac{1}{2}$ in. thick, are supplied by contract, and tests are made of a proportion from time to time. These cylinders are first rolled in the factory to a long cone, having slightly greater dimensions than the exterior of the finished barrel. The cylinder is heated in the furnace and passed straight through a series of eight pairs of roll ; each pair is grooved to receive it, the grooves becoming narrower and shallower as each successive pair is reached. The pairs are alternately vertical and horizontal ; when they are in full work they can roll about 250 cylinders per hour.

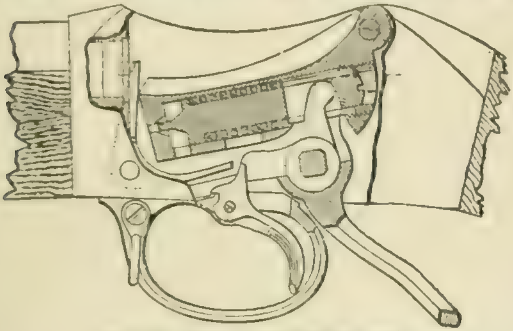


Fig. 15.—Martini breech action (open).

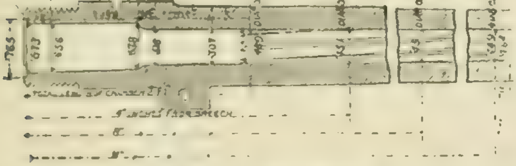


Fig. 16.—Henry barrel.

The cone is next placed between friction rollers ; these are set at a slight angle, so that in revolving they pass the cone along slowly. It emerges from their clutch polished with the compression, and showing their action by a close spiral traced on the surface. We have now a solid piece of mild steel, slightly thicker than the barrel, fairly straight and thoroughly well-consolidated.

The next step is to obtain true bearings for boring the interior and turning the exterior. The cone is placed in a clamp milling machine, and the ends milled down. This operation requires some judgment ; the milling-down of the ends must be so performed that the centres shall be approximately true centres ; that is, the amount of metal to be subsequently turned down off the exterior of the barrel shall be about equal all round. The ends, when milled down, serve for bearings by which the cone is next held horizontally, and drilled in a double-acting machine for $1\frac{1}{4}$ in. ; these act as centres when the barrel is placed vertically and drilled through from each end. Three tools are used, the last being of slightly greater diameter than the others. A shoulder is left in the centre to avoid the inconvenience of the tools from opposite ends not exactly meeting in the middle, as might be the case with the long slender drills necessarily employed. This shoulder is removed by a square tapered tool or "bit." We have now a cone slightly larger than the barrel, with a hole through it ·433 in. in diameter. This hole is then bored out to ·444 inch. Having now got a true inside, the next step is to obtain a true outside from it.

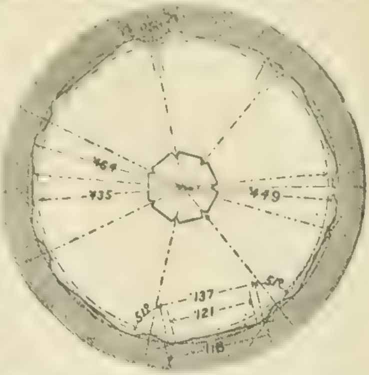


Fig. 17.—Henry rifling (true size and magnified).

The cone is placed vertically in a machine, the lower end fitting accurately on a pin, the upper end passing loosely through a hollow chuck, which revolves round a centre in truth with the centre of the pin and the axis of the bore of the cone ; the exterior of the cone, being slightly irregular, will be out of truth ; sulphur therefore is melted and poured into the hollow chuck, filling up the space between the interior of the chuck and the exterior of the cone, and hardening on cooling. The chuck then holds the cone by the outside in truth, and serves as a bearing. The cone is then placed in a lathe, and two or three short cuts taken off the outside as bearings for the rough turning. This is called "spotting." It is now rough and finish turned, the outside becoming concentric with the inside ; and the cone becomes a *barrel*.

It is next tested for truth of interior. Two tests are employed,—the first being that by *shading*. The barrel is placed in a rest, so arranged that the eye looking through the tube sees the straight line of the top of a window cutting horizontally across the aperture a little above the centre. If the barrel is accurately straight and brightly polished, the shadow thrown by the dark window-frame down the tube appears as in fig. 18. The interior circle shows the window as seen through the barrel, with the dark frame cutting across ; the next circle shows the shadow extending in a cone from A to B and C. This shadow is quite dark, and AB, AC are quite straight. BC is a portion of the arc cutting off the shadow sharply at a point half-way down the barrel.

Testing barrels.

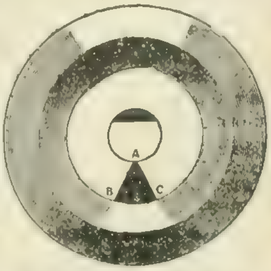


Fig. 18.—Testing by shading.

There are two outer circles extending to the eye, and approximately resembling the sketch in shading. If the barrel is untrue in interior surface, or bent, the cone will at once lose its regularity, and the sides AB, AC will no longer be straight. Should they be irregular, the barrel is "set" by striking with a hammer or [illegible] mallet across a setting block.

The barrel is next placed in a machine, and a horizontal spindle is run through it; on this spindle are two close-fitting [illegible], one in the centre and one at the end; the barrel is then caused to revolve on the spindle, and an indicator with a long arm recording small graduations is inserted at the free end between the spindle and the barrel; any irregularity of turning is multiplied 200 times by the long arm, and becomes at once apparent.

After passing these tests the barrel is finish-turned; the back sight is soldered on and screwed, and the fore sight is brazed on; the size of bore is then gauged, after which the process of polishing is completed and the barrel is ready for rifling.

Rifling. The rifling consists of seven grooves of the form shown in fig. 17. The twist is such that the bullet makes one complete revolution while travelling 22 inches; that is, one turn in [illegible] calibres of 0·[illegible] in., to employ the phraseology generally applied to the rifling of cannon. Each groove is cut separately by a tool which acts when pulled; it forms the groove by five successive cuts, being forced to project a little more at each cut; it thus passes thirty-five times up and down the barrel to complete the rifling, which can be done in half an hour. The size of bore is now finally tested; it must lie between 0·449 and 0·451 inch. The rifling is carefully tested, and the twist gauged.

Cartridge chamber. The breech end of the barrel is next chambered out to receive the cartridge, which is of the kind known as "bottle-shaped." The exterior of the breech end is of "Nock's" form, the upper [illegible] being [illegible] to the bore. This [illegible] the [illegible]; the barrel is placed in a machine [illegible] and the sights are gauged for line and elevation. No allowance is made for the deflection due to twist of rifling, it being very slight. The barrel is lastly screwed at the breech end to fit the body.

Proving. Each barrel is twice subjected to proof by powder, once before rifling, once after. Sixteen are placed in a cast-iron frame, a temporary steel screw, furnished with a vent, closing each breech end, which rests against a leaden bar. The barrels are loaded from the muzzle; a train of powder ignited by a cap fires them simultaneously; the bullets are caught in a [illegible], shaped like the shell of a snail. The charge for the first proof is 7½ drs. (=205 grs.) of powder and a bullet weighing 715 grs., secured by a [illegible] oak wad rammed down over it. The second proof is the same, except that only 5 drs. (=137 grs.) of powder are used. The service charge is 85 grs. of powder with a bullet of 480 grs.

The barrel when finished is browned by being coated with browning mixture, and caused to rust in a steam tank; it is then brushed with wire brushes. This process is repeated four times, after which the exterior is oiled over. The browning mixture consists of—

Spirits of wine	5 oz.	Corrosive sublimate	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Tincture of [illegible]	8 „	Water	1 pint.
Nitric acid	[illegible]		

Stock. The stock is in two parts,—the butt and the fore-end. They are of Italian walnut wood, and are supplied roughly shaped. They are tested for straightness of grain, weight, [illegible] [illegible]; [illegible] by [illegible] the wood has grown; [illegible] would [illegible] by putting a [illegible] of nitrate of silver, and also for appearance. Those accepted are thoroughly seasoned by keeping, or dried in a desiccating chamber, warmed by hot air; they then go to the shaping machines, where they are cut to size by revolving cutters, making 4000 revolutions per minute, and are afterwards turned in copying lathes, hollowed out by copying gauges, and bored to take the fittings. They are then tested, machined, hand-finished, and oiled up.

Body. The *body* is of mild steel; it is stamped out from the bar; it is then drifted through by a slightly tapered bar carrying a succession of cutters on it. The front part of the body is then screwed to suit the screw on the barrel, so that when home it shall fit accurately to the breech end. The lever, and indeed all parts except screws and springs, are stamped out of solid bar. Each part is milled by machinery to a correct fit; every fitting is interchangeable, and nothing is marked for selection to fit anything else. Each part is browned in the same way as the barrels, or blued.

On completion all parts are taken to the assembling room, where they are fitted together, screwed up, and turned out as finished rifles; after which they are taken to the practice ground, and tested for accuracy and extraction of cartridge by being fired from a rest at a target, the range being 500 yards.

Bayonet. The *bayonet* consists of a steel blade welded to a wrought-iron socket. Steel of a superior quality being used, it is supplied in bars, is cut into lengths, and is welded by the aid of borax to a short rod of wrought iron. The two are so put together as to form a right angle; the steel bar is put into a "Ryder" [illegible] machine, which gives it a great number of rapid blows and shapes it roughly into a blade. It is then rolled and cooled gradually under charcoal and coal-dust for annealing purposes. The socket is then drilled, and the blade ground. They are then bent into position as [illegible] bayonet. Turning and [illegible] being complete the sockets, while the blades are fine ground, hardened, tempered, tested, and polished. The sockets are then browned and adjusted to the rifles.

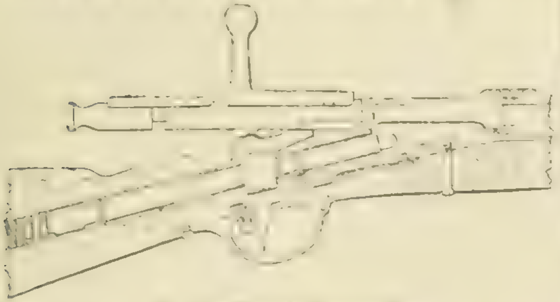
About 1000 operatives are employed at the Government factory; each Martini-Henry rifle costs about [illegible], all expenses [illegible] and to render the establishment thoroughly [illegible] the out-turn should be about a rifle a week per man.

The systems of breech-loading muskets employed by various different nations are shown in the following table:—

Country.	System.	[illegible]	[illegible]
Austria	Werndl	5	[illegible]
Bavaria	Werder	4	[illegible]
Denmark	Remington ..	5	[illegible]
England	Martini-Henry	4	[illegible]
France	Gras ..	4	[illegible]
Germany	Mauser ..	4	Do.
Italy	Vetterli	4	Do. [illegible]
Russia ..	Berdan	5	[illegible]
Spain .	Remington	5	[illegible]
Sweden ..	Do.	5	[illegible]
Switzerland	Vetterli	4	[illegible]
Turkey	Martini-Henry	4	[illegible]
United States	Springfield	5	[illegible]

It will be noticed that the Vetterli gun, used by the Italians and Swiss, is a repeater or magazine gun. It contains a supply of eleven cartridges, arranged in a tube running under the barrel, and forced by a spring into the breech [illegible] one by one, as the previously fired empty case is ejected. The [illegible] thus has twelve rounds with great rapidity without reloading; it can also be used as an [illegible] and the [illegible] This is [illegible] a great [illegible] but [illegible] the V[illegible] with [illegible] as the M[illegible] at the m[illegible] the [illegible], a proportion which [illegible] the magazine [illegible] the r[illegible] ranges, [illegible]

[illegible] Government of the U[illegible] magazine rifles, [illegible] Hotchkiss [illegible] piece. [illegible] 19. The magazine is [illegible] five cartridges, which [illegible] the chamber ready for loading. These cartridges [illegible] used for Government Springfield rifles. [illegible] by a [illegible] the magazine is empty, or a single cartridge


[illegible]—Hotchkiss Magazine Gun.

can be inserted after each round as in an ordinary breech-loader. The action of bringing the knob-handle upright and withdrawing the bolt extracts and throws out the emptied cartridge to the side; the next cartridge is then pushed up into the loading position by the spring, and is forced into the barrel when the handle presses the bolt forward; this action also cocks the piece, but the striker cannot reach the cartridge till the knob-handle is turned down, and the bolt thus locked in position. The weight of the piece fully loaded is $9\frac{1}{2}$ lb. Trials of this weapon are about to be made by the English Government.

Of all the military rifles adopted by the various Governments, the Martini-Henry is the most powerful; the practical test it underwent in Turkey, where a cheap gun of this pattern was supplied on contract by an American firm during the war of 1877–78, was most satisfactory.

Pistols.—These handy little weapons were formerly made as single or double-barrelled smooth-bored muzzle-loaders, and their system involved no departure in principle from the ordinary firearm of the day. The introduction of the revolver as a practical weapon was a great step in advance; the idea is old, and roughly constructed weapons on the same plan have long existed in museums of old arms; Colonel Colt of the United States revived it, and is the father of the modern revolver. In his pistol a revolving muzzle-loading cylinder contains a number of chambers, usually five or six, bored from the front parallel to the axis; the back of the cylinder is left solid, and forms the breech; a nipple is screwed into each chamber. As the cylinder revolves, each chamber arrives at the top, and is then opposite to a barrel; the pistol is cocked by the thumb, an action which locks the chamber against the barrel, so that the two form a continuous bore; the trigger is pulled in the usual way, and the hammer brought down on the upper nipple, exploding the charge in the top chamber. The action of recocking brings the next chamber into position. When cocked back, the cylinder revolves freely. Since Colt's time great improvements have been made in these handy weapons; the trigger was made to cock the hammer, turn the cylinder, and fire the charge by one continuous draw; this enabled the shooter to fire all the shots very rapidly without leaving his hand; the strength of pull required, however, rendered it very difficult to shoot with any degree of accuracy, especially as the exact moment when the hammer would fall was hard to estimate. A second improvement gave the shooter the choice of cocking the hammer and firing it in the usual way, if he preferred it. The next step was to make the chambers breech-loading by boring them right through, and packing the powder and bullet in a strong based cartridge, carrying its own ignition. In pistols constructed on this plan the chamber arriving at the top is brought against a false breech through which the striker is driven by the hammer. In the latest pattern of this pistol, the cylinder and barrel open away from the false breech on a hinge underneath; the action of opening throws out the empty cartridge-cases. If the user is on horseback, he thrusts the barrel muzzle downwards into his breast, belt, or holster, the hinge remaining open; fresh cartridges are taken out of the pouch and placed in the chambers; the breech is closed sharply on the hinge and is held by a snap-catch; the pistol is then withdrawn ready for use. All this can be very quickly done with one hand at full gallop.

MACHINE GUNS.

This term comprehends all weapons made to fire a rapid succession of bullets from a stand or carriage, so that, while requiring but two or three men to work them, they may throw in a fire equal to that of a detachment of infantry. In the Franco-German war of 1870 a species of *mitrailleur* was largely employed, and when used under favourable conditions attained fair success. It consisted of a number of barrels (usually 25 or 37) secured in a frame round an axis, and parallel to it. The barrels were open at the breech, and were loaded by a disc pierced to correspond with them containing a cartridge in each chamber. This disc was placed against the breech end of the barrels, the false breech containing the strikers was held firmly against it, and the whole of the charges were exploded at once. This arrangement had many defects. The recoil of so many charges fired simultaneously required strength and weight; at short ranges the bullets all went to the same spot; the number of rounds could not be regulated at pleasure; and only volleys could be fired. The Gatling machine gun, which first appeared in the United States, was vastly superior to the mitrailleur, and speedily obtained entrance into the armies of most of the civilized powers. Figs. 20 to 26 show the general construction of the weapon. In fig. 20 the Gatling is ready for firing. A block of ten barrels is secured round an axis, which is fixed in a frame *aa*. On turning the handle *h* (fig. 21), the

Mitrai leur.

Gatling gun

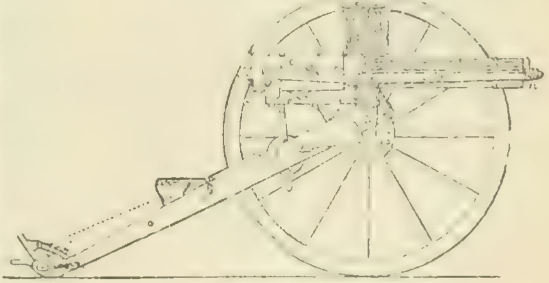


Fig. 20.—Gatling Gun.

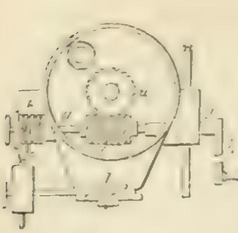


Fig. 21

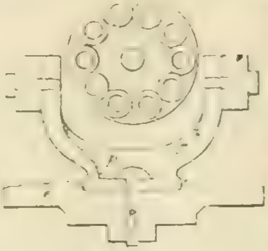


Fig. 22

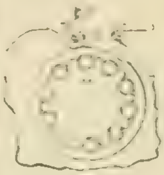


Fig. 23.

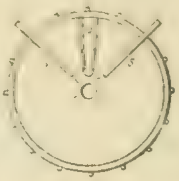


Fig. 24.

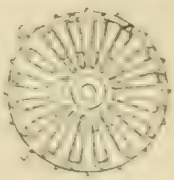


Fig. 25.

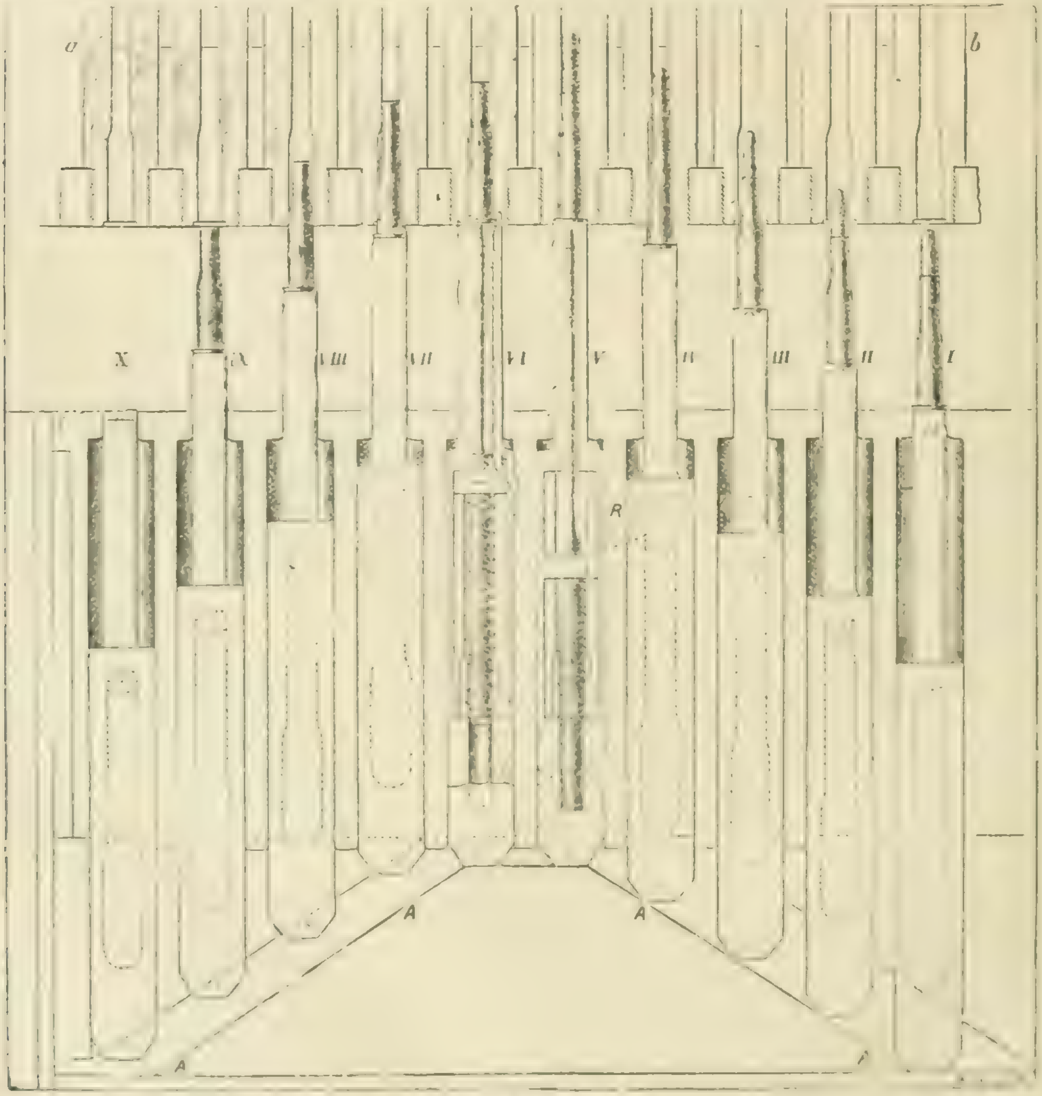


Fig. 26.—Lock of Gatling Gun.

spindle g causes the worm f to act on the pinion w, making the axis and barrels revolve. A drum T (figs. 20, 24, 25) is placed on the top at the breech end of the barrels over a hopper, through a slot in which the cartridges drop into the carrier, which consists of ten grooves or chambers M (fig. 23) corresponding to the ten barrels. The construction of the lock is shown in fig. 26. It consists of a bolt, through which passes a striker driven by a spiral spring. AAAA is a cam, sloping as in the drawing, which it must be understood represents the circular construction opened out and laid flat. As the barrels, carrier, and locks revolve, the slope of the cam forces the locks forward and backward alternately. At position I. the cartridge has just fallen into the carrier, the lock and bolt are completely withdrawn. At positions II., III., IV., the cam is forcing them forward, so that the bolt pushes the cartridge into the barrel. At IV. the cocking cam R begins to compress the spiral spring, releasing it at V. Position VI shows the cartridge just after firing, the extracting hook, omitted in the previous positions, is here represented in the act of clutching the base of the cartridge case, which is withdrawn as the locks retreat down the slope of the cam, till at X it falls through an aperture to the ground. The line *ab* marks the commencement of the rifling. In fig. 20 the drum T consists of a number of vertical channels radiating from the centre. The cartridges are arranged horizontally, one above the other, in these channels, bullet end inwards. The drum revolves on the pivot *b* (fig. 23), and the cartridges fall through the aperture B. When all the channels are emptied, a full drum is brought from the limber, and substituted for the empty one. Each barrel fires in turn as it comes to a certain position, so that by turning the handle quickly an almost continuous stream of bullets can be ejected. An experimental pattern of Gatling has been lately tried, fitted with a multiplying arrangement which could be made to fire nearly 1000 shots a minute. In fig. 21 an automatic traversing arrangement is shown, which can be put in or out of gear as desired, and by means of which the amount of traverse can be regulated. The spindle *gg* turns the wheel A, projections on which act on the arm F, and traverse the breech through a small arc, thus spreading the bullets laterally over the required front.

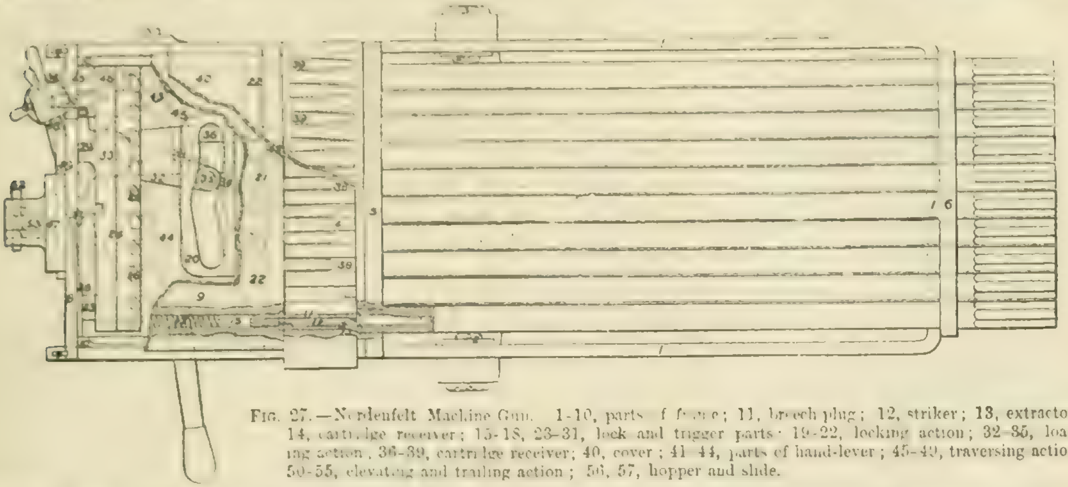


FIG. 27.—Nordenfelt Machine Gun. 1-10, parts of frame; 11, breech plug; 12, striker; 13, extractor; 14, cartridge receiver; 15-18, 23-31, lock and trigger parts; 19-22, locking action; 32-35, loading action; 36-39, cartridge receiver; 40, cover; 41-44, parts of hand-lever; 45-49, traversing action; 50-55, elevating and trailing action; 56, 57, hopper and slide.

Effective though this piece is for land service, especially in defending approaches, it is scarcely suitable for the navy, as the mobility of the boats or vessels carrying it causes immense waste of ammunition, it being impossible to fire more than a few rounds at the object before an important change of direction occurs.

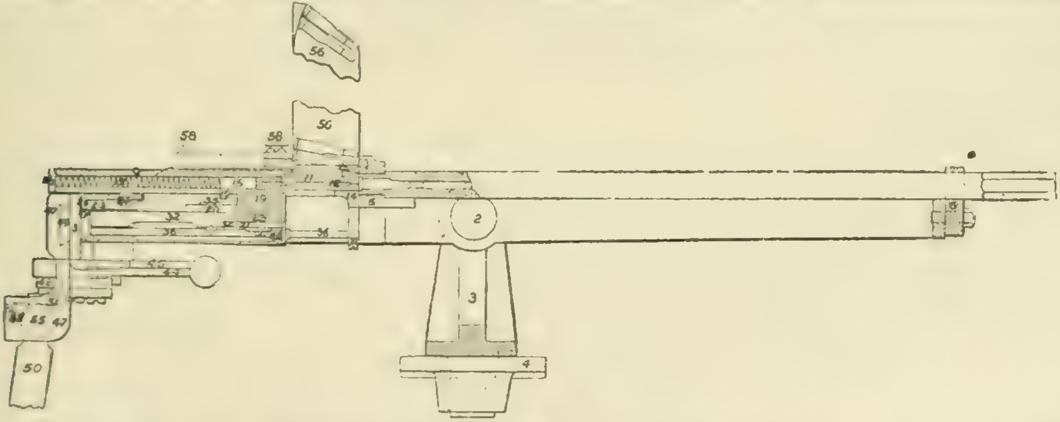


Fig. 28.

Nordenfelt gun.

The Nordenfelt machine gun, shown in figs. 27 to 31, is found specially suitable under these circumstances. The barrels are here placed horizontally, and have no movement. A box containing the locks, bolts, strikers, and spiral springs, one of each corresponding to each barrel, moves straight backwards and forwards when worked by the handle of the lever on the right. When the box is drawn back the cartridges fall from the holder on the top into the carriers simultaneously. When the box is pushed forward the bolts push the cartridges into the barrel, cocking-catches compress the spiral springs, the lever releases the catches one after the other at very minute intervals of time, and the cartridges are fired in rapid succession. In this piece, careful aim can be taken from a moving platform, and at the right moment the barrels can be fired at the object almost simultaneously; they could be made to fire at the same instant,

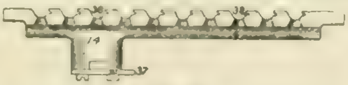


Fig. 29.

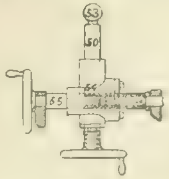


Fig. 30

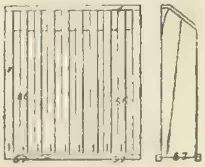


Fig. 31.

but in this case the advantage of being able to fire single shots would be lost, and the recoil would be increased. The gun would probably never be able to fire with such extreme rapidity as the experimental form of Gatling mentioned above, but it could be made to fire six or seven hundred rounds a minute. It is generally considered that a machine gun should be able to fire easily two hundred rounds in half a minute.

ORDNANCE.

Ordnance. The manufacture of ordnance is a much more scientific and complicated study than that of small arms. As the forces increase in magnitude and intensity, while the ultimate strength of material remains constant, the nicety of adaptation of means to ends grows *pari passu* with the guns. In producing a piece of ordnance, two distinct sets of conditions are involved—those belonging to its actual construction, and those by which its proportions are regulated. In constructing a gun, the material must be so selected and disposed as economically and safely to sustain the effect of the forces developed by the charge; in designing a gun, it is necessary to know the nature and direction of the forces which will combine to produce the desired ballistic results. The two sets of conditions are as distinct as those involved in the separate operations of writing and printing this article.

Construction. CONSTRUCTION.—Nearly all the accurate knowledge as yet obtained of the true action of gunpowder has been acquired within the last twenty years. The general idea previously held was that the explosion was instantaneous, and that the more violent the powder the greater would be the velocity of the projectile. The mode of proving the quality of the explosive was to place a small quantity in a short mortar, and to measure the distance to which it projected a light shell—a test altogether wrong in principle, as will be shown later on. No accurate idea had been formed of the true pressure of the powder gas on the bore during discharge, but it was understood that a gun was subjected to two principal strains or stresses—a circumferential tension tending to split the gun open longitudinally, and a longitudinal tension tending to pull the gun apart in the direction of its length.

Homogeneous guns When guns are made of cast metal, and are, in fact, homogeneous hollow cylinders, a limit is soon reached beyond which additional thickness is practically useless in giving strength to resist the circumferential tension. Supposing the metal employed to be incompressible, each concentric layer would take up a strain on discharge inversely proportionate to the square of its distance from the axis of the bore. Every metal, however, is compressible as well as extensible, and hence the exterior always affords more support to the interior than the foregoing rule indicates. The great aim then of a gunmaker is so to select and arrange his material that the exterior shall take up as much as possible of the strain thrown upon the interior.

In America, Captain Rodman introduced a method of casting guns hollow and cooling them down from the interior, so that the inner portions being first solidified were compressed and supported by the contraction of the outer parts when they subsequently cooled down. Thus, on discharge, the compressed inner portions expanded under the action of the powder gas to or beyond their natural diameter, throwing at once the strain on the outer portions which were already in a state of tension. But however well cast iron may be disposed, it is naturally too weak and brittle for use with heavy guns, and those nations which employ it thus do so because it is comparatively cheap and easy to manufacture, and not because it is the best material. Austria and Russia have of late years made light guns of bronze cast in chill, and subjected to the wedging action of steel mandrils driven through the bore. The several layers of the metal are thus placed in a state of tension as regards the exterior, and of compression as regards the interior. At the present day systems of building up guns have been devised so that each portion of the metal is made to bear its fair share of the strain.

The longitudinal tension is usually less important than the circumferential stress. It is considered to be provided against in homogeneous guns if the metal is as thick over the bottom of the bore as round the end. The strain is now measured by calculating the total pressure of the powder gas on the bottom of the bore, and comparing it with the area of the transverse section of the gun at the same place. This is not absolutely correct; but, practically, the chief modes of gun construction now adopted leave a considerable margin of strength in this direction.

Built-up guns. Sir William Armstrong first successfully employed the principle of initial tensions for all parts of a gun. In his system, wrought-iron coils are shrunk over one another, so that the inner tube is placed in a state of compression and the outer portions in a state of tension, an endeavour being made to so regulate the amount of tension that each coil should perform its maximum duty in resisting the pressure from within. Further, he arranged the fibre of the several portions so as to be in the best positions for withstanding the pressures. It must be noted that wrought-iron bar is about twice as strong in the direction of the fibre as across it. He therefore constructed the exterior of the gun of coiled bars of wrought iron welded into hoops and shrunk one over the other, thus disposing the fibre to resist the circumferential strain. These outer coils were shrunk over a hollow cylinder of forged iron, having the fibre running lengthways so as to resist the longitudinal strain. Within this cylinder or forged breech-piece was placed a steel tube, gripped in like manner by shrinkage. **Shrinkage.** This grand principle of modern gun construction is carried out by turning the inner coil in a lathe to an exterior diameter slightly greater than the interior diameter to which the outer coil is bored. The outer coil is expanded by the application of heat, and slipped over the inner one. It contracts on cooling, and if the strength of the two coils is properly adjusted, the outer will remain in a state of tension, and the inner in a state of compression. On this view, the ideal gun would be constructed of a vast number of excessively thin rings so shrunk over each other that, on discharge, each should be equally strained. An attempt has been made by Mr Longridge, M.I.C.E., to approximate to this condition by winding steel wire under tension round a steel tube. This system, though possessing much ingenuity, has never made way, and might possibly be found wanting in longitudinal strength.

Great success attended the early introduction of the coil principle. Guns of considerable size were made: the largest weighed as much as 23 tons, and projected a 600 lb shot with a fair velocity. It was found, however, that much difficulty attended the accurate shrinking of a number of thin rings, and that occasionally one or more of the outer ones would be strained to cracking, while the inner ones were intact. The original mode of construction was therefore modified, as experience was gained in the Government factory at Woolwich. Acting under General Campbell, R.A., Mr Fraser, M.I.C.E., thickened the coils, and extended their use to the breech piece, it being found that the longitudinal disposition of the fibre in that part was not required to sustain the longitudinal strain, and that the steel tube forming the bore was better supported by coils.

The manufacture of ordnance at Woolwich and Elswick may be briefly described as follows. Steel cylinders, slightly larger than the exterior dimensions of the inner tubes are supplied by contractors. They are tested for quality of metal and toughened after being bored, by being heated to the temperature necessary for them to be most suited to the particular purpose, and then plunged in oil. They are subsequently tested by water pressure at 4 tons

Fig. 32.

per square inch. The tubes are not bored quite through from end to end; a solid end is left to form the bottom of the bore. The rest of the gun is made of wrought iron. The material is chiefly received from the contractor in the form of wrought scrap, but a certain proportion of iron

Fig. 33.

puddled in the works is used also. Blooms of these materials are rolled into flat bars, which are fagoted together and rolled into long bars of the section required for the part of the gun for which they are intended. These bars are then placed in a long narrow reverberatory furnace,

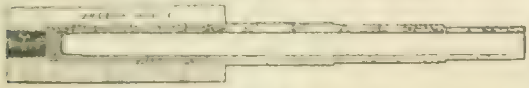


Fig. 34.

Coiling. and raised to a bright red heat. When ready for coiling, one end is drawn out and fixed to a revolving mandril, which pulls the bar out and winds it into a coil, like rope round a capstan. Sometimes a second bar is wound round outside the first coil; in this case the mandril is made to

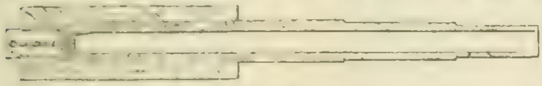


Fig. 35.

revolve in the opposite direction. The coil is next placed upright in a reverberatory furnace, and raised to a white or "welding" heat. In this state it is placed under a steam hammer, and welded till it becomes a compact hollow cylinder. On cooling it is bored and turned to the proper

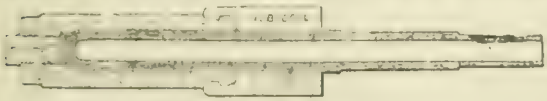


Fig. 36.

dimensions. Two parts of the gun are made of forged iron (not coiled),—the cascable screw which supports the breech end of the tube, and the hoop which carries the trunnions. The latter is either welded to the outer coil or shrunk on.

Figs. 32-39 show the method of building up Woolwich

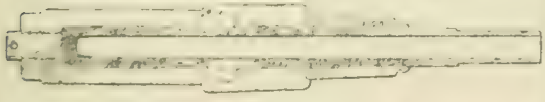


Fig. 37.

Building up. ordnance as exemplified in the 80-ton guns. The various coils are hooked together by shoulders to prevent slipping or distortion from the shock of discharge. Thus, in fig. 36, shoulders are turned on the exterior of the breech piece and inside the 1B coil; the latter is expanded by being raised to a dull red heat and slipped over the tube from the muzzle end. The expansion enables the shoulders to pass, and on cooling they grip each other as shown, while the 1B coil contracts on and slightly compresses the part of the tube within it.

Converted guns. A method of strengthening and utilizing as rifled guns some of the old cast-iron ordnance of the service has been largely employed to supply pieces of secondary power and excellent for land fronts and for practice. It was brought forward in its present shape by Sir W. Palliser in 1863, and is now being much used in the United States' gun factories. The cast-iron block or gun is bored out to the

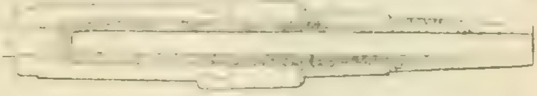


Fig. 38.

requisite dimensions, and a tube of coiled wrought iron is thrust into it; no shrinking is here employed, but a tolerable fit is ensured by accurate turning. When fitted, the tube is secured by a collar screwed in at the muzzle; a plug of iron passes through the under side of the gun into the tube near the trunnions to prevent any shift of position. The tube is in two parts, the breech end being turned down and a second tube shrunk over it. The bottom of the bore is formed by a wrought-iron cup, which is forged and stamped into shape under a steam hammer. A screw is

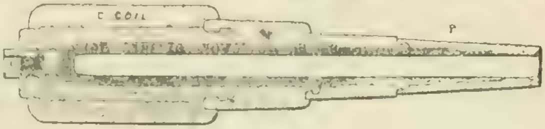


Fig. 39.

cut on the outside of the cup and inside the end of the tube; the cup is then screwed tightly home. The tube is next severely tested by water pressure, after which the second tube is shrunk on. The whole tube is then fitted into the cast-iron casing, the greatest care being taken that the breech end bears firmly home. The gun is now ready for rifling, and, after that operation is performed, undergoes proof by firing heavy charges, which expand the tube closely against the cast iron envelope, which then takes up the strain and affords the necessary support. The relation between the powers of the three classes of guns will be gathered from the following comparison :—

Nature of Gun.	Weight of Gun.	Weight of Projectile.	Weight of Charge.	Calibre.	Energy of Projectile at 1000 yards.	Energy of Projectile at 2000 yards.
	cwt.	lb.	lb.	ins.	foot-tons.	foot-tons.
Cast-iron 68 pr., smooth bore, .	95	68	16	8.12	298	136
Palliser 80 pr., converted from 68 pr. above, .	100	80	10	6.30	602	488
Wrought-iron 7-in. Woolwich gun, . . .	90	115	22	7.00	1042	811

Steel guns. The great German gunmaker, Krupp, employs nothing but steel in the manufacture of his ordnance. His earlier pieces were bored from solid blocks of this metal forged under heavy hammers. They were homogeneous, and therefore the exterior did not assist the interior to bear the strain of the powder gas on discharge to the extent which scientific methods of construction admit. Still the excellent quality of the material enabled the artillerist to get results from these pieces which have been surpassed only by the coil guns, and by Krupp's later productions. As, however, progress was made and the ratio of power to weight increased, it was found necessary to introduce a system of building up for steel ordnance also, and Krupp adopted the principle of shrinkage to which the English guns owed so

Krupp's construction. much. The interior of the recent German gun is a steel tube as in the Armstrong construction, but it is very much thicker and forms the body of the piece, instead of being chiefly used to provide a sound surface for the bore. It is thickest over the powder and shot chambers, tapering towards the muzzle (fig. 40). Over the thickest part, and in some guns over a considerable portion of the chase, hoops of cast steel are shrunk on,—the shrinkage being adjusted to bring the strength of the outer hoops into play to support the body of the gun on discharge. The number of hoops depends on the size of the gun and the severity of the strain it has to withstand; they are usually much more numerous than the English coils, and the section of a heavy Krupp gun presents somewhat the appearance of a stone wall. It is believed that the steel is not toughened in oil, but the details of manufacture have not as yet been made public.

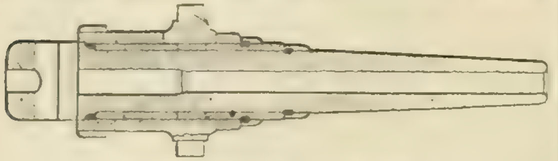


Fig. 40.—Section of Krupp Gun.

Steel of the excellent quality employed by Krupp is undoubtedly a stronger material than wrought iron; its present trustworthinesss is, however, of late date, and it has hardly gained the general confidence accorded to wrought iron. Possibly the method of construction adopted by Krupp, containing as it does a number of unwelded joints, scarcely permits the several parts of the guns to support each other as efficiently as is the case with the magnificent forgings of the coil system; be this as it may, the German pieces, though made of stronger and more expensive material than the English ones, are just as heavy for any given power, proportions and ammunition being similar.

In France and Italy a combination of cast iron and steel has been introduced with a view to economy. The interior of the gun is a moderately thick steel tube as in the coil guns; over this is a thick cast-iron body, corresponding to the steel body of the Krupp guns. On the exterior are shrunk steel hoops.

Sir J. Whitworth uses his fluid-compressed steel for the manufacture of ordnance. He forces massive hoops over a central tube, and over one another by hydraulic pressure or by shrinkage.

Mr Vavasseur employs Firth's crucible steel for his guns, which are built up somewhat in the same way as Krupp's. He also uses exterior coils of wrought iron in some patterns.

Systems of Loading.—The comparative advantages of breech loading and muzzle loading for ordnance on service are fully discussed in the article GUNNERY. We have now to mention the principal modes of closing the breech, either permanently as in muzzle-loaders, or temporarily as in breech-loaders. The former is comparatively a simple matter. When the whole gun, or the interior of it, is formed of cast metal, iron, bronze, or steel, the block is merely bored to the required depth, and the end left unbored to form the breech. Should the inner part of the gun be formed of wrought material, such as coils, it becomes necessary to close the end with some device which shall render it gas-tight and strong. Several kinds of cups and plugs have been tried for this purpose, the most successful of which is the cup already mentioned in the description of the [illegible] [illegible]. When we come to the temporary closing of the gun, as [illegible] demanded by breech-loading, a far more difficult problem presents itself. This problem has been more or less satisfactorily solved in a great variety of ways, but it will be sufficient to examine the three principal types or systems of breech-loading employed in modern artillery. They are popularly known as the Armstrong, the Krupp, and the French systems.

Armstrong breech loading system. The Armstrong system is the earliest of these in point of date. In it a slot is cut through the top of the breech of the gun into the tube at A (fig. 41); a breech block (fig. 43), through which the vent is driven, is dropped into this slot, and is pressed firmly against the bore from behind by the breech screw (fig. 42), which is provided with two powerful lever handles for the purpose. Where the breech block, or vent piece, as it is usually called, presses against the lip of the bore, both surfaces are of copper, and are renewed from time to time as channels are worn through between them by the rush of the escaping powder gas. There are many guns, from 6-pounders to 7-inch, made on this plan in the British service, and at the time of their introduction they constituted a great advance in gun construction. Experience in the field and at practice has, however, revealed many grave faults in them. No joint consisting simply of two abutting surfaces can be made so tight as to prevent the gas from escaping on the discharge of the piece; the pressure in the powder chamber is so great that a considerable expansion takes place for the moment, and permits a fan of flame to flash out. The eroding effects of gas in motion at high pressure are extraordinarily destructive, and constant necessity for repair arises from this cause. It has also been found that in rapid firing the breech screw may be too quickly forced home, nipping the vent piece before it has fallen into its proper position; the end of the bore is then not sealed, and important and perhaps dangerous accidents occur. Moreover, even with moderate sized ordnance, the vent piece becomes too heavy for convenient lifting.

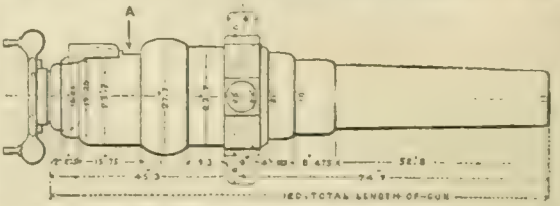


Fig. 41.—7-inch Armstrong Breech-loader.

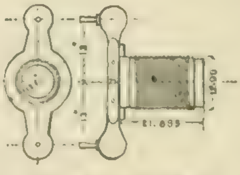


Fig. 42.—Breech Screw.

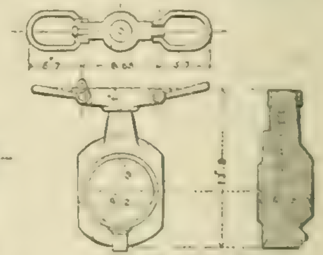


Fig. 43.—Vent Piece.

Krupp breech loading system. In the Krupp system (fig. 44), a slot is cut through both sides of the breech of the gun; in this slot, in the latest patterns, runs a cylindro-prismatic wedge, or, in other words, a wedge of D section, the round side to the rear. The flat side forms the bottom of the bore. For loading, the wedge is pulled out to the left side of the piece as far as the stop will allow it to go, the shell and cartridge are thrust up the gun from behind, the wedge is pushed in, and is pressed hard home and secured by an ingeniously-contrived screw with powerful handles. As was mentioned with regard to the Armstrong system, no amount of pressing home and screwing would by itself be of any avail in pre vent the escape of gas at the breech, and a special arrangement is therefore provided for this purpose (fig. 45). The end of the bore is enlarged, and into the recess thus formed fits a Broadwell ring, against which the face of the wedge abuts when forced home. The ring is so formed that it must always fit against the wedge, and be pressed firmly to it by the action of the gas on firing. This is accomplished by making the recessed surface of the gun and the exterior surface of the ring portions of a sphere. In spite of the theoretical perfection of the system, and the excellence of manufacture attained, it has always been found that after a time—after firing a very variable number of rounds—gas would begin to escape, and then speedily cut a channel between the ring and the wedge. Krupp has fully recognized this, and has been successful in minimizing and localizing the injury thus caused. The gas has two ways of escape: it can pass either between the ring C and the body of the gun D, and so out to Y; or from X to Y. Several forms of Broadwell ring have been tried by Krupp; the form shown in fig. 45 is now in use. When the gun is fired the gas acts on the rounded surface of the ring C, pressing it down hard against the facing-plate A, and also expanding it against the body of the gun D. The tendency of the gas is also to expand the body of the gun away from the ring, and many bronze guns have been destroyed from this cause, having expanded more than the ring was able to follow. A recess is cut in the exterior of the ring, partly to give it greater spring and partly to afford a relief channel for any gas that may have forced its way in. The form of ring here shown appears to have overcome the efforts of the gas to escape in this direction.

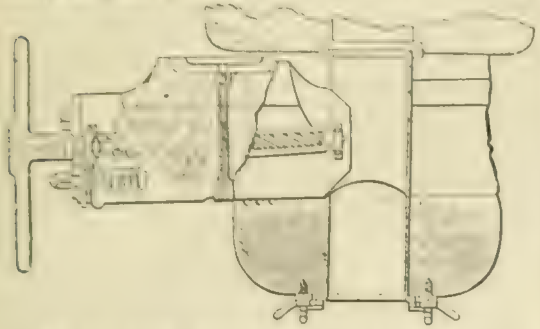


Fig. 44.—Krupp's breech action, cylindro-prismatic wedge.

Broad-well ring.

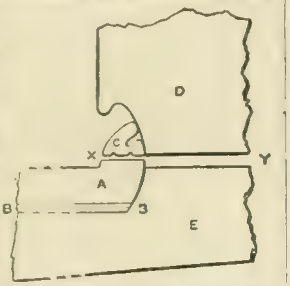


Fig. 45.—A, steel facing-plate; BB, copper discs; C, steel Broadwell ring; D, body of gun; E, wedge; X, interior of gun; Y, exterior of gun.

Having stopped the gas from getting round the outside of the ring and injuring the gun, we have now to consider the results of escape from X to Y. A channel cut through here would disable ring and wedge, which, though not so bad as disabling ring and gun, would yet be productive of much inconvenience. The insertion of the steel facing-plate A at once saves the wedge and localizes the injury. It allows, moreover, of the introduction of copper discs behind the plate, for the purpose of making up for wear, compression of metal of wedge, &c. Two relief channels are cut round that surface of the ring which abuts on the facing-plate. Spare Broadwell rings and facing-plates are supplied with the guns; should wear set in and escape of gas ensue, the defective fittings can be removed from the gun and new ones inserted in a couple of minutes. Each set should last on the average for several hundred rounds.

French breech-loading system.

In the French system no slot is cut in the gun (fig. 46). The breech is closed by a screw plug from the rear, which swings on a hinge to the side when withdrawn. The male screw on the plug and the female screw in the gun are divided circumferentially into six parts, of which three have the threads cut away, so that the surface is alternately screw and plain cylinder. When the threads of the plug coincide with the plain parts in the gun, the plug can be moved straight in or out. When pushed in, one-sixth of a turn engages the threads, which thus give half the bearing of an ordinary screw. This is called the interrupted screw system. The plug is larger than the bore, so as to afford room for the shell and cartridge to be thrust in. The end of the bore is recessed to take a ring against which the end of the plug abuts, somewhat as in Krupp's guns; or a cup of steel is fixed on the end of the plug, which is slightly convex; the pressure of the gas drives the flat back of the cup firmly against the convex surface, bending out the lips, which are at the same time pressed against the sides of the gun by the gas. This method has been lately introduced by the Elswick Company.

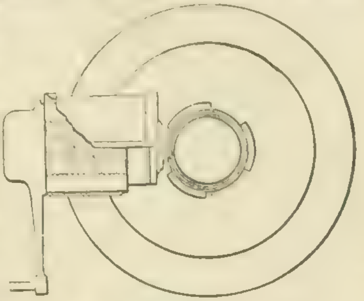


Fig. 46.—French breech action, interrupted screw.

It is difficult to award superiority to the Krupp or the French system. Each appears to possess some little advantage over the other, and both have attained great success. The Krupp system has undergone the more thorough testing in the field, and has the merit of allowing the parts which become damaged by the escape of gas to be replaced with greater ease and quickness. The French system, on the other hand, takes up less of the gun, so that in a piece of given length the bore may be upwards of one calibre longer than with Krupp's. In the French system, also, the breech-fittings are less exposed to damage by the enemy's fire, being behind the gun instead of at the side.

Gun designing.

DESIGNING.—A gun, like all other machines, must be designed to fulfil certain definite conditions. Its projectile may be required to pierce a given thickness of armour at a given distance; or weight of piece may be the limit, and it may be wished to throw the most powerful shell or shrapnel to a given distance with a given elevation, consistent with that limit. To work out problems of this nature, it is all-important to possess an accurate knowledge of the action of the charge inside the bore. By means of the Noble chronoscope and the crusher gauge (see GUNNERY), this knowledge is obtained, and we shall now explain how the indications of these instruments are employed to assist in determining the proportions of ordnance.

Gunpowder is not properly so much an explosive as a substance burning and giving off gas with great rapidity. It offers in this respect a marked contrast to gun-cotton, dynamite, and other true explosives. If one of these agents be detonated, the detonation is immediately carried through the mass, whatever its size, and the whole at once turns into gas. Gunpowder, on the other hand, as far as is known at present, cannot be detonated, but simply evolves its gas by burning in layers from the outside to the inside. Thus a large grain will take longer to burn up and become completely converted into gas than a small one will; hence the effect of enlarging the grains is to render the action of the charge less violent, the composition of the powder being the same in all gun charges. The projectile is driven out of the bore by the pressure of the gas on its base,—that is, on an area which varies with the square of the calibre. The weight of projectiles of similar form varies with the cube of the calibre. Hence the larger the gun the heavier will be the column of metal or projectile driven by each square inch of its base; and the greater must be either the pressure applied, or the time of its application, if a given velocity is to be attained. The great object of the gunmaker is to obtain the highest possible ratio of muzzle velocity to breech pressure. His ideal would be a charge so arranged that a pressure equal to the amount the gun is constructed to bear should be uniformly maintained till the shot has left the muzzle. Science is still a long way from this, but has done a good deal towards it in the last few years. A charge of gunpowder, composed of service ingredients in service proportions, exploded in a closed vessel at a density of 1·00 (equal to that of water), sets up a pressure of 43 tons per square inch; at a density of 0·75, of 23·2 tons; at 0·50, of 11·5 tons. Supposing a gun cartridge to be rammed home to the density of water, and entirely converted into gas before the projectile began to move, the pressure in the bore would rise to 43 tons per square inch at the breech, and fall towards the muzzle, as the travel of the shot afforded increasing room for expansion behind it. The column of metal to be moved, even in the heaviest projectiles yet known, is only a few pounds to the square inch of base, while the maximum pressure of the powder gas is measured in tons; it is clear therefore that the shot must get under way at some period antecedent to the setting up of the maximum pressure. In a breech-loader, where the projectile has to be forced through a bore slightly less than its greatest diameter, it will be detained longer than in a muzzle-loader, where it moves freely away, but the difference is insignificant as regards the present argument. The result of the shot's early motion is that space is at once given for expansion, and the normal 43 tons is never reached. Before these matters were fully understood, badly-proportioned charges of violent powder were found sometimes to set up what are known to artillerists as "wave pressures," which were dynamical in character, being caused by rushes of gas from one end of the charge to the other, so that the gauges indicated far higher pressures at the ends of the powder chamber than in the centre. This has now been overcome, and a great increase of both power and safety has been obtained. Several important improvements have been made of late years; the principal ones are three in number:—(1) a great stride was made in the manufacture of powder when pebbles, prisms, and 1½-inch cubes were introduced; (2) the discovery of the beneficial effect of "chambering," that is, of boring out the powder chamber to a greater diameter than that of the rest of the bore; (3) the method of "air spacing" the cartridge, so that a certain weight of powder should have a certain definite space allotted to it, irrespective of the actual volume of the powder grains. Thus in the 80-ton gun powder cubes of 1½ in. edge are used, having an absolute density a little over 1·75, or about 15·7 cubic inches to the pound. If these grains were rammed tightly home in a silk-cloth bag, the space occupied behind the shot would be 24·6 cubic inches per pound; as actually used, an air-space over and within the cartridge is left, so that the space behind the shot amounts to 34 cubic inches per pound. This density would set up a pressure in a closed vessel of 26·6 tons per square inch, but the relief afforded by the shot's motion reduces it to about 19 tons per square inch. The effect of chambering out the end of the bore where the powder lies is practically to permit a small gun to consume effectively the charge of a larger one. The cartridge is shortened, and the mechanical conditions of burning are greatly improved, so that, with large charges, higher velocity with lower pressure is obtained from a chambered than from an unchambered gun. The above information is derived from the indications of the crusher gauge, which registers the pressure of the gas at various parts of the bore. The chronoscope measures the rate at which the projectile acquires velocity during its travel from the breech to the muzzle. Knowing the increment of velocity at any point, we can calculate the amount of pressure required to produce this increment, and thus confirmation is obtained of the accuracy of the records obtained by the crusher gauge. The following table gives the increase obtained at successive stages in the development of the power of the 80-ton gun, which was first under-bored for experiment, and gradually brought to its present dimensions:—

Air sp-
ing

Chamber-
ing

Table showing Experiments with 80-ton Gun. Powder, service P_2 (1½-inch cubes).

Calibre	Diam. of Chamber	Weight of Charge	Density of Charge	Weight of Projectile	Mean Pressure in Chamber	Muzzle Velocity	Muzzle Energy	Muzzle Energy per ton of Mean Pressure	Perforating Power into armour at 1000 yds.	Thickness of Armour which would be penetrated at 1000 yds.
ins.	ins.	lb	cubic ins. per lb.	lb	tons per sq. in.	f.s.	ft.-tons	[illegible]	ft.-tons per in. of shot's circumf.	ins.
14·5	14·5	220	25·6	1259	22·9	1502	19,687	859·7	378	22·7
15·0	15·0	220	25·3	1466	23·8	1423	20,577	864·6	383	23·1
15·0	15·0	290	[illegible]	1466	22·4	1511	23,235	1037·0	433	25·1
15·0	18·0	310	36·6	1466	22·5	1553	24,493	1089·0	457	25·8
16·0	18·0	350	32·0	1703	20·4	1505	26,740	1311·0	466	26·1
16·0	18·0	425	34·0	1703	19·3	1588	29,745	1542·0	523	28·1
16·0	18·0	465[1]	31·4	1703	19·1	1626	31,527	1651·0	545	30·2

[1] Mixed prismatic powder (German).

It will be observed that each improvement has tended to facility of consumption of increased charges, so that, while the pressures are diminished, the penetrating power of the projectile is augmented, a heavier and more destructive shell being driven through thicker armour.

The manner in which the various principles, of which an explanation has been above attempted, are practically applied is laborious and complicated; the conditions are often conflicting, and the ultimate dimensions of a piece of ordnance is commonly a compromise. A couple of simple examples will illustrate this *modus operandi*. Suppose that it is required to design a gun which shall not exceed a given length, but shall throw a projectile capable of piercing a given thickness of iron at a given range. There are several formulæ of a more or less empirical nature for calculating the perforating power of a projectile moving with a known velocity. Penetration is by some regarded as a punching action, by some as a wedging action; probably it is a compound of the two. Recent experiments carried on with the very high velocity of about 2000 f. s. have thrown some doubt on the soundness of any of the formulæ. That generally used in England is as follows:—

Perfora-
tion of
armour

Let W = [illegible]

[illegible]

v = [illegible] in feet per second;

[illegible] tons;

t = [illegible] of plate [illegible] in inches.

This formula tells the gun designer what energy is necessary to overcome the resistance of the plate. Guided by experience, he assumes for the moment a striking velocity; the other component of the energy, the weight of the projectile, is then directly arrived at. The proportions of armour-piercing shells are the same for all guns, so that the weight gives the dimensions, and the calibre of the gun follows. Should this appear to be in no way unsuitable to the length already laid down in the conditions, the gun designer calculates the loss of velocity in the given range, and from the striking velocity deduces the muzzle velocity and the muzzle energy. The excellent labours (*Researches on Explosives*) of Captain A. Noble, F.R.S., of Elswick, and Professor Abel, F.R.S., have shown how to calculate the amount of work done by a pound of powder for every volume of expansion its gas undergoes; the results of many careful experiments and much intricate calculation are embodied in the accompanying table, which affords the means of determining the total work performed by any charge in any gun. A certain portion of this work is expended in heating the gun and projectile, in giving rotation, and so forth; the remainder appears as the energy of translation of the shot on leaving the muzzle. Large guns realize a greater proportion of the total work than small ones; the gunmaker knows very approximately by experience what percentage may be expected from certain classes of ordnance with certain descriptions of powder. Roughly the factor of effect may be put within the following limits:—for mountain guns, 45 to 50 per cent; field guns, 60 to 65 per cent; medium guns, 70 to 80 per cent; heavy guns, 85 to 95 per cent. The method of calculation will be best understood from an example. Suppose a charge of 425 lb of P_2 powder is to be fired from the 80-ton gun chambered to 18 inches diameter; the projectile weighs 1700 lb, and the space behind it is 14,450 cubic inches. The whole content of the bore is 60,400 cubic inches, and the volume of the charge is (425 × 27·7) 11,773 cubic inches, the number of expansions therefore is 5·13; the table shows that powder gas expanding to this extent from a density equal to that of water can perform work amounting to 92·4 foot-tons per lb. Since, however, the charge burns up in and has to fill (425 × 34) 14,450 cubic inches before doing work, the energy due to this extent of expansion (1·227) is lost, and 17·7 foot-tons per lb must be deducted, leaving (92·4 − 17·7) 74·7 foot-tons per lb as the total work the charge is capable of performing under these conditions. It is known from the preliminary tests of the powder that in the 80-ton gun between 92 and 95 per cent of the total work will be realized. Hence the energy of the projectile will lie between 29,210 and 30,155 foot tons, and its muzzle velocity between 1581 and 1600 f. s. A reference to the table on p. 292 will show that the result actually arrived at lies nearly midway between these limits. In this manner the charge required to impart the necessary energy to a shot of given weight in a given length of bore, and, conversely, the length of bore which will contain the requisite number of expansions of a given charge, are easily found; hence the charge required to produce the necessary energy is readily found; the air space and the dimensions of the powder chamber follow, and the inside of the gun is settled. The gun designer now has to put walls round his bore. Guided by the knowledge previously mentioned as derived from the crusher gauge and the chronoscope, he lays down the pressures at each point of the interior, and calculates the amount and strength of the metal to be used, according to the special system of construction employed, and thus the exterior of the gun is settled. To give another instance:—let it be required to construct the most powerful howitzer that can be made for the siege train. The conditions are given thus:—recoil (of piece only) must not exceed 20 feet per second; weight of piece must not exceed 70 cwt.; limiting purposes are to breach at 1500 yards, with not more than 5° elevation, and to bombard at 5000 yards, with not more than 35° elevation. A piece weighing 70 cwt. and running back at 20 f. s. velocity gives 156,800 units of momentum (in pounds and foot-seconds); the initial momentum of the gun in recoiling is practically equal to the momentum of the shot on leaving the muzzle. Hence the shell must have 156,800 units of momentum, which may be composed of high velocity and light weight, or low velocity and heavy weight. For breaching purposes, accuracy and penetration are essential qualities; a shell varying in length from two and a half to three times its diameter will be suitable for the purpose. We have now a neat problem in ballistics, viz., To find the calibre of a shell of the proper length, of such a weight that, with the muzzle velocity required to give a range of 1500 yards at 5° elevation, the muzzle momentum shall be 156,800 units. This problem is readily solved by the methods indicated in the article GUNNERY, and it is found that a shell 8·0 in. in diameter, weighing 170 lb, and having a muzzle velocity of 940 f. s., will be slightly on the safe side of the limits. Proceeding in a similar manner, a shell 8·0 in. in diameter, weighing 230 lb, starting with a velocity of 675 f. s., satisfies the conditions of bombardment. The calibre being thus settled, the proportions of the piece remain to be worked out. As there is no difficulty in obtaining a velocity so low as 940 f. s. with a small charge and low pressure, the length of the bore and the disposition of the metal can be adjusted to suit, not only the strain of discharge, but the conditions of service. In the gun now under consideration, the bore is made as long as possible, and the weight of metal thrown as far forward as possible consistently with preserving due strength at the breech. The reasons for this are threefold:—first, the longer

B [illegible]	Total work [illegible] in foot-tons	D [illegible] cub. in. per lb [illegible]	[illegible] work [illegible] in foot-tons
[illegible]	[illegible]	4·0	82·1
[illegible]	[illegible]	4·5	87·1
[illegible]	3·8	5·0	91·4
[illegible]	5·5	5·5	95·2
[illegible]	7·2	6·0	98·6
[illegible]	[illegible]	6·5	101·7
[illegible]	[illegible]	7·0	104·6
1·14	[illegible]	7·5	107·2
[illegible]	[illegible]	8·0	109·6
[illegible]	[illegible]	8·5	111·8
[illegible]	[illegible]	9·0	113·9
[illegible]	[illegible]	9·5	116·0
[illegible]	[illegible]	10·0	117·8
[illegible]	[illegible]	11·0	121·2
[illegible]	[illegible]	12·0	124·2
[illegible]	[illegible]	13·0	127·0
[illegible]	[illegible]	14·0	129·6
[illegible]	[illegible]	15·0	132·0
[illegible]	36·1	16·0	134·2
[illegible]	[illegible]	17·0	136·2
[illegible]	[illegible]	18·0	138·1
[illegible]	[illegible]	19·0	139·9
[illegible]	[illegible]	20·0	141·6
[illegible]	[illegible]	25·0	149·0
[illegible]	[illegible]	30·0	154·8
[illegible]	[illegible]	35·0	159·7

Action of charge in bore

Example of designing

the bore the less is the breech pressure required to produce a given muzzle velocity, and the less is the maximum strain thrown upon the studs, gas check, or other rotating agent; next, the more forward the general disposition of the metal, the farther from the breech end will be the centre of gravity, and consequently the trunnions,—a position which favours steady shooting and absence of jump; thirdly, a siege howitzer, being always fired under cover, is little exposed except near the muzzle, which should therefore be made as strong as possible to avoid injury from anything less than a direct hit by unburst shell.

Rifling.—Spherical projectiles fired from smooth-bored guns seldom or never pursue the mean trajectory. The centre of the ball's figure will rarely coincide exactly with the centre of gravity, and the pressure of the air during flight will then act with unequal effect on different parts of the surface. This inequality will be increased by accidental imperfections or roughness. The difference between the diameter of the bore and that of the projectile is termed "windage"; when this is considerable, it is a principal cause of error in shooting, as the ball rebounds from side to side against the walls of the piece as it is driven along, its actual direction of departure depending on the effect of the last bump before it leaves the muzzle. Accuracy of manufacture may greatly mitigate these errors, but will never entirely remove them; it is therefore found necessary to cause the projectile to rotate rapidly round an axis coincident with the axis of the gun; by this means the inequalities in the action of the pressure of the air, due to the imperfections above mentioned, take effect in all directions in turn as the projectile rotates, and hence neutralize each other. Extending this principle, the stability imparted to a shot by its moment of rotation is such that elongated projectiles can be employed and driven point first at high speed through the air. The course of the projectile from the time of its leaving the muzzle to the end of its flight belongs to GUNNERY (*q.v.*). Here we have to consider the methods in which the interior of the gun is made to impart rotation to the projectile. Rotation is usually expressed in angular velocity; a shot is said, in popular language, to make so many turns per second. Mathematically, the unit of angular velocity consists of rotation through the unit of circular measure in one second; the unit of circular measure is the angle subtended by an arc equal to radius, viz., 57° 17′ 44″·8. If we call this angle ω, a complete rotation will be expressed by 2πω. In considering the energy stored up in a shot's rotation, or, what is the same thing, the work done in producing that rotation, the weight of the projectile W, and its radius of gyration ρ, must be taken into account. The energy of a travelling body is $\frac{Wv^2}{2g}$; the weight of a rotating one is supposed to be concentrated at the end of the radius of gyration; then if Ω be the angular velocity, the velocity of a travelling body will correspond with Ωρ in a rotating one, and the energy of rotation will be expressed by $\frac{W\rho^2\Omega^2}{2g}$. The proportions of service projectiles differ for different guns, the proportions of head and base and the shape of head varying; but roughly for [illegible], the value of ρ^2 may be taken [illegible] 0·087 [illegible] For [illegible] [illegible] angular velocity [illegible] entirely depend on the velocity of translation or forward movement. Again, the greater the diameter of the bore the less will be the proportion borne by the arc turned through to the whole circumference; consequently the bigger the gun the less the angular velocity of the projectile, if the angle of rifling and the velocity of translation remain constant; the velocity of rotation of a point on the surface will, under these conditions, always be uniform. It is generally considered that with studded muzzle-loading service projectiles, having a length equal to about $2\frac{1}{2}$ to 3 times their diameter, the velocity of rotation of a surface point of about 110 f. s. is sufficient to keep them steady, allowing for loss of spin by atmospheric friction up to any probable range. Supposing the interior of the gun to be opened out and laid flat, the groove (of a uniform twist) will be straight, and since the shot guided by it makes a complete revolution in n calibres, the angle made by the groove with a line parallel to the gun's axis may be expressed by $\tan^{-1}\frac{\pi}{n}$. In designing the piece, the muzzle velocity is determined on, and also the velocity of rotation to be communicated to the projectile: the combination of the two fixes the final angle of the groove. Now it is easy to see that the spin of the shot on leaving the bore depends only on the conditions immediately preceding. The rate at which the work of giving rotation is done during the travel of the projectile from breech to muzzle is an entirely different question. If a shot be rotating, its tendency is, putting friction aside for the moment, to continue to rotate with the same velocity. No work is done in keeping up this rate of rotation, but work would be done in accelerating or retarding it. Thus in apportioning the work done on the shot in giving rotation at different parts of the bore we have to consider, not the actual angular velocity, but the increments of angular velocity. The work then can be distributed at pleasure over the whole length of the groove, by varying the angle it makes with a line, parallel to the gun's axis, as it runs along the bore. Supposing, as before, the interior surface of the gun to be opened out and laid flat, then OU (fig. 47) will represent a groove having a uniform twist, that is making a constant angle with a line OM parallel to the axis of the piece. O denotes the commencement of the rifling at the breech end of the bore, UPM the muzzle. Guns are rifled with any number of grooves exceeding two, but it is not necessary to consider more than one. With the groove OU, every increment of angular velocity imparted to the shot is due to an increment in the velocity of translation, and therefore the pressure between the sides of the groove, and the studs, gas check, lead coating or whatever fitting on the shot is employed for the purpose, bears a constant relation to the pressure of the powder gas on the base of the shot driving it forward. The table [illegible] the result of this with great clearness. In order to mitigate the excess of strain, recourse was had to the increasing twist, and curved grooves were employed which, when developed as in fig. 47, form the parabola OP, having its vertex at the point O, parallel to OM, and terminating at P, parallel to OU. The [illegible] OP [illegible] Since OP is a parabola having its vertex at O [illegible]

Theory of rifling.

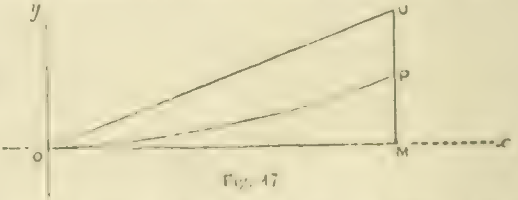


Fig. 47

[illegible] PM, which shows that the shot, though rotating in [illegible] with [illegible] angular velocity on leaving the muzzle, has [illegible] that moment, with the parabolic twist turned [illegible] as great as would be the case with the [illegible] twist. The table below exemplifies the principle [illegible] of rifling [illegible] should be constructed [illegible] columns speak for themselves, the fourth is arrived at by multiplying the area of the shot's base by the gas pressure per square inch recorded on the gauges, and given in the 5th column. Columns 6 and 7 are worked out from formulae due to Captain Noble of Elswick; in column 6 the pressures due to a uniform twist are given. It will be seen that they bear a constant proportion to the pressures of the gas recorded in columns 4 and 5, and that the maximum rises to a considerable height soon after the shot has begun to move, while at the muzzle little work is done. In column 7 the calculations are made to suit a curve consisting of a portion of a parabola, starting from the vertex where the groove is parallel to the axis of the piece, and rising to the required twist at one foot from the muzzle, thence proceeding uniformly. In this curve the maximum strain is greatly reduced, the pressure gradually rising with the increase of twist. The figures are derived from another formula worked out by Captain Noble. Column 8 shows the pressures required to give the necessary rotation when the curve of groove is a semicubical parabola, having for equation $x^{\frac{3}{2}} = py$. In the instance chosen, the early part of the curve is rejected, and it starts from 1 turn in 200 cals., arriving at the required twist at a foot from the muzzle as before. The figures are derived from a calculation worked out on the principle devised by Captain Noble. Here the maximum is yet further reduced, and some approach to uniformity of strain is made. The diagram in Plate IV. shows the pressures graphically.

Pressure on grooves.

Table showing Pressures of Gas and on Studs in 38-ton gun with various Curves of Rifling. Charge, 130 lb. Cubical Powder of 1·5-inch cube. Projectile, 800 lb. Calibre, 12·5 inches.

[illegible]	[illegible]	[illegible]	Pressure on Base of Shot	Pressure per square inch of base	Pressure on Studs with Uniform Twist of 1 turn in 35 Cals. $z = kr\phi$	Pressure on Studs, Parabolic Twist 0 to 1 in 35 Cals. $z^2 = kr\phi$	Pressure on Studs, Semi-Cubical Parabola, 1 in 200 Cals. to 1 in 35 Cals. $z^{\frac{3}{2}} = kr\phi$
ft.	secs.	f.s.	tons	tons	tons.	tons	tons.
0	00000	0	2000 (estimated)	16·3	79·3	0	31·4
1	[illegible]	140	2221·3	18·1	88·1	1·65	22·6
5	[illegible]	474	3320·3	27·0	131·6	15·6	59·8
1·0	[illegible]	676	2060·6	16·8	81·7	26·8	61·3
2·0	[illegible]	869	1394·1	11·4	55·3	42·1	65·1
3·0	[illegible]	987	1095·0	8·9	43·4	53·1	66·3
4·0	[illegible]	1074	908·8	7·4	36·0	61·95	66·3
5·0	[illegible]	1142	746·4	6·1	29·6	68·7	85·0
6·0	[illegible]	1195	668·3	5·4	26·5	75·0	64·7
7·0	[illegible]	1242	592·8	4·8	23·5	80·3	63·9
8·0	[illegible]	1277	499·4	4·1	19·8	83·3	61·0
9·0	[illegible]	1309	421·9	3·5	16·7	86·2	58·95
10·0	[illegible]	1335	355·6	2·9	14·1	88·2	56·6
11·0	[illegible]	1355	265·1	2·2	10·5	88·1	53·95
12·0	[illegible]	1369	188·7	1·5	7·5	87·3	48·8
13·0	[illegible]	1379	131·6	1·1	5·2	86·4 5·2	45·2 5·2
14·0	[illegible]	1385	120·9	1·0	4·8	4·8	4·8

Let R = [illegible] pressure between studs and grooves;
G = gas pressure on base of shot;
μ = coefficient of friction;
l = pitch of rifling;
k = [illegible] made by groove with plane traverse to axis;
φ = angle turned through by shot;
θ = angle made by groove with line parallel to axis;
ρ = radius of gyration;
z = travel of shot along bore;
v = velocity of shot;
M = mass of shot = $\frac{W}{g}$;
r = [illegible] of shot.

Then for a uniform twist ($z = kr\phi$)

$$R = \frac{2\pi\rho^2(1+k^2)^{\frac{1}{2}}}{lr(k-\mu)+2\pi\rho^2(\mu k+1)}\cdot G;$$

in a parabolic twist ($z^2 = kr\phi$)

$$R = \frac{2\rho^2(4z^2+k^2)^{\frac{1}{2}}(Gz+Mv^2)}{kr^2(k-2\mu z)+2\rho^2 z(2z+\mu k)};$$

in a semicubical twist ($z^{\frac{3}{2}} = kr\phi$)

$$R = \frac{3\rho^2\left(G\sqrt{z}+\frac{Mv^2}{2\sqrt{z}}\right)(9z+4k^2)^{\frac{1}{2}}}{kr^2(4k-6\mu\sqrt{z})+3\rho^2\sqrt{z}(3\sqrt{z}+2k\mu)}.$$

Lieut. [illegible], R.N., gives the following formula, which is [illegible] equation, and will be found much handier than the above by those familiar with differential calculus:—

$$R = \frac{\rho^2\left(G\tan\theta+\frac{d^2y}{dx^2}Mv^2\right)\sec\theta}{r^2(1+\tan^2\theta)-\mu\tan\theta(r^2-\rho^2)}\sqrt{1+\mu^2}.$$

A radical difference exists between the rifling of muzzle-loaders and that usually employed for breech-loaders. When the projectile has to be pushed down the gun from the front, it must be smaller than the bore; when it is thrust home from behind, it may be rather larger than the bore. Hence the earlier muzzle-loading shells were provided with ribs or studs which fitted in the grooves, and guided the projectile in its rotatory course; while the earlier breech-loading shells were coated with lead, into which the lands of the bore bit sharply as the powder gas forced the projectile between them. All rifled ordnance were formerly rifled with a uniform twist; indeed, it is clear that where ribs are cast or fixed on the projectile, or where they are formed in the soft envelope by the first action of the grooves, no alteration in the angle of rifling is possible, since the ribs can only make a constant angle with a line parallel to the axis of the piece, and cannot fit a groove making a varying angle with it. The smaller and earlier muzzle-loading rifled projectiles were fitted with two rows of studs, front and rear, and equal in size, so that a front and rear stud travelled in each groove, and practically constituted the ends of a rib. As the guns grew, it was found that the great strain of giving rotation at starting frequently forced the bronze studs out of the recesses machined for them in the sides of the shells; and scooped away the driving edges of the grooves even when the gun lining was of steel. The shell might have been cast with ribs on them, but certain difficulties of manufacture stood in the way, and the excessive strain would still have existed though its effects might have been mitigated. The increasing twist was therefore devised, and the rows of studs increased in number from two to three in the larger natures of projectiles. Three studs are allotted to each

Modes of giving rotation.

groove; the rear one is the largest, the front one the smallest. They are so placed that the line of their loading sides is parallel to the angle made by the groove at the breech, while the line of their driving edges is parallel to the angle made by the groove at the muzzle. In Plate IV. fig. 1 shows their position when the shell is home, and also when about to leave the bore. Thus, theoretically, the middle and leading stud should never come into play till the last moment, and the rear stud should do all the work of rotation. Practically, however, the rear stud, being of bronze, wears down against the edge of the hard groove; the centre stud obtains a bearing; the wear continues, and the leading stud takes up its share of duty; so that all three really act during the passage of the projectile through the bore. This method of employing the increasing twist necessitates wide grooves, and is unsuitable for small guns. A different plan therefore was devised to meet their case. Two rows of studs, front and rear, were so arranged that each ran in a groove of its own. The curve of the grooves belonging to the rear stud began at 0°, and reached the final angle at a distance from the muzzle equal to the distance between the front and rear rows, after which it proceeded in a straight line. The curve of the grooves belonging to the front studs began at 0°, at a distance in front of the commencement of the other grooves equal to the distance between the rows, and reached its final angle at the muzzle. Thus the two curves were alike, but one was always a constant distance in front of the other, and every stud acted through the entire length. Fig. 2 in Plate IV. shows the position of the studs when the shot is home, and also when it is about to leave the bore.

Studs.

Muzzle-loading rifling had reached this stage of progress at a time when the great wear caused by the rush of gas over the shot necessitated the adoption of some method of sealing the escape. After many trials, it was found that a flanged copper disc fitted on to the base of the projectile would expand under the first pressure of the gas, and cut off the windage completely. This saved the wear of the guns, and added to their power. It was found, moreover, that the depressions in these "gas checks" expanded into the grooves, and being firmly attached to the shell afforded an additional means of giving rotation. The next step was to remove the studs altogether, using a smooth projectile, and substituting many small grooves for few large ones. This method of giving rotation has been adopted in all recently-designed pieces, and appears likely to prove entirely satisfactory. When muzzle-loading guns were first rifled, many attempts were made to give rotation by expanding projectiles, but they proved unsuccessful, because at that time the increasing twist was not known, and the action of a violent powder and the uniform twist was that the rotator had to expand into the grooves, and at the same instant to communicate a rapid spin to the shell. It was unable to combine these operations, and the projections driven out by the gas could never settle to their work, being constantly cut down by the edges of the grooves. The result was that the shell "stripped," and left the bore without regular rotation. In the case of the twist which begins at 0°, the projections have time to expand comfortably, and adapt themselves to the shape of the grooves before they are called on to perform the work of rotation. On the other hand, since the gas presses out the flanges against the bore and into the grooves, and affords them support in that position, it is desirable that its pressure should correspond with their pressure on the driving edges of the grooves. This would be exactly met by the uniform twist, but that is unsuitable for the reasons just given. The parabolic, on the other hand, throws the principal strain [illegible] towards the muzzle, where the gas pressure is small (Plate IV.). The [illegible] by [illegible] parabola [illegible]

Gas checks.

in the 80-ton gun. While progress was thus being made in the rifling of muzzle-loaders, the rival system had not remained inactive; the use of lead coating had been found to involve a loss of power in the projectile as regarded both the amount of bursting charge or bullets carried, and the penetration into armour, on to the surface of which the lead flew forward in a splash, when the shell struck. Moreover, the lead envelope would not lend itself to the exigencies of the increasing twist. To meet these difficulties, two undercut rings were machined round the smooth projectile, one near the base, the other near the shoulder. Into these slots were pressed stout copper wires, the rear one bringing up the diameter of the shell beyond that of the bore so as to take the rifling when forced through the piece on discharge, the front one just fitting the lands, but not entering the grooves, so as to rotate irrespective of them, and thus keep the fore part of the shot steady. Projectiles thus fitted are more effective than the lead-coated ones, and are adapted to any twist of rifling. The latest breech-loaders made by the Elswick Company use the new arrangement described above for muzzle-loaders—the smooth shell with a gas check on the base. This appears to be the best form of projectile, and has the advantage of suiting either system. A few words on the section of groove best suited to various purposes will conclude the subject of rifling. The rotation is impressed on the projectile by a force acting tangentially to the surface. This principle would be represented in its extreme form by making the section of the shell to resemble a cog wheel, the grooves and lands of the gun being bored to fit. With muzzle-loading systems where windage has been necessary, the sides of the projections on the projectile, and of the grooves in the bore, have been shaped to enable the projections to run up the sides of the grooves, and so distribute the windage equally all round. The extreme form of this principle is Lancaster's oval bore, the section of which departs but slightly from a circle. All attempts at "centring" the projectile by shaping the bearings so as to convert it into a wedge, which expends that part of the force resolved radially in a crushing action on the shell, and a bursting action on the gun. The shape may, however, be made of such a form as to cause the projectile to centre fairly without exercising any injurious effect on the bore. In breech-loading systems, where the lands bite into the rotator the driving edge strikes the projection, or nearly in the prolongation of the radius, [illegible] that the points of [illegible] as nearly as possible consistently with having enough metal [illegible] the wear and the strain. Where gas checks expand into the grooves, these should be broad and flat, so that a complete fit and a strong projection should result. The driving edges should here also form a prolongation of the radius of the projectile.

Lead coating.

Copper bands.

Centring.

Conclusion.—What may be the future of ordnance it is now impossible to predict, but it seems probable that the limit of power will be found to lie in the [illegible]. For shooting guns, methods of with[illegible] increased velocities may be devised, but the weight of sponges, rods, &c., will prevent the [illegible] from carrying this principle very far. For [illegible] the field artillery appears even now to be very near the limit of what power can be gained consistently with [illegible] mobility. [illegible] hydraulics, but it [illegible] progress [illegible] to which [illegible]

[illegible]

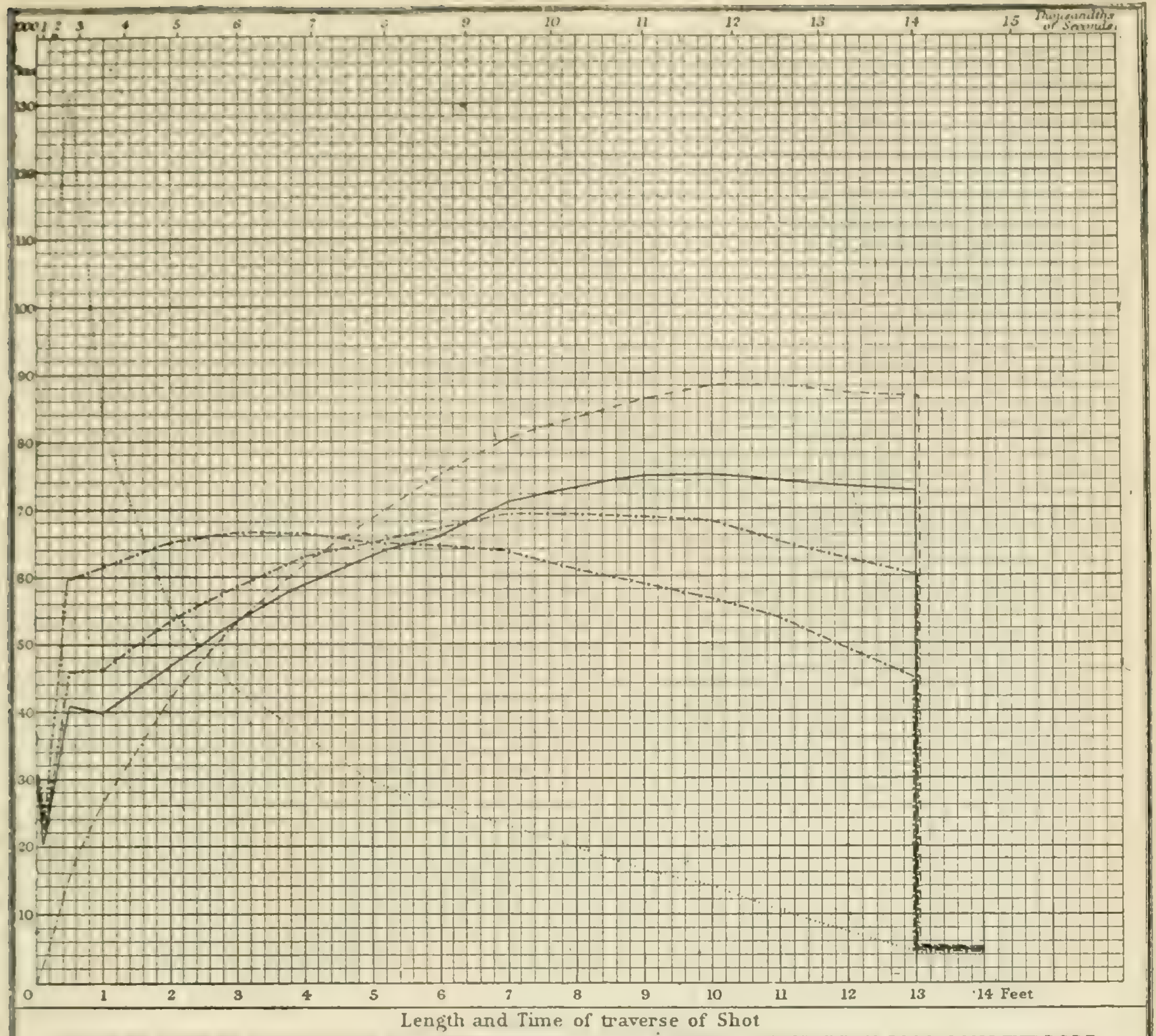


DIAGRAM SHEWING THE PRESSURE OF GROOVES ON STUDS, WITH VARIOUS TWISTS, AT EACH FOOT ALONG THE BORE

Uniform .... 1 turn in 35 cals $Z = k r \varphi$

Parabola .... 0 to .... Do .... $Z^2 = k r \varphi$

Parabola .... 1 in 200 to 1 turn in 35 cals $Z^2 = k r \varphi$

Semi-cubical Parabola .... Do .... Do .... $Z^{\frac{3}{2}} = k r \varphi$

Seven fourths Curve .... Do .... Do .... $Z^{\frac{7}{4}} = k r \varphi$

Double groove rifling
Twist increasing from 0 to 1 turn in 16 cals

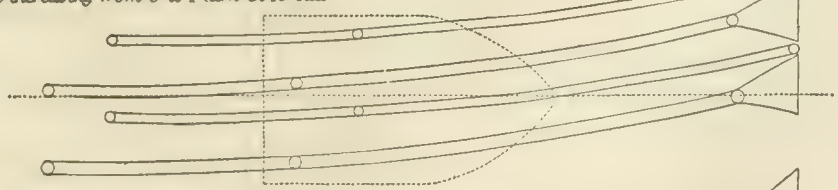


fig 2

Single groove rifling (Service)
Twist increasing from 0 to 1 turn in 16 cals

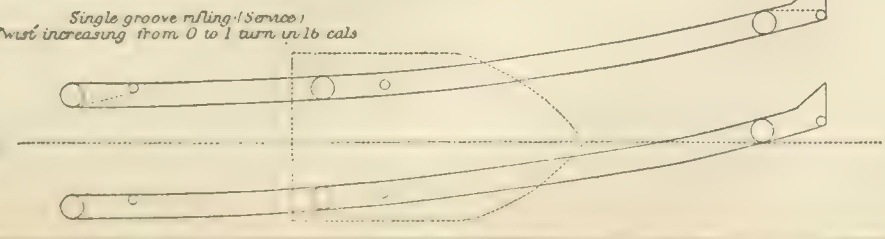


fig 1

GUNNERY

In its early days this science might have been simply defined as the art of determining the motions of projectiles discharged from pieces of ordnance; in its present state it includes also the employment of projectiles specially adapted to the purpose in view, and the manipulation of artillery so as to enable the projectiles to produce the maximum effect.

Theory of Gunnery.—Instruments of great precision, mechanical construction of much accuracy, and a considerable knowledge of the higher mathematics are necessary to obtain and make use of trustworthy data for the establishment of sound principles on which to base the theory of gunnery. It is therefore not surprising that, owing to the early discovery of gunpowder, the art was long practised in a crude manner, without any attempt being made to reduce it to a science. Thus, though firearms appear to have been in use from the early part of the 14th century, little of value was understood of the laws regulating the flight of projectiles till the time of Nicholas Tartaglia, who published a treatise on the subject at Venice in 1537. About sixty years before that date, Leonardo da Vinci had enunciated some of the mathematical principles of trajectories in a manner which shows him to have possessed far more insight than any of his contemporaries; but he did not pursue the inquiry, and Tartaglia may be regarded as the father of ballistics. He was a man of great talent and ingenuity, but unfortunately had no opportunities of observing artillery practice; he was unable, therefore, to bring his calculations and speculations to the test of fact, and failed to carry conviction to the minds of the philosophers of the age. Before his time it had been generally believed that a ball on leaving the mouth of a gun proceeded for some distance in a straight line,—a fallacy which lurks in the phrase "point-blank," not yet expunged from popular speech. He saw, however, that "a piece of artillery cannot shoot one pace in a right line," and propounded the axiom that "the more swifter a pellet doth flee the more direct is his range,"—a truth expressed at the present day by the statement that a high velocity gives a flat trajectory. This eminent philosopher claimed the invention of the gunner's quadrant; he took into account in his calculations the resistance of the air, but placed the angle of elevation at which the maximum range would be obtained at 45°, which would only be the case in vacuo. Galileo was the next mathematician of note who investigated the subject. In his *Dialogues on Motion*, published in 1638, he recognized fully the resistance of the air, and pursued the inquiry in the direction indicated by Tartaglia. It was not, however, till Newton's time that a substantial basis was laid down for a true theory of gunnery. The grand discovery of the law of gravitation revealed the hitherto unexplained secret of the projectile's fall to earth. The great improvements in mathematical methods of analysis invented by him rendered possible solutions of previously impracticable problems; while the splendour of his achievements in natural science stimulated philosophers of all countries. Towards the end of the 17th century he investigated the trajectory of a projectile on the supposition that the resistance of the air varied as the first power of the velocity. Bernoulli in 1719 gave a solution of the problem on the supposition that the resistance varied as any given power of the velocity. This solution was, however, [illegible] complicated [illegible]. No further progress was made till Benjamin Robins in 1742 published his *New Principles of Gunnery*, in which he furnishes a notable example of the manner in which theory should be wedded to practice, and hypothesis to experiment. Had Robins been in the possession of accurate instruments he would probably have arrived at results of considerable correctness. He invented the ballistic pendulum, and was the first to ascertain experimentally with any degree of correctness the velocities of projectiles on leaving a gun. A "triangle" or gyn supported a pendulum of iron having a massive wooden bob; to the bob was fixed a steel ribbon which passed through a steel clamp set to the desired pressure. A bullet fired into the wooden bob caused the pendulum to swing; the length of the arc described was recorded by the steel ribbon; the weight of the bullet and the conditions of oscillation of the pendulum being known, the velocity of the bullet could be calculated from the length of the arc. The weight of Robins's first pendulum was 56 lb, and it was therefore only suited for small arms. It could measure the velocity at only one point each round, and therefore, to ascertain the velocity lost by a ball in passing through the air, it was necessary to fire a series of rounds at one distance, and afterwards a similar series of rounds at another distance. Velocities of 1700 feet per second were measured, and the loss of velocity due to the resistance of the air, up to a distance of 250 feet from the muzzle, was approximately ascertained. Robins discovered that the resistance of the air was greatly increased as soon as the ball travelled faster than sound, and attributed it to the creation of a vacuum behind the shot, into which the air could not rush with speed greater than that of sound. Count Rumford in 1751 made use of the recoil to measure the velocities of bullets, on the principle that the momentum of the bullet forward was equal to the momentum of the gun backward. To carry this out, the gun was suspended as a pendulum, and the length of the arc it described on firing measured. By firing a bullet from a gun thus suspended into the ballistic pendulum, two independent records were obtained, and it would have been easy to calculate the loss of velocity, from the muzzle to any range at which the pendulum could be hit, by the combination. The roughness of the methods unfortunately did not permit completely satisfactory results. Dr Hutton next took up the inquiry, and increased the weight of the pendulum and the bullets. No very great advance, however, seems to have been made till 1840, when experiments on the resistance of the air to the motion of spherical shot were carried on at Metz by the French Government. MM. Piobert, Morin and Didion were the chief experimenters. They raised the weight of the receiving pendulum to nearly 6 tons, and fired into it 50-pound balls at a range of 330 feet. The information now obtained spread over a much wider field than that traversed by Robins. It was even found possible to construct the trajectories of projectiles with some approach to truth, and empirical formulæ were laid down by which ranges and times of flight could be approximately calculated. It was not, however, till the introduction of electricity as a means of determining the velocities of projectiles that accurate knowledge of the resistance of the air was obtained. In 1840 Professor Wheatstone invented an instrument for this purpose, called the electro-magnetic chronoscope. He has had many successors, whose productions exhibit a great amount of ingenuity; those from which the most valuable results have been obtained, and which are in use at the present moment, are the Bashforth chronograph, the Noble chronoscope, the Le Boulengé chronograph, and the Watkin chronograph.

Newton.

Didion.

Electric velocity instruments

The general principle on which these four instruments are designed is that a projectile after leaving the gun shall severs a fine wire stretched across a screen, thus breaking an electric current, and causing a record to be made by the

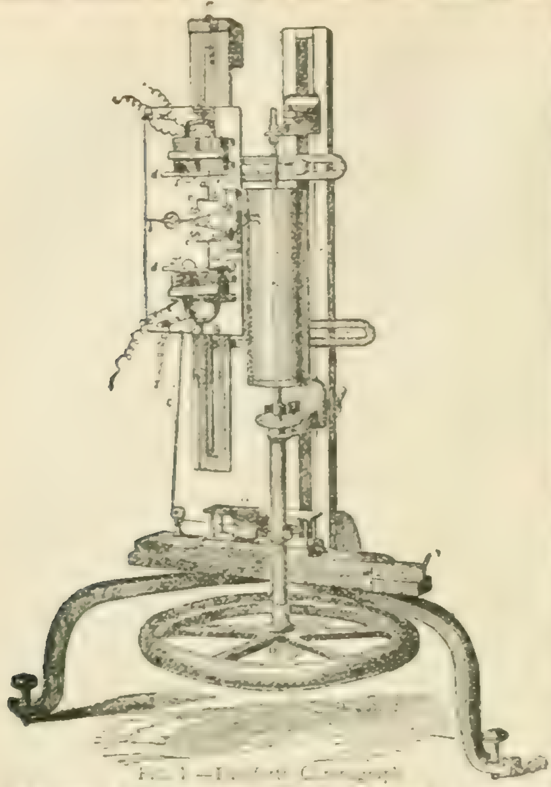


Fig. 1.—Bashforth Chronograph.

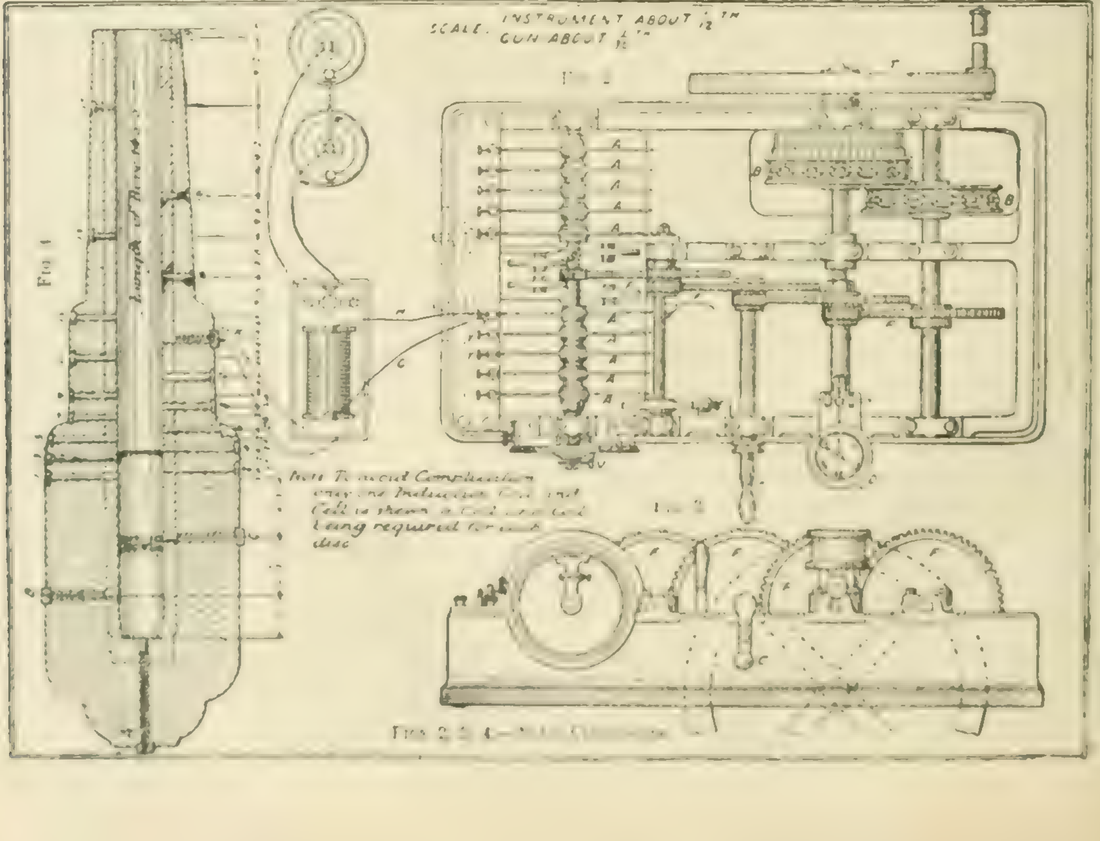
instrument at the moment. The Le Boulengé is connected with two wire screens only, the others with several. As two records are necessary to obtain a velocity, recording the time taken by the shot to pass between two screens, the number of points of a shot's flight at which an instrument is capable of indicating the velocity is one less than the number of screens employed. The chronograph invented by the Rev. F. Bashforth, late professor of mathematics to the Advanced Class of the Royal Artillery, is shown in fig. 1.

Bashforth chronograph.

A is a fly-wheel, which, in revolving, carries with it K, a cylinder covered with paper specially prepared to receive the records of the chronograph. B is a toothed wheel which turns the drum M and unwinds the string CD, thus allowing the platform S to descend slowly down the slide L. E, E' are two electromagnets, whose keepers are supported by the frames *d*, *d'*; *f*, *f* are the ends of springs which act against the attraction of the electromagnets. There are two distinct currents—one through the screens and E, the other through the clock and E'. When these are interrupted—one by the shot cutting a screen, or the other by the clock breaking circuit, so that the magnetism is destroyed, the spring *f* or *f* draws back the keeper, which, by means of the arm *a* or *a'*, gives a blow to the lever *b* or *b'*, causing the marker *c* or *c* to depart from the spiral that it has been describing—a spiral consisting of a double line running round the cylinder. The apparatus is adjusted so that the platform L, and consequently the markers *c*, *c'*, descend about ¼ inch for each revolution of the cylinder; the folds of the spiral are thus ¼ inch apart. The cylinder is made to revolve with considerable rapidity, so that the intervals between the consecutive clock marks, indicating seconds, measure from 20 to 25 inches; hence the screen marks denoting the moment of the severance of the wire by the shot can be allotted to their proper value in seconds with great accuracy. The screens are so contrived that the current, interrupted by the passage of the shot through one, is completed again before the next is reached. To accomplish this, the cutting of the wire is made to release a spring which makes a fresh contact; thus any number of screens can be used and a corresponding number of records obtained.

Noble chronoscope.

The chronoscope invented by Captain Noble of Elswick, late Royal Artillery (figs. 2, 3, 4), is constructed to furnish eight or more records, according to the number of discs, and is so excellently adapted for the measurement of exceedingly minute portions of time that it is usually employed to ascertain the velocity acquired by the shot in moving from a state of rest inside the gun at different parts of the bore. It is thus intimately connected with gunmaking


SCALE. INSTRUMENT ABOUT 1/12TH
GUN ABOUT 1/12TH
Fig. 2
Fig. 3
Fig. 4
Length of Bore
A
B
C
Note To avoid Complication only one Induction Coil and Cell is shown a Coil and Cell being required for each disc

Figs. 2, 3, 4.—Noble Chronoscope.

out, having the same character as other velocity instruments, is described here. The screens used for recording the flight of the shot through the air are now discarded, and the

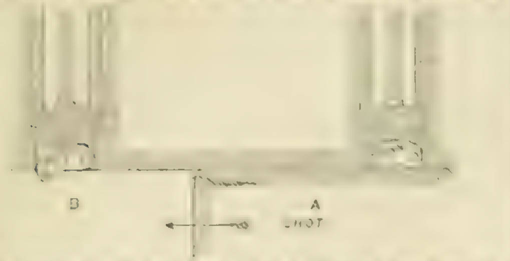


Fig. 5.—Cutting plug, knife down. Fig. 6.—Cutting plug, knife up.

"cutting plugs," shown in figs. 5, 6, 7, are substituted for them. In figs. 5 and 6 B is the bore, and A a flat-headed shot or cylinder passing along it in the direction of the arrow. The plugs are screwed into the sides of the gun, as in fig. 7, which gives an end view of the bore. As the shot passes, its foremost edge pushes up the knife D, cutting the wire c, which passes in at one side of the plug C, then through a hole in the knife D, and out again at the other side of the plug. The ends of this wire are connected with the main wires leading to the instrument, and the knife D, in cutting it, interrupts the current. Fig. 4 shows a 10 inch gun pierced to receive cutting plugs in eighteen places. The main wires run from a plug to the primary of a Ruhmkorff coil, fig. 2, near the instrument, with which the secondary communicates. Figs. 2 and 3 show the instrument in plan and elevation.

Cutting plugs.

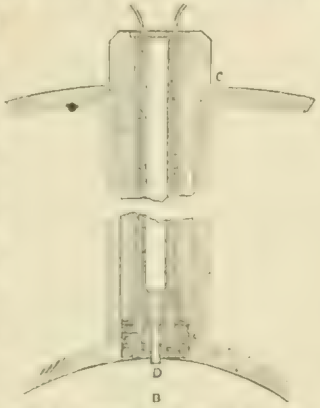


Fig. 7.—Cutting plug, ready for firing.

A, A are disks, 36 inches in circumference, fixed on a horizontal shaft S. This shaft is caused to rotate, so that the edge of the disks travel at about 1100 inches per second, by a series of toothed wheels F, F, gearing as shown, and worked into rapid motion by the handle C. This motion is kept up with regularity by the descent of the weight B acting on the hindmost shaft, the speed of which is multiplied 200 times at the shaft S. At V is a vernier, reading a graduated circle, which is fixed on the shaft S. The edges of the disks are covered with a coating of lampblack. One of the secondary wires G is brought from the coil, and placed in communication with the revolving disk; the other secondary wire H is fixed in a discharger Y, just clear of the edge of the disk. A stop-clock is placed on a stand D, and records the rate of revolution of one of the shafts. When the gun is fired the shot begins to move, and, as it travels along the bore, cuts the wires of the plugs in succession, breaking the primary currents, and causing sparks to pass in the secondary current from the dischargers Y, Y, to the disks A, A, which are in rapid revolution. The sparks burn off the lampblack and record their positions on the disks by a minute spot. Now if the shot could cut all the plug-wires simultaneously, all the spots on the disks would be in a straight line, but it does not do so, and during the intervals between the cutting of successive plug-wires the disks continue to rotate, so that the line of spots forms a spiral round the cylinder represented by the disks, as is apparent on bringing the machine to rest. The shaft S is then turned so as to place each spot in succession opposite an index, and the spaces travelled by the circumferences of the disks between the spots are read off on the graduated circle. As the circumference of the disks is made to travel at the rate of 1100 inches per second, and the vernier reads to thousandths of an inch, the machine indicates portions of time rather less than a millionth of a second; it is, in fact, practically correct to hundred thousandths of a second. A millionth is about the same fraction of a second as a second is of a fortnight. Thus the distance between two successive spots gives the actual time occupied by the shot in travelling over the portion of the bore between two corresponding plugs, and therefore the velocity acquired at any point is found. As the increment of velocity is constantly decreasing after the charge is fairly lighted, the point at which the mean velocity is acquired is very nearly behind the middle of the space between the two plugs. The observations are worked out, errors being eliminated, and the results put in the form shown in column 3 of Table I.

The "crusher gauge" (fig. 8) is so closely associated in its use with the Noble chronoscope that it is convenient to give a description of it here, though its indications are

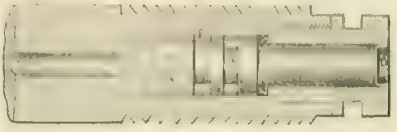


Fig. 8.—Crusher gauge.

valuable to the gunmaker rather than to the gunner. In fig. 4 are shown three plugs, A, B, and C, driven through the walls of the gun, and terminating flush with the bore. These plugs contain gauges for measuring directly the pressure of the gas on the surface of the bore. They are of the same diameter as the cutting plugs, and can be used in any of the twenty-one holes pierced in the gun. Fig. 8 shows the construction. The bottom of the plug is chambered out, and a steel anvil E is placed at the top of the chamber. Against this anvil is pressed a cylinder of pure copper A, carefully tested for quality, which is held in its place by a spring B. A piston C fits accurately the lower part of the chamber, any ingress of gas being prevented by the gas-check D, which is flush with the bore. When the gun is fired the powder-gas presses the piston hard against the copper cylinder A, which yields and becomes shorter, expanding laterally. The plug is then removed from the gun, and the nozzle unscrewed; the cylinder is extracted and measured. Its compression is compared with those given in a table constructed from experiment, and the pressure of the gas per square inch recorded. With the chronoscope the velocities are obtained directly from the time shown by the instrument to have been taken by the shot in passing over the interval between two cutter plugs. From these velocities calculation deduces the pressures required to produce the increments of velocity. These calculated pressures are compared with and confirmed by those obtained directly from the indications of the crusher gauge. Table I. shows the nature of the information obtained from

TABLE I.

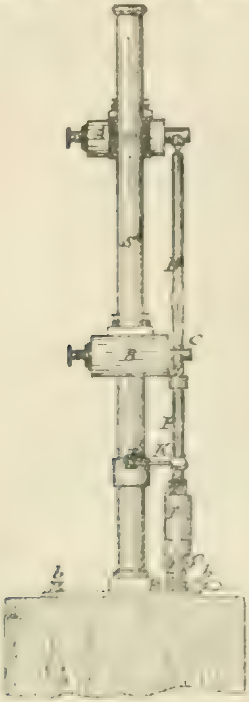
Distance of Plug from Bottom of Bore.	Mean of 4 Rounds.		
	Pressure.	Velocity.	Difference in Velocity.
	tons per sq in	f.s.	f.s.
Axis	23·8		
1 ft.	23·8		
2 ,,	22·5		
		137	
3 ,,	19·9		533
		670	
4 ,,	14·2		244
		914	
5 ,,	11·6		127
		1041	
6 ,,	7·0		69
		1110	
7 ,,	3·8		55
		1165	
8 ,,	2·9		47
		1212	
9 ,,			40
		1252	
10 ,,			34
		1286	
11 ,,			29
		1315	
12 ,,	1·9		25
		1340	
13 ,,	1·6		21
		1361	
14 ,,	1·3		18
		1379	
15 ,,	1·1		16
		1395	
16 ,,	0·6		14
		1409	

Pressures and velocities inside bor

the combination of the two instruments, when used with a 38-ton gun, firing an 800-lb projectile, with 130 lb of 1·5-inch cubical powder.

Le Boulengé chronograph.

The last velocity is calculated from that taken by a Le Boulengé instrument outside the gun. This chronograph, the invention of an officer of the Belgian artillery, is shown in figs. 9, 10, and its mode of application in fig. 11.



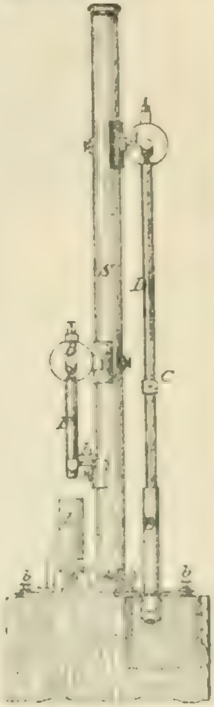


Fig. 9.—Le Boulengé Chronograph, side view. Fig. 10.—Le Boulengé Chronograph, front view.

The shot after leaving the gun cuts the wire of the first screen, and [illegible] the wire of the second screen. The wire of [illegible] net A [illegible] This rod [illegible] which is [illegible] Directly the first screen is cut, the rod C,

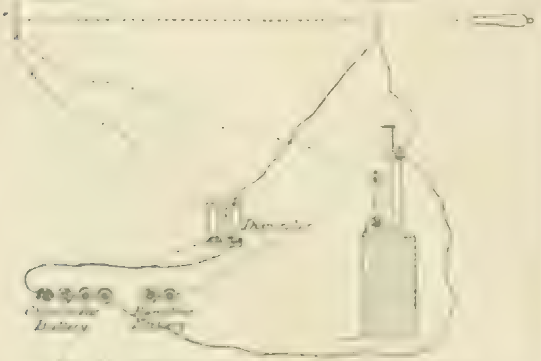


Fig. 11.—[illegible]

[illegible]

taneously. When this is done the long and the short rods fall at the same moment. A certain time is consumed by the short rod in reaching the disk, setting free the spring, and cutting a nick on the zinc. During this time the long rod is falling into a recess in the stand deep enough to receive its full length. The instrument is so adjusted that the nick thus made is 4·435 inches above the zero point, corresponding to ·15 sec. This is the disjunctor reading, and requires to be frequently corrected during experiments unless the weather is exceptionally favourable to the electrical conditions. Instead now of using the disjunctor to cut both currents simultaneously, suppose the shot to cut them in succession; then the long rod will be falling for a certain time, while the shot is travelling from one screen to the other, before the short rod is released. The longer the shot takes to travel this distance, the farther the long rod falls, and the higher up on it will be the nick made by the knife. A simple calculation connects the distance fallen through by the rod with the time occupied by the shot in travelling over the distance between the screens, and hence its velocity at the middle point is known. A graduated rule is generally supplied with each instrument, arranged for a certain distance between the screens; from this any velocity obtained can be read off at once.

Watkin chronograph.

The electric chronograph, invented by Captain Watkin, R.A. is shown in figs. 12, 13, 14.

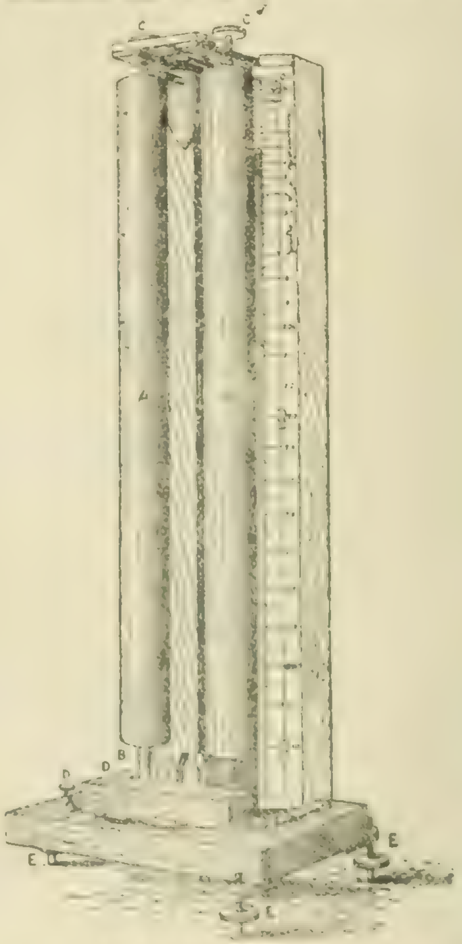


Fig. 12.—Watkin Chronograph.

[illegible] Between [illegible] V [illegible] A [illegible] press against A and to sustain the weight by gripping the piece B (fig. 13) of the weight. In this position the keeper H is at a short distance from the poles of the electromagnet. Directly the current is allowed to circulate, the keeper is attracted down to the magnet, the spring G, G is pushed away, a small spring L presses on the arm CD, the jaw AC flies open and the weight is released. The two cylinders A, A (fig. 12) form part of the circuit of a secondary induction coil. The screens are similar to those employed for the Bashforth chronograph; they are traversed successively by the shot, which momentarily interrupts the primary current, and thus causes an induced current to pass through the cylinders A, A. As these, however, are not in electrical connexion, the current has to pass across through the brass wire of the weight, which is in the act of falling. The cylinders are covered with smoked paper, and the passages of the spark in and out leave minute spots showing the exact position of the weight at the moment; any number of screens may be used, and a duplicate record is obtained in one experiment of the space fallen through by the weight, while the shot is traversing each interval between the screens. As before, a simple calculation connects time and space, and an ingenious scale enables the experimenter to read off the velocities whatever be the distance between the screens.

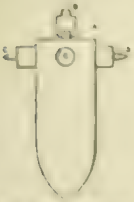


Fig. 13.—Weight.

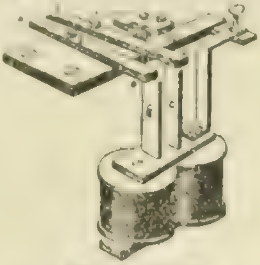


Fig. 14.—Holder.

In all these instruments slight errors exist, arising from mechanical imperfection, or from irregularity in the electric currents; still, the accuracy arrived at is sufficient for practical purposes, as is well shown by the following table:—

Table II.—*Velocities of Martini-Henry Bullets fired with two different Charges, observed with several Instruments.*

	Le Boulengé		Bashforth.	Watkin.	
	Instrument A.	Instrument B.		Right Cylinder.	Left Cylinder.
	1167	1163	1163	1155	1157
	1141	1140	1143	1137	1136
	1140	1135	[illegible]	1129	1132
	1136	[illegible]	1141	1138	1139
	1147	1145	1142	1140	1140
Means of 5 rounds	1146	1144	1146	1140	1141
	1272	1275	1269	1259	1259
	1268	[illegible]	1269	1267	1267
	1270	1271	1277	1270	1268
	1277	[illegible]	1287	1272	1272
	1285	[illegible]	1290	1287	1285
	1290	[illegible]	[illegible]	1284	1284
	[illegible]	[illegible]	1263	1264	1264
	[illegible]	[illegible]	1291	1285	1284
Means of 8 rounds	[illegible]	[illegible]	[illegible]	1274	1273

These instruments enable the experimenter to ascertain the velocity of a projectile up to considerable distances from the gun. With rifled ordnance no difficulty is found in hitting screens of moderate size at a range of 2000 yards; and, practically, the loss of velocity due to the resistance of the air can be determined for all ranges and all velocities.

It might be supposed that, having the means of acquiring this knowledge, the artillerist would find little difficulty in solving the grand problem of his art, which may be thus briefly stated:—Given a projectile of known weight and dimensions, starting with a known velocity at a known angle of elevation in a calm atmosphere of approximately known density, to find its range and time of flight, its velocity, direction, and position at any moment,—or, in other words, to construct its trajectory. This state of perfection has, however, not yet been reached; mathematics has hitherto proved unable to furnish complete formulæ satisfying the conditions. The resistance of the air to slow movements of, say, 10 feet per second seems to vary with the first power of the velocity. Above this the ratio increases, and, as in the case of the wind, is usually reckoned to vary with the square of the velocity; beyond this it increases still farther, till at 1200 feet per second the resistance is found to vary as the cube of the velocity. The ratio of increase after this point is passed is supposed to diminish again; but thoroughly satisfactory data for its determination do not exist. From this it would appear that, as the motion of the shot increases in rapidity, the air finds continually greater difficulty in filling up the space left by the advancing projectile, but that, when once a point is reached where the vacuum in rear is complete, further increase of speed only encounters additional difficulty in displacing the air in front. The difficulty of meeting the conditions by mathematical formulæ is very great, since the velocity of the projectile changes continually, and moreover is resisted by air continually varying in density as the shot rises and falls again. It is evident that the greater the weight of a shot in proportion to the column of air displaced by it, *i.e.*, to the square of its diameter, the less effect will the resistance of the atmosphere have upon its motion; thus very heavy projectiles moving with very low velocities will be but little retarded by this cause. It is desirable, therefore, before proceeding to explain what has been done towards the complete solution of the problem above stated, to establish the limit, and investigate the trajectory when the resistance of the air is neglected. Trajectory in vacuo

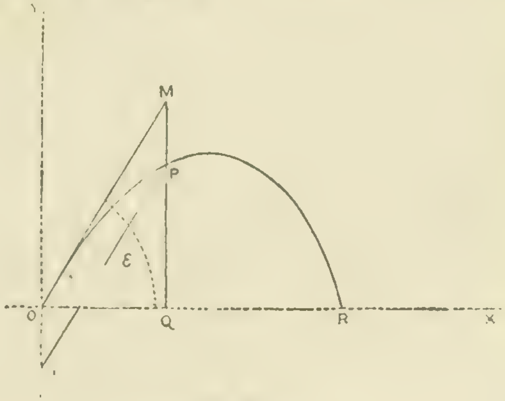


Fig. 15

Let v = muzzle velocity of projectile;
ϵ = angle of elevation;
t = time of flight.

Let the projectile start with velocity v from the point O (fig. 15), in the direction OM, so that MOX is the angle of elevation. Let OM be the distance which would be traversed in a period of time t, if gravity did not act. Draw ON vertically downwards, equal to the distance through which the shot would fall in time t under the action of gravity only. Complete the parallelogram OMPN. Then P will be the position of the projectile at the end of the time t. We have then—

$$OM = vt,\ \text{and}\ ON = MP = \tfrac{1}{2}gt^2.$$

$$\text{Therefore}\ OM^2 = \frac{2v^2}{g}\cdot MP.$$

Since OM² bears a constant ratio to MP, the trajectory is a parabola, having its axis vertical, and OM for a tangent.

Again, the horizontal velocity = $v\cos\epsilon$, and remains uniform; the initial vertical velocity = $v\sin\epsilon$, and is acted against by gravity. Then—

$$x = OQ = vt\cos\epsilon$$
$$y = PQ = vt\sin\epsilon - \tfrac{1}{2}gt^2.$$

eliminating t, we get—

$$y = x\tan\epsilon - \frac{gx^2}{2v^2\cos^2\epsilon},$$

which is the equation to the trajectory, and is a parabola. To find the range, put $y = 0$, the two resulting values of x give the position of the gun, and the end of the range, thus, $OR = \frac{v^2\sin 2\epsilon}{g}$.

In Robins' experiments in 1742 and subsequent years, it became apparent that up to a certain point the resistance of the air increased with an increasing power of the velocity. Hutton in 1790 placed this point at 1600 f. s., and considered that the ratio decreased after this velocity was passed. He proposed as a formula for the resistance R ∝ [illegible]. General Didion, in 1840, deduced from the experiments at Metz the formula $R \propto av^2 + bv^3$. The experiments with rifled projectiles carried on at Gavre in 1861 led Professor Helie to the conclusion that the resistance of the air at practical velocities was more nearly proportional to the cube of the velocity than to any other working expression. He constructed a formula for the trajectory by empirically modifying the formula given above for the path of a projectile *in vacuo* thus—

Helie's formula.

$$y = x\tan\epsilon - \frac{gx^2}{2\cos^2\epsilon}\left(\frac{1}{v^2} + \frac{kx}{v}\right);$$

from which he deduces an expression for the range which at low elevations for velocities between 800 f. s. and 1400 f. s. is very fairly accurate, and which furnishes the simplest method yet devised of roughly constructing a range table:—

$$r = \frac{1}{2kv}\left(\sqrt{1 + 2kv\frac{2v^2\sin 2\epsilon}{g}} - 1\right).$$

where
r = range in feet;
v = velocity in feet per second;
ϵ = angle of elevation;
k = 0·0[illegible]45 $\frac{d^2}{w}$;
d = diameter of projectile in inches;
w = weight of projectile in pounds,
g = force of gravity = 32·19.

The above value of k is given for ogival heads; with hemispherical, pointed, or flat heads a different coefficient of resistance would be required. The ogival is the form which suffers least retardation from the air. The most complete and valuable series of experiments yet carried out is that of Professor Bashforth (1865 to 1870) at Woolwich and Shoeburyness. He found that, velocities and forms being equal and similar, the resistance varies exactly as the square of the diameter of the projectile. He further arrived at the conclusion that between 900 and 1100 f. s. $R \propto v^6$, between 1100 and 1350 f. s. $R \propto v^3$, and above 1350 f. s. $R \propto v^2$. These results confirm in great measure those previously obtained, but unfortunately do not lend themselves readily to the construction of mathematical formulæ. Bashforth adopted the cubic law as his basis, as it offers the least difficulty in manipulation, and, putting R = [illegible], made the coefficient [illegible] a variable, the values of which he has tabulated. His method consists in building up the arc of the trajectory bit by bit, taking such portions so that a mean value of [illegible] for that portion may be used without important error. The path of the projectile may thus be constructed with almost any desired amount of accuracy, but the process is exceedingly laborious, and requires the use of a lengthy set of tables which cannot be reproduced here. For a complete description of the subject the reader is referred to Mr Bashforth's works. Mr Bashforth, however, tabulated the loss of velocity due to the resistance of the air with regard to the time and distance of the shot's flight, and subsequent experiments carried out by the War Office in 1878-79 have since confirmed and extended the results he had previously obtained. As most of the problems of modern gunnery can be approximately solved by the use of these tables, we give in Table III. an abstract with explanation.

Bashforth's [illegible]

TABLE III.—*Loss of Velocity of a Projectile in Time and Distance.*

F.S.	Feet.	Seconds.	F.S.	Feet.	Seconds.	F.S.	Feet.	Seconds.
400	5000	5·000	1100	20898	30·531	1800	24441	33·091
410	5416	6·028	1110	20974	30·600	1810	[illegible]	33·113
420	5820	7·003	1120	21048	30·667	1820	24520	33·135
430	6213	7·923	1130	21121	30·731	1830	24560	33·157
440	6595	8·808	1140	21191	30·794	1840	24599	33·178
450	6967	9·645	1150	21261	30·855	1850	24638	33·200
460	7330	10·443	1160	21330	30·914	1860	24677	33·221
470	7684	11·206	1170	21397	30·972	1870	24716	33·242
480	8031	11·936	1180	21463	31·028	1880	24755	33·262
490	8370	12·635	1190	21528	31·083	1890	24794	33·283
500	[illegible]	[illegible]	1200	21592	31·137	1900	[illegible]	[illegible]
510	9026	13·951	1210	21655	31·189	1910	24871	33·323
520	[illegible]	14·570	1220	21717	31·240	1920	[illegible]	33·343
530	9658	15·168	1230	21778	31·290	1930	24947	33·363
540	[illegible]	15·741	1240	21838	[illegible]	1940	[illegible]	[illegible]
550	10267	16·295	1250	21897	31·386	1950	25022	33·402
560	[illegible]	16·829	1260	21955	31·432	1960	25060	33·421
570	[illegible]	17·345	1270	[illegible]	31·477	1970	25097	33·440
580	11141	17·844	1280	[illegible]	31·521	1980	[illegible]	33·459
590	11423	18·327	1290	22124	31·565	1990	25171	33·477
600	[illegible]	18·796	1300	22179	31·607	2000	[illegible]	33·496
610	11977	19·250	1310	[illegible]	31·649	2010	25243	33·514
620	12247	19·690	1320	22286	31·689	2020	25279	33·532
630	12514	20·118	1330	22339	31·729	2030	25315	33·549
640	12776	20·533	1340	22391	31·768	2040	25350	33·567
650	[illegible]	[illegible]	1350	22443	[illegible]	2050	25385	33·584
660	[illegible]	21·364	1360	22494	31·844	2060	25420	33·601
670	13545	[illegible]	1370	22544	31·881	2070	25455	33·617
680	13793	22·074	1380	22594	31·918	2080	25489	33·634
690	[illegible]	22·432	1390	22644	31·953	2090	25523	33·650
700	[illegible]	22·781	1400	22693	31·988	2100	25556	33·666
710	14519	[illegible]	1410	22741	[illegible]	2110	25590	33·682
720	14755	23·449	1420	22789	32·057	2120	25623	33·698
730	14987	23·769	1430	22837	32·090	2130	25656	33·713
740	15215	24·080	1440	22884	32·123	2140	25688	33·728
750	15440	[illegible]	1450	22931	32·156	2150	25720	33·743
760	[illegible]	24·677	1460	22978	32·188	2160	25752	[illegible]
770	[illegible]	24·962	1470	23025	32·220	2170	25784	33·773
780	[illegible]	[illegible]	1480	23071	32·251	2180	25815	33·787
790	[illegible]	[illegible]	1490	23116	32·282	2190	25847	[illegible]
800	[illegible]	[illegible]	1500	23162	32·312	2200	[illegible]	[illegible]
810	[illegible]	[illegible]	1510	23207	32·342	2210	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32·372	[illegible]	[illegible]	[illegible]
830	[illegible]	[illegible]	[illegible]	[illegible]	32·402	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	23342	32·431	[illegible]	[illegible]	[illegible]
[illegible]	17490	[illegible]	[illegible]	[illegible]	32·460	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32·517	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32·544	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
910	[illegible]	[illegible]	[illegible]	[illegible]	32·627	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
930	[illegible]	[illegible]	[illegible]	[illegible]	32·680	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2410	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1730	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1740	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34·116
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1770	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1780	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	30·459	1790	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
						[illegible]	[illegible]	34·165

The rate of loss of velocity is here correctly [illegible] for an ogival projectile having a weight [illegible] equal to the square of the diameter [illegible]. Thus a projectile [illegible] of 3-inch calibre [illegible] with a velocity of [illegible] f. s. [illegible] velocity of 400 f. s. at a distance of [illegible] 5000 = [illegible] feet after a time of [illegible] − 5 [illegible] seconds. [illegible] of [illegible] decrease the [illegible] If the 3-inch [illegible] twice as well as [illegible] = 0·5 instead of 1·0.

Example 1.—The [illegible] gun fires at a vessel in [illegible] range of [illegible]. The muzzle velocity is [illegible] f.s., the [illegible], and the weight of [illegible] lb. Required the velocity at the point, and the time of flight.

Here [illegible] $= 0.150$[illegible]

[illegible] = 993 ft.

Selecting the [illegible] f.s. in the first column, the second column gives [illegible] feet. Subtracting, [illegible] − 993 = 22,616. [illegible] in the second column and taking proportional parts, this [illegible] corresponds to [illegible] f.s., which is the velocity [illegible], showing the projectile to have lost 197 f.s. of its velocity during flight. In the third column, opposite 22,616 feet, we find [illegible] seconds. Subtracting this from the time opposite [illegible] feet, and dividing by $\frac{d^2}{w}$, we have

$$t = \frac{1}{0.1506}([illegible]54 - 31.929)$$
$$= 4.[illegible] \text{ seconds.}$$

Example 2.—An observer in an outwork notes the flash of a [illegible] in 3¾ seconds the shell [illegible] buries itself in the parapet, [illegible] in half a second by the report of the gun. The shell is [illegible], and found to weigh 60 lb, and to measure 15 centimetres in diameter. Required the range, the muzzle velocity, and the striking velocity.

The range is given by the velocity of sound, which travels through air at an average rate of 1140 feet per second; so that

$$r = 3.75 \times 1140 = 4275 \text{ ft.};$$
$$\frac{d^2}{w} = \frac{(15 \text{ cm.})^2}{60} = \frac{(5.91 \text{ in.})^2}{60} = 0.5821;$$
$$r\frac{d^2}{w} = 2488 \text{ ft., and } t\frac{d^2}{w} = 2.183 \text{ sec.}$$

We have now to consider what muzzle velocity will cause the projectile to traverse the given distance in the given time. It must move at a mean speed of 1315 f.s. Assume the muzzle velocity to be [illegible] f.s.; corresponding to this are found 23,607 feet and 32·[illegible] seconds. Subtracting from these the reduced range and time, we have 21,119 feet and 30·707 seconds; if the velocity has been correctly assumed, it is clear that the range and the time of flight should result in the same terminal velocity. In the present case, opposite 21,119 feet stands 1130 f.s., while opposite 30·707 seconds stands 1125 f.s. Thus it appears that the velocity has diminished more rapidly in the time travelled than in the distance traversed. This shows that it is assumed too high. Trying 15[illegible]4 f.s., and proceeding as before, each column indicates 1120 f.s., which therefore is the terminal velocity, showing that the projectile has lost 464 f.s. of its speed during flight.

Drift.—Projectiles fired from rifled guns do not move in a vertical plane, but deviate to the right or to the left according to the direction of their rotation. All nations have adopted the right handed twist, probably because it happened to be selected first. If the observer stands in rear of the piece and looks at the gun when fired, the projectile rotates in the same direction as the hands of a watch. It then steadily bears away to the right. The reason of this is not very clearly understood; in fact, two rival theories are put forward to account for it. If there were no resistance of the air, the path of the shot would be a parabola, and the axis of an elongated projectile would remain parallel to its original direction. The resistance offered by the air causes the axis to tend to assume a position tangential to the trajectory. On leaving the gun the projectile moves in the direction of its axis, which is also the direction of the axis of the gun. The action of gravity soon causes the path of the shot to make a small angle with the original direction of the axis; that is, the trajectory soon deviates from a straight line; the axis of the projectile is urged by the resistance of the air to accommodate itself to the new path, but as the path is constantly changing, the axis is always too late, since the rotation tends to preserve its parallelism. Thus there is always an angle—depending in amount on the velocities of rotation and translation, weight of shot, and density of the air—between the axis of the shot GB and the trajectory CD (fig. 16). Thus far both theories answer to the facts, but they differ as to the deductions. The first view is that the resultant resistance of the air, which has the effect of a force in the direction DC, tends to turn the shot about an axis passing through G, and perpendicular to the plane containing BGD, so that if the shot had no rotation, it would turn end over end. But as it has a right handed twist, this motion is combined with that which the resistance of the air tends to impart to the shot, and the point A is therefore slightly deflected to the right at first. Continuing the action, the axis GA describes a cone about CD, rotating in the same direction as the shot rotates about its own axis. The resultant of the air's resistance tends to increase the angle BGD, therefore the shot will have a sinuous motion; but as the first deflexion is to the right, and afterwards the point is more to the right than to the left, the deviation will on the whole be to the right. The other view is that, as the axis of the shot is always directed a little above the trajectory, the resistance of the air meets the surface on the under side, on which therefore there is more pressure than on the upper side. The consequence of this is that the friction of the air with the rotating surface is greater below than above, and therefore causes the projectile to roll bodily to the right while travelling forward. The path thus curves away from the vertical plane, and the resistance of the air tends to cause the axis to lose its parallelism with that vertical plane, though it is, as before, too slow in altering its direction to become tangential to the curve described. Crucial experiments to set this point at rest are as yet wanting. The "drift" or "deflexion" is usually corrected in the British service by inclining the tangent sight. The result of this is that as the range increases, the higher the sight is raised, and the farther is the eye-notch to the left of the vertical plane containing the axis of the gun. In the German service the tangent sight is placed vertically in the gun, and the deflexion is allowed for by a graduated sliding leaf in the head. The same arrangement is used in those British guns, as the howitzers, which fire variable charges, as the slope of the tangent sight will accurately suit only one muzzle velocity.

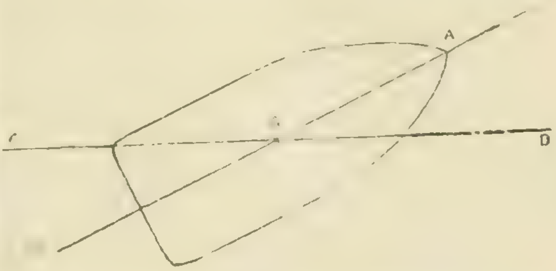


Fig. 16.

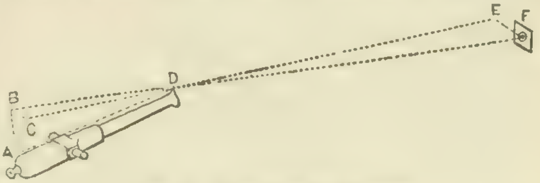


Fig. 17.—Correction for deflexion.

To ascertain the correct slope, the actual deflexion is determined for each gun on the practice ground at various ranges with a vertical sight; then, in fig. 17, AD is the line of sight when the axis of the gun is horizontal. CD is the line of sight with a vertical tangent sight set at the angle of elevation ADC required for the range DF. Since the projectile deflects to the right, it is necessary that the line CD should point to E in order to hit F. This is accomplished by inclining the tangent sight AB, so that BC shall give the requisite allowance. The relation is thus established. By similar triangles,

$\frac{BC}{CD} = \frac{EF}{FD}$; then BC = AC tan BAC, and CD = AC cosec ADC, so that $\frac{BC}{CD} = \frac{\tan BAC}{\operatorname{cosec} ADC} = \frac{EF}{FD}$. Putting the angle ADC (the elevation) = e, the angle BAC (the slope of the tangent sight) = θ, EF (the deflexion) = d, and DE (the range) = r, we have $\tan \theta = \frac{d}{r} \operatorname{cosec} e$.

The action of the powder charge, the travel of the projectile along the bore, the rifling, and, speaking generally, what takes place inside a gun when fired, are matters specially connected with the designing and manufacture of ordnance, and are therefore treated under GUNMAKING.

Projectiles.—The requirements of modern artillery have necessitated many complications in the preparation and use of projectiles, which now vary greatly in their nature and in the purposes for which they are employed. A general description of the several kinds supplied to European armies will be found under AMMUNITION, and but few remarks will be required to connect them with the guns for which they are intended. Smooth-bored ordnance use solid round shot and case, common shell, and diaphragm shrapnel shell. Solid shot are used against masonry, wooden shipping, and masses of men. They were at one time fired red hot at shipping. Roughly, the cube of the diameter in inches multiplied by 0·133 gives the weight of the shot in pounds. Case shot consist of iron balls packed in iron or tin cylindrical cases. They are effective up to about 350 yards against troops, boats, and rigging, and are especially suitable for flanking ditches. Common shell are completely filled with powder, and are burst in flight by time fuzes, or, on striking, by percussion fuzes. They are used against men in masses, buildings, works, and materiel generally. Diaphragm shrapnel shell contain a small bursting charge and a number of balls. They are fitted with a time fuze which explodes the charge when they near the object, so that the released balls fly forward. They are very destructive against troops. In addition to the above projectiles, [illegible] shells, called carcasses, filled with a violently burning composition, are thrown into villages and amongst shipping. Ground light balls cast among the enemy's working parties at night disclose their position. Parachute light balls contain a parachute tightly folded up, and a cup of illuminating composition; they are fired with a fuze timed to burst in the air, and they then remain suspended for a time, throwing a bright light down on the enemy's working parties.

The great advantage of rifling was long recognized in small arms and sporting pieces before it was extended to ordnance. The first rifled arms threw bullets which, except for certain projections designed to fit the grooves of the barrel, were spherical. They gave very good results in accuracy, but it was not till the introduction of elongated projectiles that a distinct gain in power was recognized. The gain in accuracy is due in great measure to the [illegible] with which the bullet is centred in the bore by the action of the grooves, while the rotation imparted to it [illegible] the disturbing effect of [illegible] or of variations in the position of the centre of gravity. The elongated shot [illegible] the [illegible] upon the area of the transverse section [illegible] to the [illegible] without [illegible]. [illegible] in addition to greater accuracy, rifling confers a [illegible] and greater penetration. [illegible] of the last [illegible] of fuzes which explode when [illegible]. The projectiles used with rifled guns are case shot, common shell, shrapnel shell, and Palliser shell. The case shot differ little from those made for smooth-bore ordnance. Common shell are generally from $2\frac{1}{2}$ to 3 calibres in length. They are designed to contain as much powder as possible, consistently with strength of wall to resist the shock of firing. Their effect is almost entirely due to explosion; velocity has little to do with it beyond conferring range and penetration. Common shells are generally fuzed with percussion fuzes. They are effective for breaching, for setting fire to buildings, against troops if not much scattered, and especially against wooden or thinly plated vessels. The introduction of iron-clad ships is almost entirely due to the terribly destructive fire of shells. Shrapnel shell are filled with bullets, and have a bursting charge only sufficient to open the case and release the contents, which then fly forward with the velocity possessed by the projectile before breaking up. The bullets and fragments very speedily lose this velocity after separation. It is therefore most important to judge the range correctly and to form an accurate estimate of the practice, so that the result of each round may guide the aiming and timing of the next. When the shrapnel is burst in the air by a time fuze, it is exceedingly difficult to judge its precision by the puff of smoke. The splashes or puffs of dust of the bullets striking the ground should therefore be carefully looked for. When the shrapnel is burst on striking the ground by a percussion fuze, it is much easier to estimate the accuracy of the shooting, and it is common therefore to get the range by firing a round or two with percussion fuzes before setting the time fuzes. If the ground is hard and the distance of the enemy such that the shell strikes at but a small angle of descent, percussion fuzes generally burst the shrapnel better than time fuzes, which, in their turn, have the advantage at long ranges and over soft ground. For field service time fuzed shrapnel should be burst at from 50 to 100 yards in front of the object, and about 10 to 15 feet above the ground. The cone of dispersion of the bullets and fragments is considered to be so proportioned that the diameter at any point of the axis is one-third of the distance of that point from the burst or apex. To get satisfactory results from time fuzes it is necessary to have a gun which shoots with great regularity, a fuze composition which burns evenly, and an accurate mode of setting the fuze. Of late years improvements in powder and design of ordnance have rendered the velocities practically uniform. The fuze composition [illegible] but is tolerably satisfactory; and a new fuze [illegible] has just been introduced which can be set to any desired degree of accuracy. As the power of shrapnel shell is entirely due to the velocity possessed by the bullets when freed from the envelope, it is of paramount importance in long range firing that the shell should start with a high velocity and retain as much of it as possible. It is considered that with field guns the velocity of the projectile at the moment of bursting should not fall below [illegible], otherwise the contents will have a [illegible] effect. The bullets themselves should retain a velocity of about [illegible] on striking to be thoroughly effective. With the more modern field guns the effective range of shrapnel extends up to about [illegible] yards; with heavy guns to [illegible] or even [illegible] yards.

Palliser shells are made of a mixture of selected brands of iron, and are cast in moulds so constructed that the pointed part of the head is in contact with iron, and that of the body with sand. The head is thus "chilled," as the rapid carrying off of the heat by the iron mould causes the particles of the metal to arrange themselves closely, and confer extreme hardness, a fine property so essential for the penetration of iron plates. The head is of the ogival shape, that being found most effective in combining strength with sharpness (fig. 18). It is a moot point whether projectiles of hardened steel are more effective than those of chilled iron against armour. Probably the steel can get through a

Common shell

Shrapne

Armour-

greater thickness, but the damage done by the fragments of the Palliser after perforation is more serious. The cost of the steel shell is about five times that of the iron one. The latter are cast in sand because extreme hardness is not there required, and a sounder casting is thus obtained. No fuzes are used with these shells; they are burst by the shock of impact on armour, which explodes the powder charge. It is doubtful if they would explode on striking iron vessels not armour-plated, and they would fail to burst on striking wooden ships. They are effective in destroying masonry, and have been driven through great thicknesses of stone. They hold about a quarter as much powder as a common shell of the same diameter. The greatest penetration of armour yet known was obtained by the 100-ton gun at Shoeburyness in 1877. The target consisted of four 8-inch wrought iron plates, sandwiched with three 5-inch layers of teak, the whole put together with enormous strength. The projectile perforated three plates and the teak, burying its nose about half-way into the last plate, which was much cracked and bulged. The 100-ton gun has perforated with ease 22 inches of solid wrought iron plate strongly backed, but failed to drive a hole through a similar target when the plate was of steel. Very recently extraordinary penetration has been obtained by a 6-inch 70-pounder made by Sir W. G. Armstrong & Co. Fired with a velocity of nearly 2000 f. s., this small projectile pierced about 11 inches of wrought iron. The subject of penetration is treated under GUNMAKING.

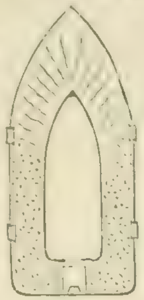


Fig. 18.—Palliser shell.

A description of some of the fuzes and firing tubes used in gunnery will be found under AMMUNITION. The general principle guiding the selection of time or percussion fuzes is that when a shell is required to burst in the air a time fuze is employed, when on striking an object a percussion fuze is chosen. In muzzle-loading guns (not using gas-checks) time fuzes are ignited by the flash of discharge; otherwise the shock is taken advantage of to light the composition by exploding a detonator. Percussion fuzes are sometimes found to act too rapidly; where it is desired that penetration to a certain depth in earth or other material shall take place before explosion, it is found necessary to slow the fuze by interposing a small column of composition, burning for, say, a quarter of a second, between the detonator and the bursting charge. In firing a heavy shell with high velocity at a weak vessel, the resistance of the side is so slight that it may happen that the fuze either fails to act, the shell not being sufficiently retarded to set it in action, or explodes the shell after it has passed through both sides. To meet this case a specially sensitive and rapidly acting fuze has been devised.

Fuzes.

Guns were formerly primed with loose powder and fired by a match, next by common quill tubes filled with composition and ignited by a portfire, then by detonating tubes exploded by a hammer. Now friction tubes have superseded these methods for ordinary service. When it is desired to fire a gun from a distance, or to fire a number of guns absolutely at the same moment, Abel's electric tubes are employed. In them two fine copper wires pass down through the head, insulated by gutta percha, except at the ends, which are separated by $\frac{1}{5}$th of an inch of a composition of subphosphide and subsulphide of copper with chlorate of potash. The other ends of the wires are in contact with the copper lining of two holes in the head. The wires from the battery are placed in these holes; when the current passes, the composition is heated to ignition and explodes the tube.

Electric tubes.

Service of Ordnance.—The general principles guiding the employment and manipulation of artillery are applicable to the schemes of warfare of all civilised nations. Slight differences exist in calibres and weight; but it may be taken that the considerations which regulate the designs of English guns have the same force elsewhere. The details of manufacture, the systems of loading, and the method of rifling, are the chief points regarding which artillerists differ; these matters are treated under GUNMAKING. Of two pieces constructed with equal skill to perform the same kind of work, the heavier will always be the more powerful. Thus weight is the chief controlling element in the employment of guns, though cost and convenience of manipulation have often to be taken into account. The artillery of the present day is the outcome of a long series of improvements, and the whole system of this important arm bears traces of frequent modification and continual compromise. The first introduction of firearms appears to have taken place in England in the reign of Edward III. On the Continent it was probably somewhat earlier, but the actual date and the circumstances attending their introduction are involved in obscurity. It is said that cannon were used in the English expedition against Scotland in 1327, and at the battle of Crecy in 1346. In 1360 there were four copper guns in the Tower. For about two centuries cannon continued to be manufactured of copper, brass, or bronze, good castings of which were made long before the art of smelting iron ores was perfected. In the early part of the 16th century guns were sometimes made of wrought iron plates put together longitudinally and hooped with wrought iron. In 1545 cast iron ordnance were manufactured in England, and supplanted pieces of all other materials for a time. The growing needs of warfare, however, soon demanded guns possessed of fair mobility to accompany armies in the field, and the cast iron pieces used being found excessively cumbrous, bronze was once again resorted to for field artillery. From about the middle of the 17th century till the introduction of rifled cannon, all the heavier natures of ordnance—fortress, siege, and ship guns—were made of cast iron; and all the lighter—field and boat guns—of bronze. In 1717 the bronze foundry was established at Woolwich, and most of the smooth-bored field pieces, howitzers, and mortars used in the service were made there. The heavy cast iron guns were supplied by contractors, and proved by Government officials. The long peace which succeeded the Napoleonic wars was highly unfavourable to the progress of gunnery, but a great development took place in the arts and sciences, so that, on the breaking out of the Crimean War, the latest discoveries in metallurgy and the excellence attained in machinery at once enabled inventors to make a great advance in artillery. At the transition period, a few wrought iron smooth-bores, throwing spherical shot of 150 and 100 ℔, were manufactured to overcome the resistance of iron plates then recently introduced for armouring ships. These pieces were speedily discarded for rifled guns; and practically it may be said that the adoption of steel and wrought iron for guns coincided with the change from smooth-bores to rifles, both steps of progress being thoroughly established about 1860. In spite of the great superiority of the new ordnance, it cannot be said that the old pieces are yet superseded; vast numbers of them exist over all parts of the world, and often form the only defence. Even the fortifications in England are still largely armed with them on land fronts; and though they are gradually disappearing, they yet claim notice. Bronze guns are now obsolete in the British service. Figs. 19 to 24 show typical kinds of cast iron ordnance. Those denominated according to the weight of their projectile are made strong enough to fire solid shot or shell; those called by the diameter of the bore fire shell only. It must be remembered that, with spherical projectiles, the solid must be heavier than t

Early ordnance.

Smooth-bored ordnance.

hollow kinds, which need not be the case with rifled ordnance, as the projectile may be of any length. The guns are used for direct fire, the howitzers for curved fire, the mortars for vertical fire, *i.e.*, they are set at 45° elevation, and the requisite range attained by varying the charge of powder, instead of firing at various degrees of elevation, as with guns and howitzers.

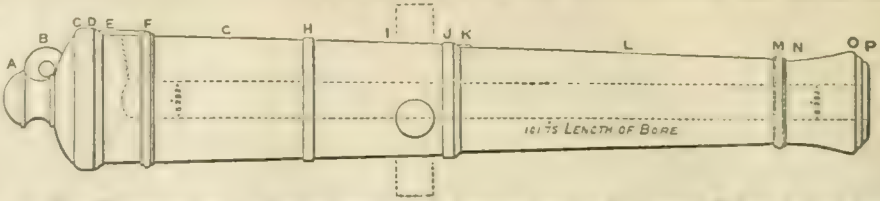


Fig. 19.—18-pounder Gun. A, button (cascable); B, breeching loop (do.); C, breech; D, base ring and ogee; E, vent-field; F, vent-field astragal and fillets; G, 1st reinforce; H, 1st reinforce ring; I, 2d reinforce; J, 2d reinforce ring and ogee; K, patch for foresight; L, chase; M, muzzle astragal and fillets; N, neck; O, swell of muzzle; P, muzzle mouldings.

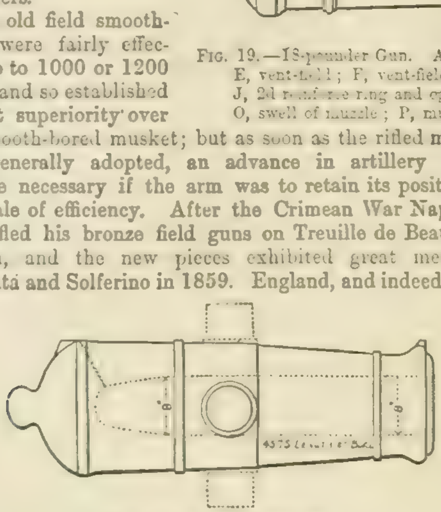


Fig. 20.—8-inch Howitzer.

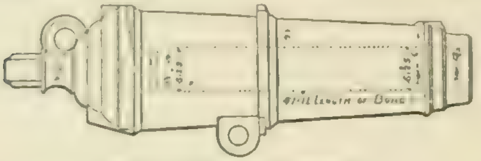


Fig. 21.—32-pounder Carronade.

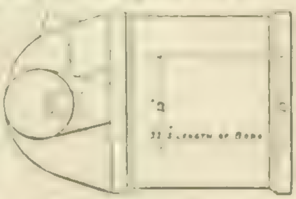


Fig. 22.—13-inch Mortar.

The old field smooth-bores were fairly effective up to 1000 or 1200 yards, and so established a great superiority over the smooth-bored musket; but as soon as the rifled musket was generally adopted, an advance in artillery power became necessary if the arm was to retain its position in the scale of efficiency. After the Crimean War Napoleon III. rifled his bronze field guns on Treuille de Beaulieu's system, and the new pieces exhibited great merit at Magenta and Solferino in 1859. England, and indeed every European power, was busily engaged in experimenting during this period. The early Armstrong guns in England, Broadwell's and Krupp's in Prussia, and imitations of the French plan in other countries, speedily caused field artillery to regain its place in war. The northern kingdoms of Denmark and Norway and Sweden, favoured by specially good iron ores, and free from the immediate alarm of war, retained cast iron as the material for light ordnance. Prussia had already begun to use steel for smooth-bores, and naturally adhered to it for rifled guns, while the coil system brought forward by Armstrong was found cheap and enduring in England. The new Prussian guns were breech-loaders, constructed on the double wedge system; they proved unsatisfactory, and since the Franco-Prussian war of 1870-71 have been abandoned in favour of a single wedge system of great neatness and efficiency. The Armstrong guns were also breech-loaders, and when tested by land and sea, on actual service in China, New Zealand, and Japan, proved to be very powerful when compared with the old smooth-bores, but also exhibited many defects of construction. At this time no thoroughly successful breech-loader had been invented, and England reverted to muzzle-loading, while the Continental powers for the most part endeavoured to improve their methods of breech-loading. In 1872 the British wrought iron and steel muzzle-loading 9-pounder of 8 cwt. had been introduced into the service, and the 16-pounder of 12 cwt., of similar construction, was being brought forward. Against these guns the Prussian 6-cwt. field breech-loader had no chance. Its lightness was almost its only merit. Throwing common shell with percussion fuzes (which were useless on soft ground), having but a poor muzzle velocity, and suffering much from retardation by the air, its effect was feeble compared with that of the British 9-pounders, which threw with 200 f. s. more velocity a time-fuzed shrapnel of excellent construction, while the 16-pounder, though not equally fortunate with the 9-pounder in the arrangement of its projectile, yet by sheer power and weight of metal surpassed in deadly effect every field gun in existence. England's field artillery was undoubtedly the most powerful known at that period. No one was more alive to this fact, or more dissatisfied with it, than the Germans. Their great gunmaker, Krupp, forthwith improved his breech-closing fittings, and instituted series upon series of experiments till he produced two guns—one for horse artillery, and one for field batteries, also horsed—which were an enormous advance on the weapons previously employed against the French. The lighter gun weighs 7 cwt., and throws a shell of 11 ℔ weight, with a muzzle velocity of 1525 f. s.; the heavier weighs 9 cwt., and throws a shell of 17 ℔ weight, with a muzzle velocity of 1460 f. s. These are figures indicating power not to be attained by the English 8-cwt. gun, or even the newer pattern of 6 cwt. throwing a 9 ℔ shell with a muzzle velocity of 1380 f. s., and the 12 cwt. gun, throwing a 16 ℔ shell with a muzzle velocity of 1360 f. s. The immediate consequence of the introduction of these improved German pieces was the instituting of a series of experiments in England which resulted in the production of a muzzle-loading field gun, weighting 8 cwt., and throwing a 13 ℔ projectile with a muzzle velocity of 1560 f. s. Shrapnel shell from this gun will retain velocity over 800 f. s. (the speed below which they cease to possess high efficiency) up to 3500 yards range. In this new gun advantage is taken of all the latest improvements, such as an enlarged powder chamber, increased length of bore, polygroove rifling, rotation by gas-check, and powder specially adapted to the piece. Although the introduction of this field gun once more places English light-artillery in the van, further progress is near. Sir W.

Field ordnance.

Field guns.

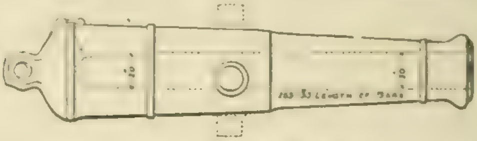


Fig. 23.—10-inch Shell Gun.

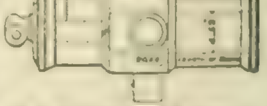


Fig. 24.—Coehorn Howitzer.

G. Armstrong & Co. are now (1879) experimenting with field guns, both muzzle and breech loading, yielding velocities of 2000 f. s., and no doubt a fresh development of the new principles of air-spacing and chambering (already initiated in the Royal Gun Factories) is at hand (see GUNMAKING).

Siege guns.

The history of the progress of siege guns would be in a great measure a repetition of that of the field artillery. Briefly, the smooth-bored siege train of cast iron 18-pounders and 8-inch howitzers was replaced in 1859-63 by one composed of 20-pounders, 40-pounders (figs. 25-28), and 7-inch rifled breech-loading pieces, with certain howitzers which never earned adoption. Subsequently the breech-loaders have been gradually ousted by 25-pounder, 40-pounder, and 64-pounder muzzle-loaders, with 8-inch, 6·6-inch, and 6·3-inch howitzers, new patterns of which latter pieces have just passed their early trials. The 64-pounders were introduced in 1864. For naval purposes the calibre was chosen so that 32-pounder round shot could be fired from it on emergency. The 40-pounders are stronger, and fire much heavier charges than their breech-loading congeners. The 25-pounder was introduced in 1874 to supersede the 20-pounder breech-loader for light siege trains, and as a gun of position. Ever since 1853 experiments have been carried out by the English and other nations for the improvement of mortars and howitzers, first in a smooth-bored and then in a rifled state. These experiments are still in progress, and it cannot be said that the art of throwing heavy shell at high angles has as yet arrived at perfection. In 1872 short pieces throwing shells of 180 lb and 64 lb were adopted, but recently longer and more powerful shell-guns have been tried, throwing heavier projectiles with greater accuracy. In these new pieces polygroove rifling with gas-check rotation affords a hope that the necessary precision may be attained.

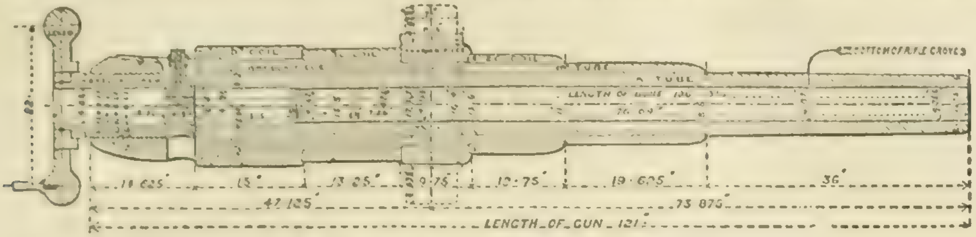


FIG. 25.—40-pounder Armstrong Rifled Breech-loader.

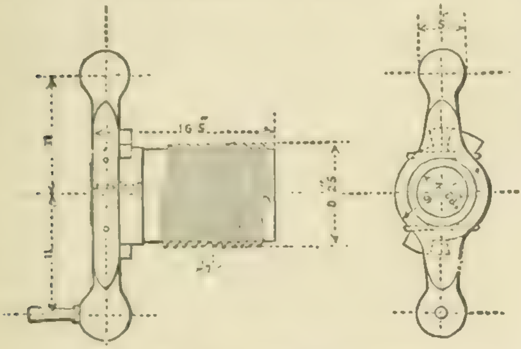


FIG. 26.—40-pounder Breech Screw.

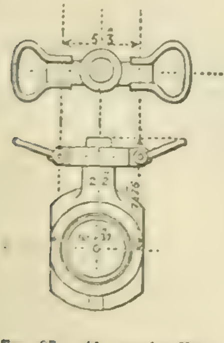


FIG. 27.—40-pounder Vent Piece.

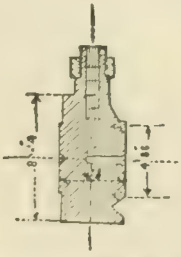


FIG. 28.—40-pounder Vent Piece (section).

Converted guns.

The "converted guns" must not be passed over, since they are largely employed to arm our land fronts and to provide cheap and efficient pieces for practice by the reserve forces. When first elongated rifled projectiles were introduced, a great many methods of strengthening the old cast iron ordnance were proposed. The most satisfactory was that put forward by Palliser, and consisted of lining bored-out cast iron shells with wrought iron tubes. Some of the smaller men-of-war carry these pieces, but the great majority are used only for the secondary purposes above mentioned. The 32-pounders of 58 cwt., and the 8-inch shell-guns of 65 cwt., have thus become 64-pounders, and the 68-pounder of 95 cwt. has become an 80-pounder.

Armour-piercing guns.

Important as are the land-service pieces of the army to England, yet, viewing her naval supremacy as one of the chief sources of her greatness, we must consider heavy ship and coast-defence ordnance to take the first place in modern gunnery. The contest between guns and armour has now continued with scarcely any intermission for upwards of twenty years, during which time the armour has increased in thickness from 4 to 24 inches, and the guns from 68-pounders to 2000-pounders; that is, from the most powerful of the old cast-iron smooth-bores to the 100-ton gun. The first armour-piercing rifled guns were the 7-inch Armstrong breech-loaders, but their supremacy was of short duration. They were the heaviest made on that system, and were speedily succeeded by far more powerful muzzle-loaders. In 1867 8-inch and 9-inch guns had already been introduced. The 9-inch Woolwich rifled gun of 12 tons was tried in competition with the xv-inch American smooth-bore, which weighed nearly half as much again, against armour. The British piece gained a decisive victory. In 1868 it was decided to introduce a 10-inch gun of the same character. Since that time progress has been continual, and the latest productions of the three great gun-producing establishments of the world are the 71-ton steel breech-loader, recently tested, of the German maker (Krupp), the 80-ton muzzle-loader of Woolwich, and the 100-ton muzzle-loader of the Elswick firm (Sir W. G. Armstrong & Co.).

Tables IV. and V. show all the principal rifled guns in the land and sea services of Great Britain. It has always been an object with the authorities to assimilate the guns of the two services as far as their respective requirements will permit, and so to avoid multiplication of stores at the numerous home and foreign stations where supplies are made; but still it will be observed that considerable differences exist, and, judging from the progress of events, it appears likely that these differences will increase, because, as the science of gunnery becomes developed, each new kind of gun is more exactly fitted to the performance of the special work for which it is intended, and therefore less suitable for other purposes.

Land service rifled guns.

TABLE IV.—*Land Service Rifled Guns.*

Nature, Weight, Calibre, &c.	Weight of heaviest Projectile.	Max Service Muzzle Velocity.	Class.	Perforation at 1000 yds. About	Bursting charge of common shell. About	How Mounted.
Muzzle-loading.	lb.	f.s.		ins.	lb. oz.	
17"·72 of 100 tons	2000	1600	Armour-piercing guns	30·0	66 0	*En barbette.*
16"·0 of 80 tons	1700	1600		28·0	58 0	In turrets.
12"·5 of 38 tons	800	1420		16·0	43 0	In casemates, on sliding carriage on traversing platform on racers.
12"·0 of 35 tons	700	1340		13·7	40 0	*En barbette* on ditto, ditto.
12"·0 of 25 tons	600	1300		10·8	35 0	In casemates on do., and *en barbette.*
11"·0 of 25 tons	535	1315		11·9	30 0	Do. do. do.
10"·0 of 18 tons	400	1365		11·2	20 0	Do. do. do.
9"·0 of 12 tons	250	1420		8·8	19 0	Do. do. do.
7"·0 of 7 tons	115	1560	Land-front (fortress) guns.	Armour-piercing projectiles not supplied for these and smaller guns	9 0	*En barbette*, sliding carriages on traversing platform. Moncrieff carriages.
7"·0 of 82 cwt., breech-loading	90	1165			6 0	Do. do.
80 pr. (6"·3) 5 tons	80	1240			9 0	Sliding carrs. on traversing platform
64 pr. (6"·3, 71 cwt. & 58 cwt.)	64	1250 1245			7 0	Standing and Moncrieff carriages.
64 pr. (6"·3) 64 cwt.[1]	90	1365	Siege-train guns.	23 to 25 ft. from point of shaft to muzzle of gun.	7 0	Travelling carriages (siege).
40 pr. (4"·75) 35 cwt.	40	1560			3 0	Do. (siege and batteries of position)
25 pr. (4"·0) 18 cwt.	25	1320			2 0	Do. do.
8"·0 howr. 46 cwt.	180	790			14 0	Do. (siege); also on beds for siege
8"·0 howr. 70 cwt.[1]	230 170	675 940		for bombarding. for breaching.		
6"·6 howr. 36 cwt.[1]	135 95	610 845		for bombarding. for breaching.		
6"·3 howr. 18 cwt.	64	830			7 0	Travelling carriages (siege).
16 pr. (3"·6) 12 cwt.	16	1355	Field guns.	About 23 ft. from point of shaft to muzzle of gun.	1 2	Field gun carriages, with limbers.
13 pr. (3"·0) 8 cwt.	13	1560			0 14	Do. do.
9 pr. (3"·0) 6 cwt.	9	1390			0 7	Do. do.
7 pr. (3"·0) 200 lb.	7	970	Mountain-train guns.	.. .	0 6	Mountain service, on travelling carriages. Siege, on beds.
7 pr. (3"·0) 150 lb.	7	675		.	0 6	Do. do.

[1] Special projectiles for penetrating masonry.

Sea service rifled guns.

TABLE V.—*Sea Service Rifled Guns.*

Nature, Weight, Calibre.	Weight of heaviest Projectile.	Max Service Muzzle Velocity.	Perforation at 1000 yds. About	Bursting charge of common shell. About	How Mounted.
Muzzle-loading.	lb.	f.s.	ins.	lb. oz.	
16"·0 of 80 tons	1700	1600	28·0	58 0	In turrets.
12"·5 of 38 tons	800	1420	16·0	43 0	In turrets, loading by hydraulic machinery.
12"·0 of 35 tons	700	1340	13·7	40 0	In turrets, loading by hand gear
12"·0 of 25 tons	600	1300	10·8	38 0	Do., do., and broadside.
11"·0 of 25 tons	535	1315	11·9	30 0	Broadside, revolving, and on turn-tables [illegible]
10"·0 of 18 tons	400	1363	11·2	20 0	Broadside, revolving, in turrets, and [illegible]
9"·0 of 12 tons	250	1420	8·8	19 0	Broadside and revolving
8"·0 of 9 tons	180	1415	7·7	14 0	Broadside.
7"·0 of 6½ tons	115	[illegible]	Armour-piercing projectiles not supplied for guns of less than 8-inch calibre	9 0	Broadside.
7"·0 of 90 cwt.	115	[illegible]		9 0	[illegible]
64 pr. (6"·3) of 64 cwt.	64	[illegible]	..	7 0	Broadside.
64 pr. (6"·3) of 71 cwt.	64	[illegible]	..	7 0	[illegible]
9 pr. (3"·0) of 8 cwt.	9	[illegible]		0 7	Boat
9 pr. (3"·0) of 6 cwt.	9	[illegible]	.	0 7	Boat
7 pr. (3"·0) of 200 lb.	7	[illegible]		0 6	Boat
Breech-loading.					
20 pr. (3"·75) of 16 cwt.	21	1000		1 2	Gun vessels' and upper decks of iron-clads [illegible]
12 pr. (3"·0) of 8 cwt.	12	1170	.. .. ..	0 8	Boat, [illegible]
9 pr. (3"·0) of 6 cwt.	9	1060		0 6	Do.

Table IV. shows five distinct classes of rifled ordnance. 1. The heavy armour-piercing guns (figs. 29, 30) are mounted round our coasts in casemates and barbette batteries. Their function is to protect the British shores from the attack of iron-clad ships, wooden vessels, and boats. They are accordingly provided with chilled projectiles, common shells, and a small proportion of shrapnel shell. In order to strike vessels steaming past at high speed, great accuracy, combined with rapidity of fire, is requisite. The guns are aimed either by eye or map, according to the nature of the coast. In the former case, the detachment commander estimates the range, gives the necessary elevation by means of the tangent sight, directs the line of fire according to his judgment, jumps down and gives the word to fire—allowing for the vessel's motion and the time of the projectile's flight.

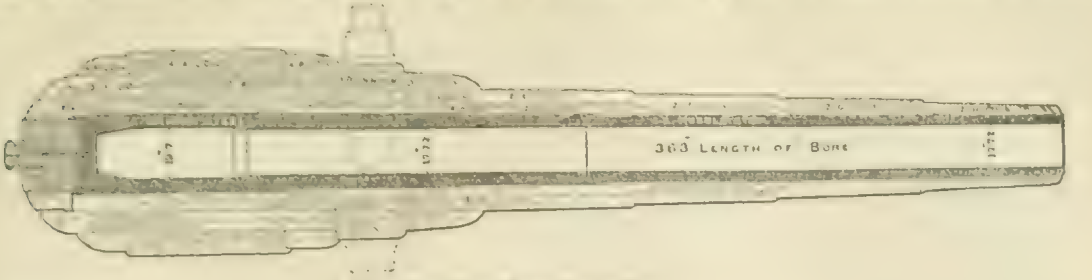


Fig. 29.—100-ton Gun (section).

Watkin's [illegible]

The map system has been recently perfected by Captain Watkin, R.A. In it the whole navigable front commanded by the battery is plotted down in small squares numbered and lettered. Tables of the distances of the centres of these squares, the degree of training on the traversing arc required to lay the gun on the desired square, together with the actual elevation necessary to deposit the shot in that square, are constructed for each group of guns.

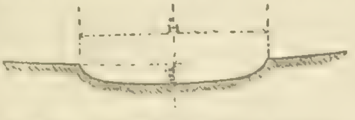


Fig. 30.—100-ton Gun (section of groove).

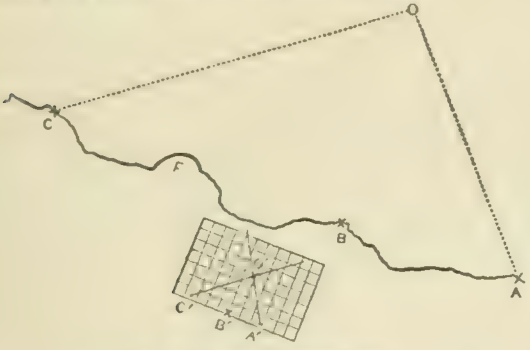


Fig. 31.—Watkin Position-finder.

In fig. 31 F is a fort defending the channel; ABFC the line of shore; O the object to be hit, a vessel passing. A, B, and C are stations of observation. In a convenient spot the commanding officer of the artillery in the fort places the map, over which play two arms A′O′, C′O′ kept constantly parallel to the two lines of sight AO, CO, by means of mechanism actuated by currents of electricity transmitted by a cable connecting A and A′, C and C′. As A′C′ represents, on the scale of the map, the distance AC, the junction O′ represents on the same scale the position and distance of the object O. Tell-tales are distributed in the casemates, which constantly exhibit the number of the square over which the vessel is passing, showing the position of the ship, so that when the gun, or group of guns, are loaded, they can be either laid in the ordinary way, taking the range from the tables, or, if the object is invisible from the casemate, by trailing the gun round till the number of degrees indicated by the tell-tale agrees with the reading on the traversing arc, and giving elevation to suit the range. The arcs showing the direction of the guns are so arranged that guns trailed to any given number of degrees are parallel with each other. Supposing that from smoke or other cause the object cannot be distinguished from C, an observer is placed at B, and the arm is shifted from C′ to B′. The practical working of the system is as follows. The commanding officer watches the course of a vessel as indicated to him by the arms on the map, the observers at A and C constantly following the centre of the object with their glasses. He telegraphs to the battery orders to load and lay, in accordance with the instructions given for each square of the map, and transmitted to the tell-tales. As the vessel passes over the square for which the guns are laid, the commanding officer can fire electrically the group of guns by pressing a key with his finger, or he may direct each detachment to keep up independent practice, laying in accordance with the indications sent by him through the tell-tale. The arrangements for exploding submarine mines or fixed torpedoes, where hostile vessels are passing close to them, are somewhat of the same character as those above described.

Guns of defence.

2. The *land-front guns* of fortresses shown in the table are intended to overpower and quell the fire of any pieces which can be brought against them by a besieger. They are very largely supplemented in most fortified places by a number of the old smooth-bored guns and carronades, which are well adapted for the use of case shot at close quarters, for sweeping the glacis, and for the defence of ditches. The rifled guns throw common shell into the siege works, and where possible among the enemy's material. They harass his working parties and reliefs with shrapnel, and endeavour to cut down his parapets and dismount his artillery by direct fire.

Guns of attack.

3. *Siege-train guns* accompany an army on a campaign where great mobility is not required, and where it is necessary to reduce fortified places. They should be the most powerful pieces which the means of transport will permit. In the more civilized parts of the world, where roads and climate are favourable, it is generally considered that about 70 cwt. is the heaviest weight of piece that can be carried with an army. In less favourable countries it is frequently impossible to transport more than half that weight. The early rifled siege-train guns were grouped into two classes. A unit of the heavy train comprised—

64 prs. of 64 cwt.	8
40 ,, of 35 ,,	8
8″ howitzers of 46 cwt.	14 (figs. 32, 33).

A unit of the light train comprised—

40 prs. of 35 cwt.	10
25 ,, of 18 ,,	10
6·3″ howitzers of 18 cwt.	10

Lately 8·0″ howitzers of 70 cwt. and 6·6″ howitzers of 35 cwt. have been introduced, but their allotment has not yet been settled. Siege guns are supplied with special shell, somewhat similar to Palliser projectiles, for penetrating masonry; also with common and shrapnel shell. The howitzers rarely use shrapnel shell. On first attacking a fortress at a long range, the duty of the guns is to cut down the defender's parapets, dismount his artillery, dismantle his ramparts, and subdue his fire, so as to facilitate the construction of batteries nearer the place. In the meanwhile the howitzers lob heavy shell into his works, and bombard the town, if necessary. As soon as practicable, breaching batteries are thrown up in such spots as may be found suitable for the attack of a weak point. It is rarely possible to breach by direct fire in the case of works of modern design. Here it is that curved fire is so effective, and here it is that the accuracy of rifled howitzers becomes so necessary. In order to make a practicable breach up which an assault can be delivered, the masonry at B (fig. 34), must be cut away, and owing to the height of the cover at A the fire must be curved to reach a point sufficiently low. Direct fire—*tir à plein fouet*, as the French express it—would strike too high up. Sometimes a work is so constructed that it is necessary to strike a point half-way down the masonry revetment to form a practicable breach. As it is desirable to strike with as much force as possible in breaching, it is evident that where the profile of the work requires the angle of descent of the shell to be considerable, it is necessary to select a spot for the battery at the longest range compatible with accuracy. For, given a certain angle of descent, the longer the trajectory (*see par.*) corresponding to that angle, the greater will be the remaining velocity. Sometimes the guns of the siege train are employed with an army in the field to hold a position without ground or against attack. They are then usually guns of position, and are so placed as to command the approaches most effectually, and yet, if possible, to be dragged away at the last moment in case of retreat. They will usually have common shell when thus employed.

Breaching.

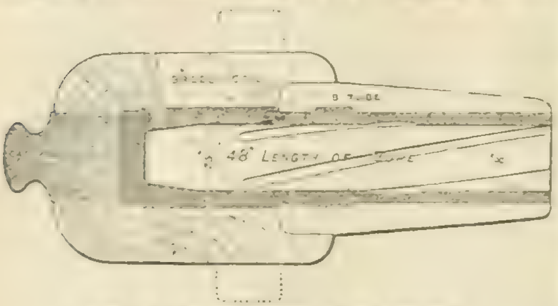


Fig. 32.—8-inch Howitzer, 46 cwt. (section).

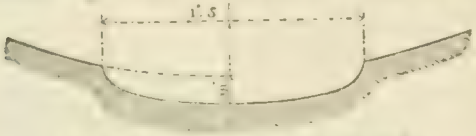


Fig. 33.—8-inch Howitzer (section of groove).

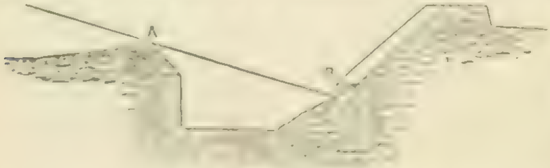


Fig. 34.—Breaching Work.

4. The all-important qualities of field guns (figs. 35, 36, 37) are mobility and shrapnel-shell power. They must be able to make long marches rapidly, to change position without delay, to escort troops and the [illegible] accurate, well-sustained fire at high velocities, and to support rough usage without detriment to their efficiency. They are supplied with shrapnel and common shell, and case shot, of which shrapnel form by far the largest proportion.

5. The *mountain-train guns* are both 7-pounders; they fire the same shell, but the heavier one uses a 12 oz. cartridge, while 6 ounces is as much as can be fired from the lighter one. Both guns are intended for mule transport, one mule taking the gun, another the carriage, and a third the wheels, &c.; but at the Cape of Good Hope the heavier 7-pounder is mounted on a light high field-carriage for transport as well as for firing, while in Ashantee the lighter 7-pounders were dragged on a kind of sleigh. The lighter gun is tolerably effective for nearly a mile, and the heavier for about a mile and a half. Some jointed guns, proposed by an artillery officer, are now under trial. They are composed of two pieces screwed together, and, being carried separately, form a gun of about twice the weight of the ordinary mountain gun. Great increase of power is expected from this method of construction. Mountain guns are principally employed to throw time-fuzed shrapnel at troops, and percussion-fuzed common shell into hill works and woods occupied by the enemy.

Mountain guns.

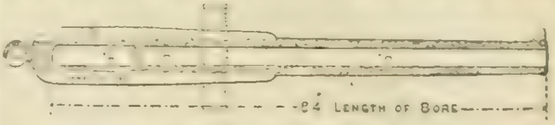


Fig. 35.—13-pounder of 8 cwt. (section).

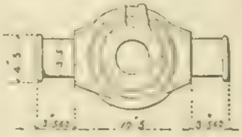


Fig. 36.—13-pounder of 8 cwt. (front view).

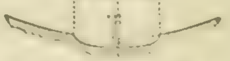


Fig. 37.—13-pounder of 8 cwt. (section of groove).

In Table V. the principal sea-service rifled guns are shown. Three kinds of work are performed by them, viz., to pierce ironclads and armoured forts, to attack unarmoured vessels, and to keep up a fire on troops on shore or on approaching boats. The heavy armour piercing guns are well provided with common shell, as well as with chilled projectiles, so as to perform the first and second duties, but they have a very small proportion of shrapnel shell, which is intended to be used by them against troops or boats only on emergency. The 7-inch and 64-pounder guns are supposed to be quite sufficient in ordinary cases for the second and third duties, assisted in the third case by the smaller boat guns. All these are well furnished with common shell and shrapnel.

Na

Gun Carriages.—The development which has taken place of late years in the power of artillery has necessitated corresponding changes in gun carriages. Formerly, every carriage was capable of travelling to some extent; even the heaviest guns were mounted on carriages fitted with trucks, which permitted motion on the ramparts or about a deck. Later on, sliding traversing platforms were introduced, upon which the gun carriages recoiled on trucks. Extra means of checking recoil became necessary as the power of the guns grew; compressors, or friction plates, were introduced, and are now only partially superseded by the hydraulic buffer. Mobility of carriage has almost entirely been given up, except for field and mountain artillery. The heaviest ship guns travel on platform wagons, not on their travelling carriages; and it is possible that the traversing platform and slide principle will extend yet further.

Carriages.

Tables IV. and V. show how the various pieces in the British service are mounted. Differences of detail exist, but the general system is the same for all European

Field gun carriages.

countries. Wrought iron is rapidly supplanting wood in the construction of carriages, and there are signs that it will in its turn be in great measure superseded by a mild steel. The subject of gun carriages is too long and too complicated to be treated in detail here, but, as guns are of no use without carriages from which to fire them, it is necessary to give some idea of the chief modes of mounting modern artillery. Figs. 38, 39 show the details of the 9-pounder rifled muzzle-loader carriage. It consists of three parts, the wheels, the axle, and the trail. The wheels have oaken spokes and ash felloes, the tire is of wrought iron, the nave and pipe box (which holds the end of the axletree arm) of a mixture of copper, tin, and zinc. The dish is considerable, amounting to 2 inches in the 5-foot wheel. There is little strut, so that the lowest spoke is nearly vertical, and the tire forms a frustum of a cone, instead of being a cylinder. The object of this form is to obtain lateral strength, especially in travelling on uneven ground. The axletree bed is of wrought iron, constituting, with the axle, a beam of box-girder section, the axletree forming the bottom. The trail consists of two side brackets, fixed by two transoms, two bolts, and the trail piece carrying the trail eye. The brackets are made of plate iron, riveted to a frame of angle iron. The axle carries two seats for gunners; into the trail are fitted the elevating screw and wheel, and the drag shoe with chain hangs below. Fig. 38 shows the gun and carriage in the firing position; when it is desired to move it to any distance exceeding a few yards, the point of the trail is raised, the limber is brought up, the trail eye is passed over the limber hook and keyed fast. The gun carriage and limber then form a four-wheeled vehicle, and travel as such. Figs. 40, 41 show the limber, which consists of wheels and axletree similar to those of the gun carriage, ammunition boxes, platform, and a pair of shafts. In the British service each gun carriage and limber are drawn by three or four pairs of horses, according to the nature of the piece. The driver of each pair mounts the near horse; the off wheel horse is between the shafts. In some countries pole draught is preferred.

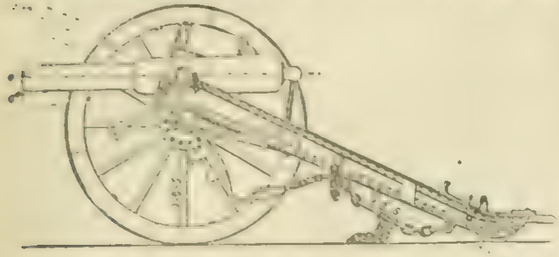


FIG. 38.—9-pounder Field Gun Carriage (elevation).

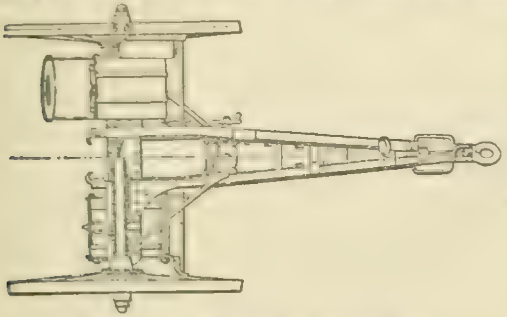


FIG. 39.—9-pounder Field Gun Carriage (plan).

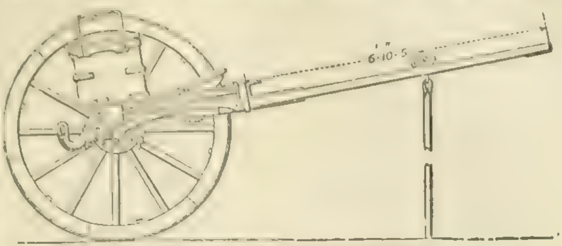


FIG. 40.—9-pounder Limber (elevation).

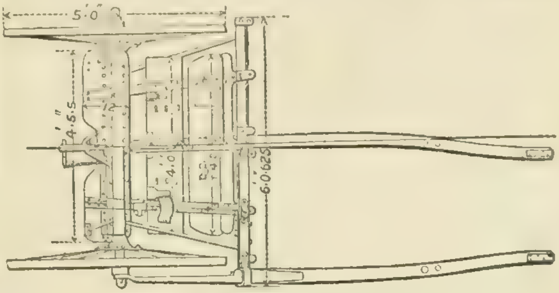


FIG. 41.—9-pounder Limber (plan).

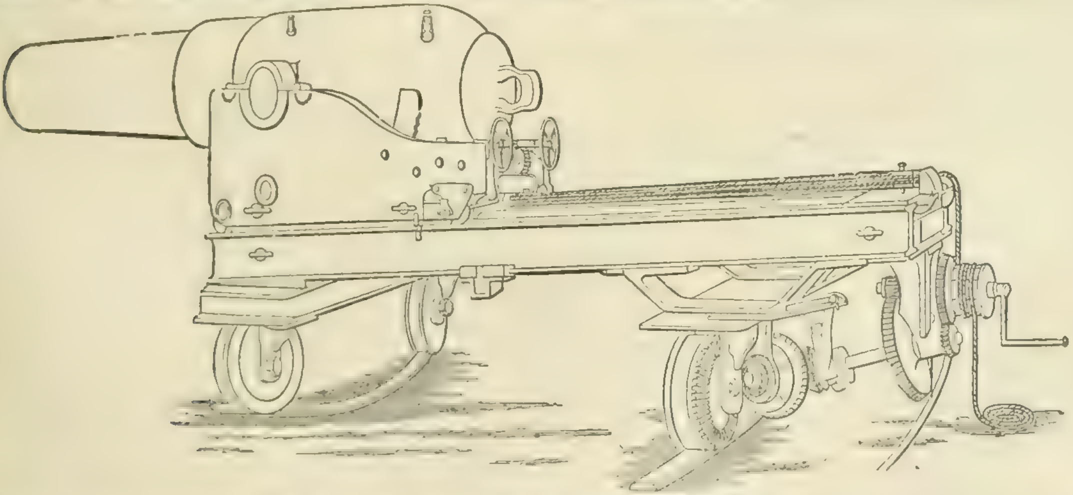


FIG. 42.—9-inch Gun Wrought Iron Carriage and Dwarf Platform.

Fig. 42 shows a 9-inch gun mounted on a wrought iron carriage and dwarf platform. This arrangement may be

Traversing slide. considered typical of all sliding carriages on traversing platforms. The direction of the gun is changed as required by training the platform to the right or left, the trucks working on the racers, front and rear, which are usually of wrought iron, laid concentrically on a bed of stone. The level of the traversing platform rises towards the rear, so as to assist in absorbing the work of recoil on firing, and to facilitate running forward again after loading. The recoil is also checked either by a system of friction plates, called a compressor, or by an hydraulic buffer, placed parallel to and between the sides of the traversing platform, so that the carriage on recoil forces a piston into a cylinder containing oil, which escapes, through holes cut through the piston head, into the space round the piston rod; the size of the holes and the amount of the oil regulate the resistance offered to recoil, and enable the gunner to stop the piece at the proper place.

Disappearing carriages. Several kinds of carriages on the "disappearing" principle have from time to time been put forward. In these the gun is exposed to the fire of the enemy only while being aimed and discharged; loading is performed under cover. The Moncrieff carriages are the most successful of this class. In them the force of recoil is stored up and employed to raise the gun from the loading to the firing position. Colonel Moncrieff applies his principle in two ways: the recoil either raises a counter-weight or forces a piston into a cylinder, compressing, by the aid of a fluid, air already much compressed. The counter-weight carriages are used to some extent in coast defence, and the hydro-pneumatic carriages are under trial for siege-train guns. Plate V. gives the details of the former. On a level traversing platform rolls a carriage or "elevator," **Moncrieff system.** which places the gun in the required position either for loading or firing. The end of the elevator opposite to that which carries the gun is weighted, so that the recoil causes the elevator to roll to the rear and the gun to descend, at the same time raising the weight, which is retained in the upward position till released after loading, when its descent again raises the gun. Thus the elevator is a lever of the first order working on a shifting fulcrum, the curve (an involute) of the rolling surface being so adjusted that the resistance of the weight gradually increases as the gun recoils, and finally stops it smoothly and without violence. Conversely, by this form the gun is raised to the firing position gradually and without being jolted.

Hydraulic Gear for Guns.—As soon as the weights of ordnance increased so greatly that their service exceeded the powers of manual labour, it became necessary to find some substitute. Steam power is always at hand in steam vessels, and it was quickly seen that it was best applied through the medium of water pressure. The simplicity and compactness of hydraulic machinery, the circumstance of its direct action rendering toothed gear unnecessary, and the perfect control it gives over the motion of heavy weights, especially adapt it for the purpose.

Rendel's hydraulic system. Plate VI. represents the system on which the [illegible] is applied to the [illegible] H.M.S. [illegible]

the port P of the turret PR. The gun is then in the loading position. In the meanwhile the turret has been caused to revolve on the conical rollers H, H by hydraulic pressure till the muzzle of the gun is brought opposite the loading apparatus, which is securely housed below decks. The water power is taken down the ammunition hoist K, which raises a truck L, carrying a shell, on the top of which is laid a cartridge, to the loading position M. The sponge N, similarly worked by hydraulic pressure, serves as a rammer also. To perform the operation of loading, the sponge is forced home through the bore of the gun against the bottom, by contact with which a button on the head is pressed, setting free a rush of water; this thoroughly and visibly cleanses the bore, and prevents the remotest possibility of a burning fragment remaining from the previous round; the sponge is then withdrawn, and the ammunition raised to M, the sponge, now become a rammer, thrusts the cartridge into the muzzle of the gun, and is drawn back, the truck is raised still higher, the rammer then pushes the projectile into the muzzle, and rams home both cartridge and shell together; a wad previously placed on the head of the rammer is left behind, just in the bore in front of the projectile, which is thus prevented from moving forward. An indicator on the rammer shows whether the charge is home. The press B is then put in action to lower the breech, raising the muzzle to the elevation required to suit the range of the object to be fired at; the gun is run forward to the firing position E, and the turret is revolved till the guns point at the object. The sights are not on the guns, but on the turret; the captain of the battery looks through a hole in the roof R, behind the guns, and arrests the movement of the turret at the correct place, when the line between the sights, which is parallel to the axes of the guns, is directed to the object. The firing may be performed either in the usual way, or by electric tubes and wires from a distance.

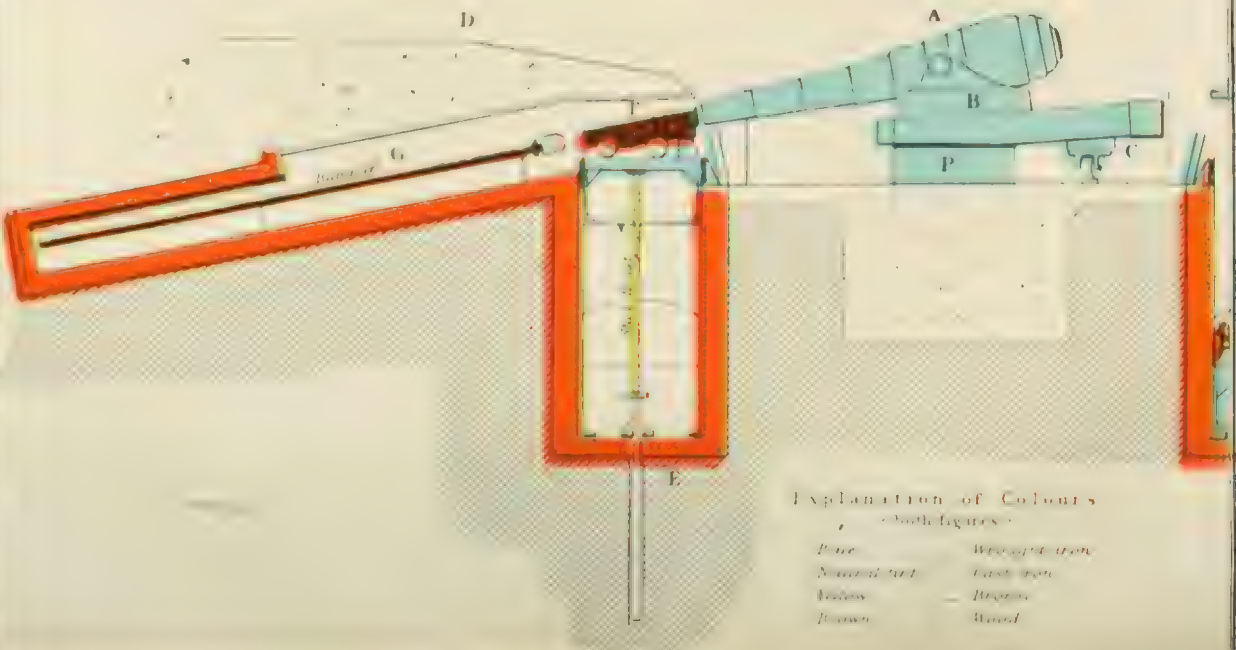
Plate V., fig. 2, shows a 100-ton rifled muzzle-loading gun, mounted *en barbette* for coast defence, and adjusted for hydraulic loading. After being fired the gun is traversed round to the position A, where its muzzle is brought opposite the loading apparatus G, which is contained in a recess in the parapet D. An hydraulic hoist E raises the ammunition on a truck F to the muzzle; a similar apparatus is constructed on the right of the gun, which is traversed to either at pleasure. The carriage B slides on the platform C, which pivots on P, a trunk through which is introduced the hydraulic power for running the gun back and absorbing the recoil.

Many other applications of hydraulic power to gunnery besides those just described are due to Mr G. Rendel of the great Elswick firm. One of the most novel is that adopted in H.M.S. "Temeraire," in which 25-ton guns are mounted on the disappearing principle in a turret having no roof and no ports; inside the turret is a turn-table carrying the gun by the trunnions on two arms, which are raised by hydraulic power, enabling the gun to fire *en barbette* over the wall of the turret. The recoil brings it down again, and it is placed opposite the loading gear by revolving the turn-table. The general principles are the same as those on which the previously described systems are constructed.

Muzzle-loading versus breech-loading. *Loading.*—This article would be scarcely complete without a reference to the comparative advantages of the muzzle and breech loading systems. Many have been much impressed with the great superiority of breech loaders as small arms, whether for sporting or military purposes, and have concluded that the same superiority must extend to ordnance constructed on this plan. Others, having seen the difficulty of avoiding complication and accident to the parts in the early breech-loaders, have hastily condemned the whole system. The truth, as is often the case, lies between the two views, as will be seen from the following considerations. The chief points of excellence to be attained by a field gun are—(1) high ratio of power to weight, (2) immunity from injury by its own fire, (3) immunity from injury by the enemy's fire, (4) capability of supporting the accidents of service, (5) rapidity and facility of manipulation, (6) efficiency of projectile. (1) The power of a gun is most conveniently measured by the energy (in foot tons) communicated to the projectile on leaving the muzzle. The following table shows how the latest English and German field guns compare together in this respect. The English guns are muzzle-loading, the German ones breech-loading.

Fig 2

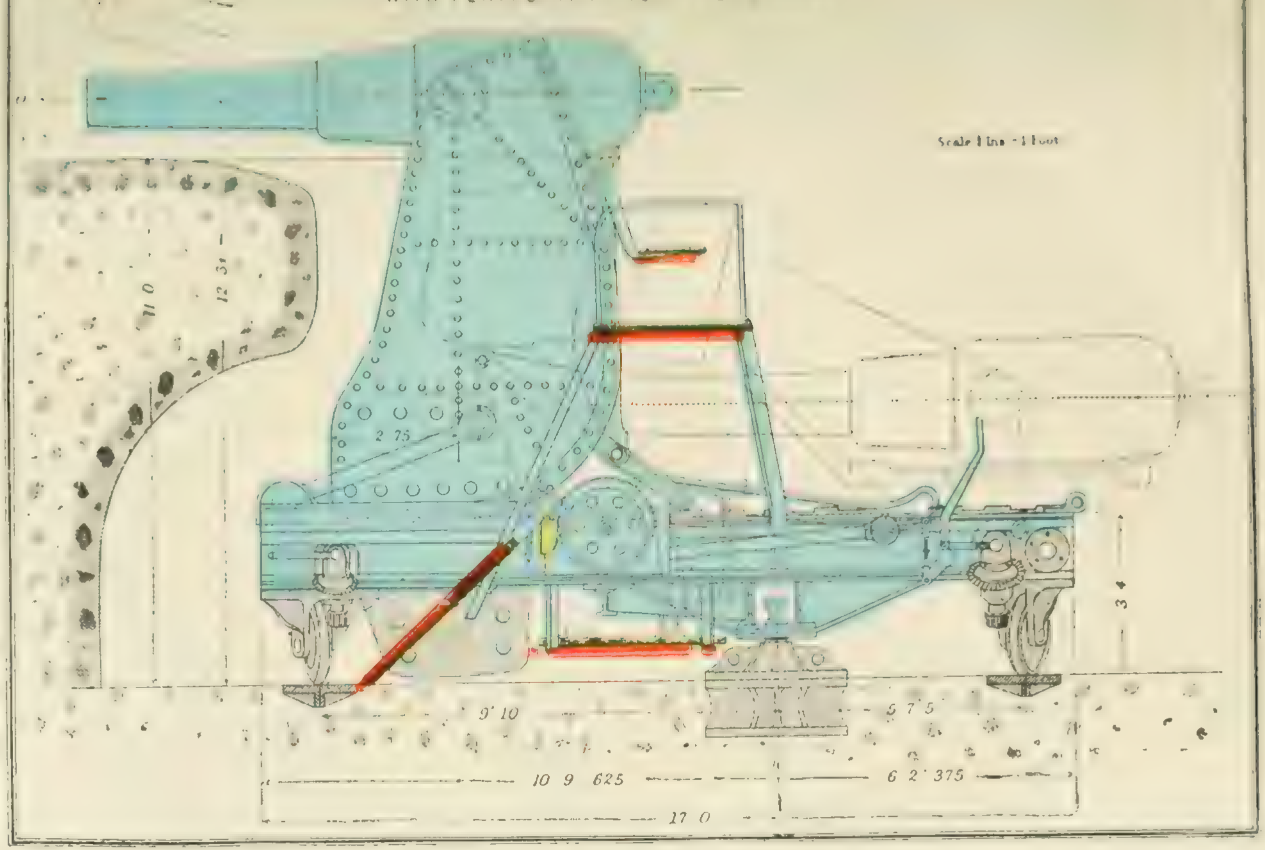
100 TON M.L. GUN EN BARBETTE
UNDER COVER LOADING
ELSWICK SYSTEM



Explanation of Colours
(both figures)

Blue	Wrought iron
Neutral tint	Cast iron
Yellow	Bronze
Brown	Wood

WITH PLATFORM 7 INCH 7 TONS MARK II



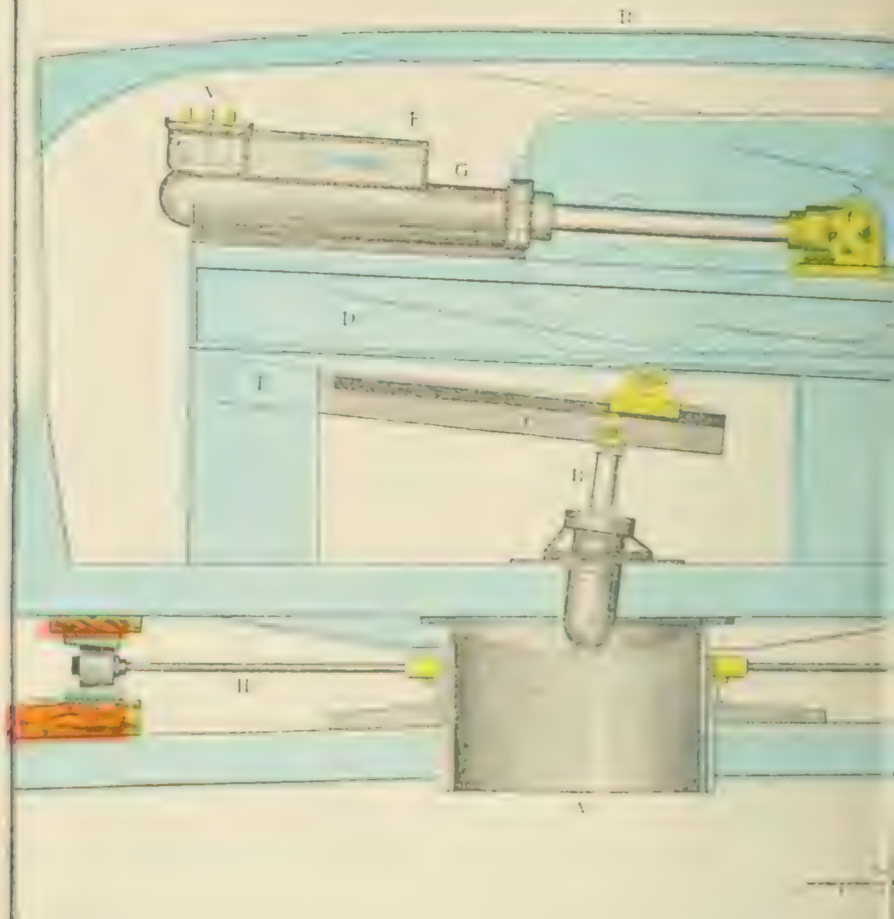
GU

SECTION THROUGH TURRE

"INFLE

Gun shown
Gun dotted in

80

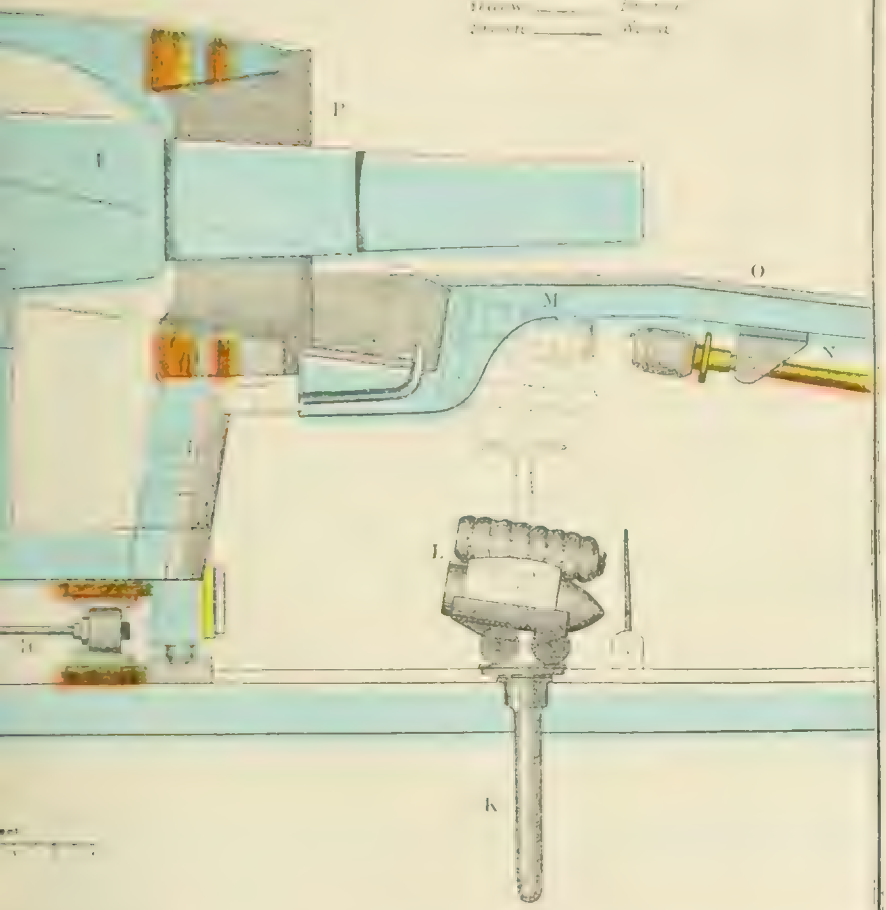


SHOWING HYDRAULIC GEAR
E" TYPE

Guns

Explanation of Colours

Blue	*Wrought Iron*
Neutral tint	*Cast Iron*
Yellow	*Brass*
[illegible]	*Wood*



W. & A. K. Johnston, Edinburgh and London

TABLE VI.

Gun.	Nation.	Weight	Muzzle Velocity	Energy.	E/W	Remarks.
pr.		cwt.	f.s.	f.t.		
9	English.	6	1380	119	397	Service guns.
16	,,	12¼	1365	213	348	
13	,,	8	1560	220	550	Under manufacture.
11	German	7¾	1525	181	467	Service guns.
15	,,	9	1460	222	493	

The English 9 and 16 pounders at the time of their introduction were the most powerful field guns known, but were after a time beaten by the new German guns, which will in their turn be beaten by the new English piece, the first supply of which was lately issued. Recently a trial was carried out of two field guns made by Sir W. Armstrong & Co. They were precisely similar in all respects, except that one was a breech, the other a muzzle-loader. No difference in their excellence could be detected. Thus it may be considered as certain that the power of a gun is in no way affected by the mere fact of its being a muzzle-loader or a breech-loader. Should, however, the adoption of one system favour an improved construction, or lend itself more readily than the other to the use of improved ammunition, this equality would disappear, and whichever system should gain a decided advantage in power, which cannot be obtained by its rival, must certainly prevail. It is almost impossible to overrate the importance of high velocity, combined, of course, with efficiency of projectile. In the field it enables the gunner to place the enemy under fire at long ranges, and so to force him to change his formations, and show his hand. It intensifies both the moral and physical effect of shell upon troops. It permits the guns to occupy good positions without the necessity of constant moving to get within range. In entrenchment firing it is, if possible, of still greater importance. Low velocity projectiles fired from field guns are almost harmless against earthworks. They have not sufficient bursting charge to do damage to the work by mere explosion, nor impetus enough to cut down the parapets; while the defenders hear the gun and crouch under cover as the shell comes. Thus it is not surprising that all our recent advances have been towards high velocities. Nothing has tended more to this end than the enlargement of the diameter of the powder chamber, which facilitates the profitable consumption of increased charges. This improvement is found to act differently on the two systems of loading. A chambered muzzle-loader requires an expanding cartridge (in field guns); a chambered breech-loader requires a breech-closing apparatus of increased size and weight. Supposing a satisfactory expanding cartridge to be devised, the muzzle-loader gains in ratio of power to weight. If this be found impracticable, the breech-loader secures an important advantage in this respect. Experiments are still in progress, and it would be premature to pronounce definitely in favour of either at present, especially as some fresh discovery or new explosive may at any moment confer preponderance on either system. (*b.*) In the Franco-German War of 1870, a large number of old pattern double-wedge breech-loaders became unserviceable by their own fire. This difficulty appears to have been quite overcome in the newer patterns of Krupp field guns by the adoption of the cylindro-prismatic wedge, with Broadwell ring and steel facing-plate. It would probably be incorrect to affirm that a breech-loader has *quite* as great immunity from injury by its own fire as a muzzle-loader, since no joint, however well contrived, can be as strong as the solid-ended steel tube forming the breech of the latter. But, putting mathematical certainty of security out of the question, it may now be accepted that practically field guns can be made as safe and enduring on one system as on the other. (*c.*) As regards immunity from injury by the enemy's fire, the muzzle-loader has a decided advantage. It is difficult to estimate the real value of this advantage, depending as it does partly on the manner in which artillery is employed, and partly on the doctrine of chances. During the Russo-Turkish War of 1877–78 but few guns were placed *hors de combat* by the enemy's fire. In such cases as did occur, the injuries were nearly always such as would not have effected muzzle loaders. The wedge handles were usually bent up by the action of percussion fuze shell jamming the wedges. The Russian field guns were generally of a feeble class; the proportion of entrenchment fighting was unusually large; and in the field the Turkish artillery habitually fired at long ranges. It may therefore be fairly concluded that the number of guns injured by the enemy's fire was not so great as to render the superior invulnerability of muzzle-loaders of much importance. These conditions will probably be reversed in any great war in which England may take part; and hence the advantage gained by muzzle-loaders in immunity from damage by hostile fire must be carefully borne in mind in comparing the two systems of loading. (*d.*) In capability of supporting the accidents of service, there is not much to choose between the two rivals. The breech-loader is more liable to injury from being upset, and exposes more parts and finer fittings to the action of the weather. On the other hand, it is easier to clean, and the officer can better see that it *is* clean. The jamming of projectiles in the bore when ramming home, which sometimes occurs with muzzle-loaders, is impossible with breech-loaders. This defect, it is hoped, has been overcome in the new English field gun. The preservation of breech-loaders, especially in mountainous countries, necessitates a profuse expenditure of oil and grease. (*e.*) In comparing the rapidity and facility of manipulation of the two methods of loading, it is necessary to consider the circumstances under which the guns are employed. Suppose a horsed battery of guns to gallop to an open spot whence they command a body of hostile troops in motion. Coming into action, the gunners load and fire as rapidly as accuracy will permit, unhampered by parapets. It is evidently of great importance to throw as many projectiles as possible among the enemy. Here the muzzle-loader will have some advantage. With full detachments in the open it takes rather less time to load, aim, and fire a muzzle-loading field gun than a breech-loading one. The reason of this is that with the former the man laying the piece can manipulate the sight and usually take aim while the loading is being performed, while, when the projectile and cartridge are thrust in from behind, he has to wait till the loading is done before he can get to the sight. There is no practical difference in the time occupied by the actual loading. In one case, the cartridge and shell are rammed down a long distance together; in the other, first the shell is put in a short distance, and afterwards the cartridge, and the wedge has also to be withdrawn and replaced. Next, suppose a commanding position to have been selected for a battery, and a light entrenchment to have been thrown up, over which the guns fire. Here the muzzle-loader will lose the advantage gained when firing in the open, as it must be loaded before being run up to the parapet, and aimed afterwards. Both natures of gun recoil, and it makes no difference in time whether the ammunition be thrust home when the gun is back at the recoil position, or after it is run up. Here the breech-loader and the muzzle-loader stand upon equal terms. Thirdly, suppose—a rare case with field guns—that firing with reduced charges is required, that shell are being lobbed from behind a parapet at high angles into a work. Here we shall have little recoil, probably not enough to permit loading at the muzzle without the gun being run back by hand. Loading at the breech will, however, be perfectly simple. In this case the breech-loader gains a very decided advantage over the muzzle-loader, since not only does it not require to be run back, but it has to be run up merely a very short distance. To this the advocate of muzzle-loading will probably reply that shells are lobbed with low velocities into works only at considerable intervals of time, that rapidity is therefore of no use, and that the advantage claimed is worthless. No doubt there is truth in this argument, but suppose the action of reduced charges on the gun to be imitated by the introduction of a brake which shall check the recoil within a short space, even when the gun is firing rapidly with high velocity, then the breech-loader behind entrenchments gains a distinct advantage. The German guns are supplied with powerful but clumsy brakes, more for travelling purposes than for firing, and it is doubtful how far they answer for the latter object. In the British service it has not been thought important to check recoil, since a certain amount of it has been necessary for loading behind parapets; but trials have been made of brakes, &c., for the purpose of preventing guns from running backwards down a reverse slope when fired from the crest of a hill, or, more generally, for checking excessive recoil. Up to the present time (1879) no great success has attended these efforts, nor does it appear feasible to abolish recoil altogether by sinking the wheels in a ditch, since the strain on the carriage would then be much increased. There is no doubt the question offers grave difficulties, especially as lightness is such an important feature in the construction of field gun carriages. As yet, then, the reduction or checking of recoil behind a parapet confers but a problematical superiority on breech-loaders, and cannot be held to counterbalance the advantage gained by muzzle-loaders in the open. (*f.*) In the older pattern guns of both systems, where studs and windage were pitted against lead coating and no windage, the muzzle-loading projectile was able to take a better time-fuze than could be used in the breech-loader, but it did not possess the same accuracy of shooting. Since the introduction of the polygroove system, in which rotation is given and windage sealed by a copper flanged ring or disc at the base of the shell, the muzzle-loading projectile has lost the advantage of being able to use the simpler time fuze, but has gained in several important respects. The breech-loading shell has also been improved by the substitution of two copper wires for the lead coating, but is probably inferior to the new muzzle-loading projectile, which, however, can be used equally well for breech-loaders. It may be said therefore that the systems are equal in respect to efficiency of projectile.

Thus then, taking the six qualities named as chief excellences to be sought for in field artillery, it appears that in four of them there is practically little or no advantage gained by either system over the other, while, in the two remaining qualities, the muzzle-loader has slightly the best of it. On the whole it seems therefore that, at the present moment, the balance of evidence is in favour of muzzle-loading for field guns.

[illegible] In comparing the advantages of the rival methods of loading siege guns, the entirely different character of the two classes of pieces composing a train at once forces itself on our attention. One class consists of long guns, projecting far over a parapet, and usually fired at low elevations with heavy charges; the other of short guns, usually fired at high elevations with light charges, the muzzles in recoil coming well within the emplacements. The Germans use long and short 15-centimetre guns, both breech-loaders, and capable of throwing shell of the same weight. The long gun, fired with heavy charges, weighs about three times as much as the short gun, which is fired with light charges. Supposing the dimensions of the short gun were increased, the proportions remaining unchanged, till its weight equalled that of the long gun, then it would be able to fire shell of three times the weight. This is what is actually being done in the British service. Now all these heavy pieces, firing either heavy powder charges or heavy shell, require very strong and consequently very heavy carriages to bear the recoil, and it is found convenient to transport the guns on comparatively light platform waggons apart from their firing carriages. Hence there is no longer any necessity for constructing firing carriages with a view to travelling purposes; and it is probable that traversing slides will be introduced for all heavy siege pieces. It is not requisite to institute at length a comparison of the various qualities desired for siege guns. Rapidity is very rarely of importance with them; they are always fired under cover, and it may be at once assumed that, as far as power and endurance go, the two systems are practically equal. A fresh set of conditions comes into play: the projectiles are heavy; and convenience of loading, combined with safety to the gunners from the enemy's fire, should now be considered. As these points are connected with the form of carriage employed, it was necessary to call to mind in comparing breech with muzzle loading, that slides are likely to take the place of travelling carriages. When long guns are fired, in order to permit loading at the muzzle, it is requisite that the recoil should be great, and the emplacement deep. Many devices, such as flexible rope rammers, jointed staves, &c., have been tried, but have not proved perfectly successful in overcoming this difficulty. Breech-loading here has a considerable advantage. Long guns are fired at low angles of elevation, and no difficulty therefore is experienced in thrusting the projectile home from behind in a nearly horizontal bore. High velocity is required, and the breech-loading system lends itself readily to enlargement of the powder chamber, without necessitating the complications of an expanding cartridge. If slides are used the hydraulic buffer checks the recoil at once; on the other hand, the parapet affords rather better protection to men standing close to it at the muzzle than to men standing a little way off at the breech. These conditions are reversed with the short pieces. The rammer is short, and no great recoil is necessary to permit loading at the muzzle. The elevation is high, and it is much easier to drop a shell in from the front than to thrust it up from behind. Indeed this cannot usually be done, and a breech-loader has to be brought nearly horizontal for loading. High velocity is never required, and enlargement of powder chamber is not wanted. The men are in the most sheltered position at the muzzle. If these views be admitted as correct, it seems clear that the long pieces of a siege train should be breech-loaders, and the short ones muzzle-loaders. To this it may be objected that uniformity would be sacrificed by such a combination. There is not much in this objection. The mere fact of two guns being loaded in different ways is surely of little consequence, and can easily be grasped by the dullest gunner. It is done every practice day on board ship, where the old pattern Armstrong vent-piece breech-loaders are combined with modern muzzle-loaders. As regards the stores, a long and a short gun of the same weight would not under any circumstances fire the same ammunition, and even in cases where a heavy long gun is associated with a light short one having the same diameter of bore, as in the case of the German 15-centimetre pieces, there is no reason why the same projectile should not be used for both if desired; that is, the new smooth muzzle-loading shell, with a gas-check on the base, would answer for both.

The question of breech-loading or muzzle-loading is therefore not only complicated, but is liable to alteration in its conditions with every advance made in the science of gunnery. To decide that an army or a navy should have nothing but breech-loaders, or nothing but muzzle-loaders, would be to make a fetish of uniformity; there is plenty of room for both systems. With regard to heavy fortress and ship guns, it is easy to suggest positions where it will probably be found that one system has a decided advantage over the other. Thus, taking the sea service first, in turrets the muzzle-loader is preferable. The loading can be performed with great facility outside the ports, and a turret of a given diameter will house a pair of bigger guns than when the loading has to be done inside at the breech, unless some method of exterior loading can be devised for the breech-loading class. For broadside guns, on the other hand, it seems equally clear that breech-loading has the advantage, as muzzle-loaders have to be run in so far to permit loading that they must be too short for ballistic excellence. For a small gun placed on a slide in the bow of a boat, it appears far more convenient to load at the breech. For those gunboats in which the vessel is simply the gun carriage and the line of fire is given by the helm, loading at the muzzle from below deck offers great advantages. Land service heavy guns, mounted on sea fronts for the protection of harbours, &c., present a great variety of conditions. In some cases the rocks or ground on which the battery is erected have such a form that a heavy gun loaded at the breech could be used where only a comparatively small one could be loaded at the muzzle. Sometimes a turret can be erected with loading gear outside, and then the conditions are reversed. In the case of very heavy guns, which once *in situ* are not intended ever to be moved, the argument from uniformity loses much of its cogency; and the circumstances of every gun position could therefore be separately considered. The guns and howitzers arming land fronts of fortresses should follow the same rule as given for the siege train, the conditions of service in battery being very similar. The long pieces should be breech-loaders, the short ones muzzle-loaders. Wherever the comparative advantages of breech-loading and muzzle-loading are nearly equal, the decision should be in favour of the muzzle-loader as possessing the inherent advantages of simplicity, solidity, and cheapness.

Conclusion.—The science of gunnery has received so many developments of late years, and is even now progressing so rapidly, that it is impossible to do justice to the subject within the limits of an article. The reader who wishes for more minute details, and who would study any part of the science thoroughly, is recommended to consult the following list of works:—

English.—Robins, *New Principles of Gunnery*; Gen. Boxer, [illegible] R.A., *Treatise on Artillery*; Col. Owen, R.A., *Modern Artillery*; [illegible] Majors Griffiths and Duncan, R.A., *Artillerist's Manual*; Major Sladen, R.A., *Principles of Gunnery*; Rev. F. Bashforth, *Motion of Projectiles*; W. D. Niven, *On the Calculation of the Trajectories of Shot*; Capt. Noble and Prof. Abel, *Researches on Explosives*; W. W. Greener, *Modern Breech-Loaders* and *Chokebore Guns*; *Proceedings of Royal Artillery Institution* (quarterly); Lt.-Col. Strange, R.A., *Manual of Field Artillery for Canada*; *Reports of Committee on Explosives*; *Reports of Committee on High-Angle Fire*; *Changes in Artillery Materiel and Stores*; and the War Office publications—*Proceedings of Ordnance Select Committee*; *Text-Book on Ordnance*; *Text-Book on Ammunition*; *Text-Book on Carriages.*

French.—Gen. Didion, *Traité de Balistique*; Id., *Lois de la Resistance de l'Air*; Prof. Helie, *Traité de Balistique Expérimentale*; G. Piobert, *Traité d'Artillerie Théorique et Expérimentale*; *Revue d'Artillerie* (monthly).

Italian.—*Rivista Marittima* (quarterly).

American.—Holley, *Ordnance and Armor*; *Annual Reports of Chief of Ordnance.*

German.—*Handbuch für die Offiziere der Königlichen Preussischen Artillerie*, Berlin, 1877; *Mittheilungen uber Gegenstande des Artillerie und Genie-Wesens*, Vienna (monthly); *Handbuch fur die K.K. Artillerie*, Vienna (published in sections, 1871-77); Maj.-Gen. Count Bylandt-Rheidt, *Der indirecte Schuss mit Hohlgeschossen*, Vienna, 1874; Prof. Georg Kaiser, *Theorie der Elasticitat und Festigkeit rohrenformiger Korper*, Vienna, 1876; Id., *Ueber Laffeten-Construction*, 1877; *Militär-Wochenblatt*, Berlin. (E. M.)

Note.—The publishers are indebted to the kindness of H.M.'s Stationery Office and the Royal Artillery Institution for assistance in preparing some of the illustrations for the foregoing article.

GUNNY. This name is applied to cloth or bags made of jute, and is supposed to be derived from *ganga* or *gania* of Rumphius, or from *gonia*, a vernacular name of the *Crotalaria juncea*—a plant common in Madras. One of the first notices of the term itself is to be found in Knox's *Ceylon*, in which he says: "The filaments at the bottom of the stem [coir from the cocoa-nut husk (*Cocos nucifera*)] may be made into a coarse cloth called gunny, which is used for bags and similar purposes." Jute (*q.v.*) is the fibre of two species of *Corchorus*, *C. capsularis* and *C. olitorius*, one species of which, probably the latter, has long been known as the Jew's mallow, from the fact that the leaves have long been used in Palestine, Egypt, and Arabia as a potherb.

The seeds of the jute plant are sown in April or May and the plant is cut down close to the roots just before flowering. The tops are then clipped off and the stems made into bundles, which are placed in tanks or ditches and covered with turf or other heavy substances to keep the bundles under water. Here they are watched anxiously day by day till the fibre separates easily from the central woody portion. The period of retching or soaking takes from eight to ten days; if allowed to remain too long, the fibre rapidly decays. In drying also the fibre generally becomes of a deeper colour. When the fibre is ready for manipulation, the operator descends into the tank or ditch, and taking 10 to 15 bundles, strips off the barky fibre and washes thoroughly, and by a dexterous movement of the wrist spreads and separates the fibres over the surface of the water. The fibre soon becomes clean, and is hung over bamboo framework to dry. The fibre thus obtained is fine, long, and silky, but the short staple and the portion near the root held in the hand of the operator during washing, which frequently has bark attached, are the portions generally selected to make gunny bags or cloth of.

The kind of cloth known as gunny, [tat, choti, &c., is woven in various lengths and widths for use as bedding, bags, &c., and formerly, more than at present, every man, woman, and child, boatmen, husbandmen, and others, in their spare moments, distaff in hand, wove gunny cloth. Even the Hindu widow, saved from death and despised by all, made her life less miserable by making gunny cloth, and thus rendering herself to an extent independent of her family. On the eastern frontier women are clothed in it, and the poor cover themselves with it at night. In the Malayan Archipelago it is no unusual sight to see a poor Chinese coolie with a dress made of gunny cloth. The great and most important use, however, to which gunny cloth is applied is in making bags wherein to pack rice, linseed, sugar, cotton, and other products for shipment.

As soon as this cheap, strong, and serviceable material became known, the manufacture speedily assumed enormous proportions, and vast quantities of jute were imported into Dundee for the manufacture of gunny bags and cloth alone. The Dundee mills, in the early period of this trade, had only Indian hand-woven gunnies to compete with. The introduction of the latest machinery of the most approved patterns into Bengal, the chief seat of this industry in India, has, however, had the effect of giving India the opportunity of competing with the Dundee mills on advantageous terms, and now India supplies vast quantities of gunnies to Europe, Egypt, Ceylon, the Malayan Archipelago, China, and the United States. In America alone it is computed that the annual average outturn of cotton is 3,500,000 bales, each bale requiring 6 yards of wrapping material, and of this one-third at least is supplied in gunny cloth. In 1872–73 6,105,275 gunnies and 64,347 pieces were exported from India, whilst in 1876–77, during a period of eleven months, 30,110,616 gunny bags and 8,262,835 yards of gunny cloth were exported to foreign countries. These figures do not include what is sent coastwise or what is used for packing exported Indian produce.

Bombay too has machinery for weaving jute, but has not as yet done much to compete with Bengal, and indeed there appears little hope for Bombay unless large quantities of jute can be made to grow on the spot, since, apart from the cost of carriage, the juices in the jute plant, as in many other plants, become resinified by drying, and therefore require operating upon whilst perfectly fresh, being attended after treatment with more difficulty in manipulation and a less outturn of fibre.

The excellent gunny bags sent to England are often used for repacking for exportation, and large quantities find their way to paper mills.

GUNPOWDER

UPON the great importance of the invention of gunpowder it is needless to dwell. Not only has it revolutionized the art of war, and given the forces of civilization a vast advantage over mere numbers and savage valour, but we may even urge, paradoxical though it appears, that the very improvements by which modern science has rendered military machines more deadly tend to make war far more expensive, and therefore to prevent its being so frequently or so rashly undertaken as of old. Besides such indirect services to civilization, gunpowder has been and is of great use in the arts of peace, although of late years to a certain extent superseded by more potent explosive agents.

istorical etch. Such being the case, it is not a little remarkable that the discovery of gunpowder should be veiled in uncertainty, although this very obscurity seems proof of its great antiquity. It is, however, certain that it was *not* invented, as has been often stated, by the German monk Bertholdus Schwartz, about 1320, although Wilkinson, in his *Engines of War*, considers Schwartz may have suggested the use of a mortar, since the form as also the name of this piece of ordnance may well have been due to some accident in the laboratory. Roger Bacon, who was born in 1214, refers, *circa* 1267, to an explosive mixture of the nature of gunpowder as known before his time, as being employed for purposes of diversion, and as producing a noise like thunder, and flashes like lightning; he even suggests its application to military purposes, and indulges in the supposition that some such composition might have been employed by Gideon to destroy the Midianites (Judges vii.). He elsewhere writes —"Ex hoc ludicro puerili quod fit in multis mundi partibus, scilicet, ut instrumento facto ad quantitatem pollicis humani, ex hoc violentia salis, qui salpetræ vocatur, tam horribilis sonus nascitur in ruptura tam modicæ pergamenæ, quod fortis tonitru rugitum et coruscationem maximam sui luminis jubar excedit" (see preface to Jebb's edition of Bacon's *Opus Majus*). In the above passage saltpetre is alone referred to as the violently explosive substance, but Bacon was well aware of the fact that saltpetre of itself will not *explode*, for in his previously written treatise, *De Secretis Operibus Artis et Naturæ et de Nullitate Magiæ*, he says "that from saltpetre *and other ingredients* we are able to make a fire that shall burn at any distance we please." In chap. xi. of the same work these other ingredients are veiled in the disguise of an anagram: "Sed tamen salis petræ *lura nope cum ubre* et sulphuris, et sic facies tonitrum et coruscationem, si scias artificium;" the unmeaning words in italics have been translated as *carbonum pulvere*. Robins, in his work on gunnery (1742), and Dutens (*Enquiry into the Origin of Discoveries attributed to the Moderns*) suggest that Bacon may have derived his knowledge from the MS. of Marcus Græcus, preserved in the National Library at Paris, entitled "Incipit *Liber Ignium* a Marco Græco perscriptus, cujus virtus et efficacia est ad comburendum hostes, tam in mari quam in terra." Marcus Græcus, who lived about the end of the 8th century, was therefore not ignorant of the military uses to which the composition might be put; among other modes of launching fire upon an enemy he gives one to the following effect:—one pound of live sulphur, two of charcoal of willow, and six of saltpetre, reduced to a fine powder in a marble mortar and mixed together; a certain quantity is to be put into a long, narrow, and well compacted cover, and then discharged into the air. This is evidently the description of a rocket. It has also been suggested that Bacon may have learnt the secret in Spain, in which country he is known to have travelled, and whose Moorish masters were then far in advance of the rest of Europe in science and literature. Albertus Magnus, in his treatise *De Mirabilibus Mundi*, repeats almost word for word several receipts in the work of Marcus Græcus; also, an epistle by Ferrarius, a Spanish monk, and a contemporary of Bacon, which is preserved in the Bodleian Library at Oxford, gives receipts for Greek fire, rockets, and "thunder." There is a treatise on gunpowder in the library of the Escurial, written about 1250, which appears to describe both rockets and shells; the Arabians are, from this and other authorities, supposed to have enclosed combustible or explosive compositions in hollow globes of iron, which were discharged upon the foe either by hand, like the modern grenade, or from the warlike machines then in use; it has also been stated that towards the close of the 13th century they projected small balls from tubes carried in the hand, or attached to the end of a lance, and only used at close quarters, being in fact hand-guns. Rockets were employed during the reign of the Greek emperor Leo, about 880, and indeed seem to have been known in India from time immemorial, some of them having been made of great size.

The gloom of the dark ages precludes further attempt to trace back the history of gunpowder with any certainty, but Mr Dutens, in the work before quoted, adduces many passages from classical authors in support of his view that a composition of the nature of gunpowder was not unknown to the ancients, as, for example, the story of Salmoneus, king of Elis, who, according to Virgil (*Æneid*, vi. 585), for his audacity in attempting to imitate thunder and lightning, was slain by Jupiter; Mr Dutens considers he may have fallen a victim to his own experiments. Eustathius, a commentator on Homer, speaks of him as being so skilled in mechanics that he constructed machines to imitate thunder (Eustathius ad *Odyss.*, λ 234, p. 1682, l. 1; see also Hyginus, *Fabul.*, 61, 650; Valerius Flaccus, lib. i. 665). It is also narrated of Caligula by Dion Cassius (*Hist. Rom.*, "Caligula," p. 662) that he had machines which imitated thunder and lightning, and emitted stones. See also Johannes Antiochenus, *Chronica apud Peiresciana Valesii*, Paris, 1634, p. 801.

According to Themistius (*Orat.*, xxvii. p. 337) the Brahmins had similar machines. Philostratus, in his life of Apollonius Tyanaeus (lib. ii. cap. 14), written about 200 A.D., relates of a people of India, dwelling between the Hyphasis and the Ganges, whose country Alexander never entered: "Their cities he could never have taken, though he had led a thousand as brave as Achilles, or three thousand such as Ajax, to the assault; for they come not out to the field to fight those who attack them, but these holy men, beloved by the gods, overthrow their enemies with tempests and thunderbolts shot from their walls."

From the mention by Vitruvius, and in Plutarch's life of Marcellus, that one of his machines threw large stones with great noise, it has been thought that Archimedes used some explosive composition in the defence of Syracuse.

The most ancient reference of all is in the Gentoo code of laws (Halhed's translation), supposed by some authorities to be coeval with Moses. It runs thus: "The magistrate shall not make war with any deceitful machine, or with poisoned weapons, or with cannon and guns, or any kind of firearms." The translator remarks that this passage may "serve to renew the suspicion, long since deemed absurd, that Alexander the Great did absolutely meet with some weapons of that kind in India, as a passage from Quintus Curtius seems to ascertain." The word translated firearms is literally a weapon of fire, and one species of it has been described as a dart or arrow tipped with fire and discharged from a bamboo, so that the reference may not be to any *propelling* agent, but merely to some combustible or incendiary composition, of the nature of the so-called Greek fire.

Greek fire.

It is almost certain that those authors who assert that the Arabians used gunpowder at the siege of Mecca, 690 A.D., having derived their knowledge of it from India or China, confound gunpowder with this Greek fire, which seems to have been the generic name given to several different combustible mixtures, although Arabian writers speak of them as Chinese fires. Greek fire was introduced into Constantinople from the East about the year 673; it was discharged upon the enemy by means of various engines of war, or in smaller quantities attached to arrows or darts. The Saracens used it against the Crusaders. Maimbourg, in his *History of the Crusades*, describes its effects; and Joinville, who was an eye-witness, says "it was thrown from a petrary, and came forward as large as a barrel of verjuice, with a tail of fire as big as a great sword, making a noise like thunder, and seeming like a dragon flying in the air; the light it gave out from the great quantity of fire rendered the camp as bright as day, and such was the terror it occasioned among the commanders in the army of St Louis that Gautier de Cariel, an experienced and valiant knight, advised that, as often as it was thrown, they should prostrate themselves upon their elbows and knees, and beseech the Lord to deliver them from that danger against which he alone could protect them." However, its actual destructive effect seems to have been very inadequate to the terror it occasioned. From the account of Geoffrey de Vincsauf, sand and earth, but especially vinegar, appear to have been considered the best extinguishers; water would not put it out. One description of this wildfire was composed of resin, sulphur, naphtha, and probably saltpetre. Bacon states that religious scruples hindered European nations from adopting Greek fire; but if so, they seem to have been gradually overcome, for its use is mentioned by various writers, Anna Comnena, Père Daniel, and Froissart among them. Similar scruples no doubt considerably retarded the introduction of gunpowder; and the fear that its adoption would prove fatal to all knightly gallantry also caused it to be regarded with aversion. Firdousi, the famous Persian poet, describes in his writings what were doubtless the effects of rockets and wildfire discharged upon the enemy, but he ascribes the whole to magic.

Eastern origin of gunpowder.

The researches of all authorities seem to point to the Far East as the birthplace of an explosive mixture of the nature of gunpowder; it was used there from time immemorial, although doubtless its application as a propelling agent is of far later date. In all probability, the germ of the science of explosives lay in the accidental discovery of the peculiar properties of the nitre so plentifully found mixed with the soil upon the vast plains of India and China. By means of the charred embers of wood-fires, used for cooking, the two most active ingredients of gunpowder might easily be brought into contact, and, under the action of heat, more or less deflagration would ensue; in fact, the accidental dropping of some of the crude saltpetre into the coals would show its remarkable power of supporting and accelerating combustion. The combination of saltpetre and charcoal in a more or less powerful mixture can therefore be easily conceived, the sulphur being an after addition, and not necessary to cause explosion. Our present gunpowder is only the improvement and perfection of such a mixture. Saltpetre was early known as "Chinese snow," and some have supposed the use of gunpowder in cannon to have been known in China very soon after, if not before, the Christian era. But this seems to be an error, for Colonel Anderson, C.B., in his book on gunpowder (London, 1862), quotes a conversation held by John Bell of Antermony, who visited Peking in 1721, with the emperor's general of artillery, to the effect that from their records it had been used in fireworks, &c., for about 2000 years, but that its application to the propulsion of shot was a late introduction. Some of their compositions had such names as "devouring fire," "earth thunder," &c. The *Institutes of Timur*, written about the middle of the 14th century, contain no mention of cannon or gunpowder, although full particulars are given of the equipment of his troops; it is, however, related that when Timur engaged the army of Mahmud under the walls of Delhi, men scattered wildfire and flung rockets in every direction. In this connexion it may be noted that, while the use of rockets was of very old date in India, the names given to pieces of artillery under the rule of Baber and the Mogul conquerors of Hindustan almost invariably point to a European, or at least to a Turkish origin. It is also well authenticated that Akbar and Aurungzebe had Englishmen and other Europeans in their service to teach the art of gunnery. The analysis of the gunpowder made by the Chinese in the present day shows a composition almost identical with that employed in Europe, which has only been arrived at after centuries of experience, so that, in all probability, they have corrected their earlier formula from Western sources.

Its introduction into Europe.

Whatever obscurity may hang over the early history of gunpowder, it seems most probable that its employment as a propelling agent originated among the Moors or Saracens,—whose civilization for several centuries contrasted forcibly with the intellectual darkness of Christendom,—and from them spread eastward, as well as northward into Europe. Condé (*Hist. Dom. Arabs in Spain*) states that Ismail Ben Feraz, king of Grenada, who in 1325 besieged Baza, had among his machines "some that cast globes of fire with resounding thunders and lightnings resembling those of the resistless tempest; all these missiles caused fearful injuries to the walls and towers of the city." The first reliable contemporary document relative to the use of gunpowder in Europe, a document still in existence, bears date 11th February 1326; it gives authority to the priors, the gonfalonier, and council of twelve of Florence to appoint persons to superintend the manufacture of cannons of brass, and iron balls, for the defence of the commune, camps, and territory of the republic.

t use Eng-

If the testimony of John Barbour, archdeacon of Aberdeen, who wrote in 1375, is to be believed, cannon, which he calls "crakys of war," were employed during the invasion of Scotland by Edward III. in 1327; but they are not mentioned in the accounts of the expenses of this war preserved in the record office. An indenture, first published by Sir N. H. Nicolas in his *Hist. Royal Navy* (London, 1847), and since by Lieut.-Colonel H. Brackenbury (*Proceedings R. A. Institution*, 1865), stated to be of 12 Edward III., 1338, contains several references to small cannon as among the stores of the tower, and also mentions "un petit barrell de gonpouder le quart'plein." If authentic, this is certainly the first distinct mention of gunpowder in Great Britain we now possess, but doubts have since been thrown upon the date of this MS. It, however, seems certain, from a contemporary document in the National Library in Paris, that, in this same year 1338, there existed in the marine arsenal at Rouen, an iron weapon, called "pot de fer," for propelling bolts, together with some saltpetre and sulphur to make powder for the same; at this period the ingredients were usually kept separate, and mixed when required. From the year 1345, 19 Edward III., we have, preserved in the Record Office, reliable accounts of the purchase of ingredients needed for the fabrication of gunpowder, and of the shipping of cannon for France. In 1346 Edward III. ordered all the saltpetre and sulphur that could be found to be bought up for him, but the quantities obtained were very small. Whether it be true or not that cannon were used by the English at Crécy in that year belongs rather to the question of the employment of artillery in the field; it has been maintained that such was the case by Napoleon III. (*Études sur le passé et l'avenir de l'Artillerie*). It may be noted that Petrarch, about the year 1344, in his dialogues *De remediis utriusque fortunæ*, speaks of "brazen globes cast forth by the force of flame with a horrible sound of thunder" as having become as common as any other kind of weapon.

In the year 1377, being the first of Richard II., Thomas Norbury was ordered to buy, amongst other munitions, sulphur, saltpetre, and charcoal to be sent to the castle of Brest. In 1414 Henry V. ordered that no gunpowder should be taken out of the kingdom without special licence; in the same year this monarch also ordered twenty pipes of powder made of willow charcoal, and various other articles for the use of the guns.

It was not, however, until the reign of Elizabeth that the manufacture of gunpowder can be said to have been established in England. The greater portion required had been previously imported from abroad, and the trade had been an open one; but the threatening attitude of Spain compelled the Government to provide some effectual means of defence, and patents were issued by the crown for the manufacture of gunpowder, constituting it a monopoly. Early in this reign saltpetre began to be artificially produced in England, but the quantity so obtained formed a very small proportion of the supply needed, the remainder being brought from various parts of the Continent and from Barbary. Again, in [illegible], [illegible] in order to prevent the sale of [illegible] defective powder, a proclamation was issued by Charles I., prohibiting the manufacture, as well as that of saltpetre, except under the king's commission, and directing that all gunpowder should be proved and marked by the king's proof-master. A little later, in [illegible], the East India Company had commenced the importation of saltpetre, and had also erected powder works in Surrey. Their renewed charter in [illegible] contained a clause providing that [illegible] tons of saltpetre were to be furnished to the ordnance annually, and from that time forward we hear of no difficulty, at least in England, of obtaining the chief ingredient of gunpowder, although on the Continent great attention has been paid to its artificial production; this was especially the case in France during the reign of Napoleon I., when the supremacy of Great Britain at sea for many years prevented the importation of saltpetre by her enemies.

About the year 1590, George Evelyn, grandfather of the celebrated John Evelyn of Wooton, received the royal licence to set up powder mills at Long Ditton and Godstone; the Evelyns are said to have brought the art from Holland. The works at Faversham, afterwards for so many years the Government gunpowder factory, date from Elizabeth's reign, but were then of secondary importance to those at Godstone. There seems reason, however, to suppose that powder mills existed at Waltham Abbey so far back as 1561, for in that year we find John Thomworth of Waltham in treaty, on behalf of Queen Elizabeth, for the purchase of saltpetre, sulphur, and staves for barrels. Fuller also refers (*English Worthies*, i. 338) to the powder mills at Waltham Abbey, of which place he was appointed vicar in 1641. In 1787 they were sold to the crown by John Walton, and reorganized under the superintendence of the famous Sir William Congreve. The old royal factory at Faversham was given up after the peace of 1815, being first let and afterwards sold to the well-known firm of Messrs John Hall & Son; a third Government factory at Ballincollig was disposed of a few years later. The Waltham Abbey works have been greatly enlarged of recent years, and no expense has been spared to render them, by the introduction of new and improved machinery, the most complete as well as the safest in the world. It is impossible to describe in detail the various improvements which have been made in the manufacture of gunpowder, but the most important will be briefly stated when describing the successive processes to which the ingredients are subjected.

The Ingredients and their Action.

Objects to be attained

The objects to be attained in the production of an explosive agent for artillery and small arms are—(*a*) the maximum of propelling force; (*b*) the minimum of *initial* pressure in the bore of gun; (*c*) uniformity of action; (*d*) freedom from fouling, especially in small-arm powders; (*e*) durability, *i.e.*, power to bear transport and keep well in store. Of all explosive substances at present known, gunpowder alone can be said to fulfil the first three conditions.

Advantages of gunpowder.

Its advantages may be summed up as follows:—(*a*) the rate of combustion of gunpowder is gradual compared with that of most other explosives; and, both by adjusting the proportions of the ingredients and varying the mechanical processes of manufacture, its explosiveness can be modified so as to suit every description of weapon; (*b*) the ingredients are easily procured, and are comparatively cheap; (*c*) with proper precautions, it is comparatively safe in manufacture, in store, and in transport; it also keeps well in a moderately dry atmosphere.

Co- [illegible] powder.

The earliest gunpowder used in cannon in Europe consisted of equal parts of saltpetre, charcoal, and sulphur, pounded up and mixed together as required, and must have proved a mixture far inferior in strength to that given in the MS. of Marcus Græcus. To account for the use of such a very weak composition long after better proportions had been ascertained, it must be remembered that the earliest cannon were composed of iron staves roughly hooped together, and tubes of thin iron, or even of wood or leather, with hoops bound round them, were sometimes used. Indeed the effective application of gunpowder as a propelling agent involves a whole train of inventions, and it was doubtless chiefly owing to the backward state of mechanical science during the Middle Ages that such weak powders were employed. The slow growth of artillery science in Europe for five centuries, and its rapid development in very recent years, are facts which support this presumption. Even about 1410 the proportions were still but 3 saltpetre, 2 sulphur, and 2 charcoal. The relative amount of saltpetre was gradually increased, and Tartaglia (*Quesiti e Inventioni diversi*, Venice, 1546) mentions twenty three various compositions as having been used at different times; the gunpowders of his days were:—

	Saltpetre.	Charcoal.	Sulphur.
Cannon powder	4	1	1
Musket „	48	8	7
	18	3	2

It is remarkable that Robins states the above proportions to have been very nearly those of his own day (1742), for there is a great deficiency of saltpetre in the cannon powder, and a considerable excess in that for muskets, compared with the relative quantities now employed in England. For a long period of time it was the custom for the fine grain or musket powder to contain a larger proportion of saltpetre than that for cannon; and, again, the amount of nitre was relatively reduced as the piece of ordnance became heavier, doubtless with the view of obtaining a slower burning powder for large charges. However, we find that by the latter part of the last century, what was called "common war powder" was almost universally composed of 6 saltpetre, 1 charcoal, and 1 sulphur, and these are the proportions still in use by many Continental nations (D'Antoni *On Gunpowder*, translated by Capt. Thompson, R.A., London, 1787).

So far back as the 16th century, Baptista Porta is said to have arrived at the proportions now used in France, which, however, were certainly not adopted until a comparatively recent period. Exhaustive experiments have also been carried out in that country by Beaumé, the Committee of Public Safety, Chaptal, and Proust, who fixed upon percentages of saltpetre varying from 76 to 80, of charcoal from 13 to 16, and sulphur from 5 to 9. These may seem to give rather a wide margin, but this will surprise no one who is acquainted with the great differences in results given by comparatively slight variations in the conditions of experiment, with powder of the same composition. In the British Government service but one scale of proportions has been employed for many years, and the very extensive trials of the "Committee on explosives" have shown that there is no good reason to depart from that scale; for they have conclusively demonstrated that the variations in the mechanical and physical properties of gunpowder, produced by the processes of manufacture, exert even more influence upon its action than a comparatively considerable difference in composition; this does not, however, apply to the small charges used in firearms. It will be seen, moreover, that one of the three ingredients—charcoal—can be so varied in *quality* as very materially to affect the results.

The following table gives the percentage composition of gunpowder as now made in different countries for military purposes:—

	Saltpetre.	Charcoal.	Sulphur.
England, Royal Gunpowder Factory,	75	15	10
France	75	12·5	12·5
Germany	76	14	10
Austria	76	14	10
Russia	75	15	10
Belgium	75	12·5	12·5
Spain, Cannon powder	75	15	10
Spain, Rifle „	75	12·5	12·5
United States	75	12·5	12·5

Trade powders.

The proportions of the ingredients in English commercial gunpowders vary considerably according to the market for which they are intended. The best sporting powders have about the same composition as those made by Government. Wherever cheapness is the chief object in view, the quantity of nitre is diminished, and the other two components relatively increased. Some of the powder for the African trade, commonly called "nigger powder," does not contain much more than 50 per cent. of saltpetre, while other kinds are nearly as bad. Blasting powder contains a low proportion of saltpetre, from 60 to 62 per cent.; but, although this reduction may originally have been made in order to manufacture a cheaper article, yet it is also the most effective for the object desired in many cases, which is to remove large masses of earth or soft rock, and this can best be done by using a comparatively weak or slow-burning powder. The element of time is here of great importance; a very quick-burning or violent explosive would not displace such large masses of a soft material, although the local effect would be more destructive (see BLASTING and EXPLOSIVES).

Before proceeding further, it will be as well briefly to consider the properties of the three ingredients of which gunpowder is composed, and the part played by each.

Saltpetre, or nitrate of potash (KNO_3), occurs as a natural production on or near the surface of the earth in several warm climates, especially the plains of India and China. When it arrives in England, it has only been partially separated from the earthy and foreign saline matters with which it was combined when found, and is quite unfit for the manufacture of gunpowder; the salts of sodium especially, from their property of absorbing moisture, are most injurious. In this state the saltpetre is known as "grough" nitre, the impurities commonly present being the chlorides of potassium and sodium, and the sulphates of potash, soda, and lime, together with sand and organic matter; they do not usually exceed 5 lb per cwt., the exact proportion of impurities in any sample being termed the "refraction" of the saltpetre, and allowed for in the price. The nitrate of soda, called "cubical nitre" or Chili saltpetre, which is found abundantly in South America, although chemically adapted to supply the place of potassium nitrate, cannot be employed in the manufacture of gunpowder, owing to its very deliquescent properties. This salt is, however, largely converted into saltpetre by the action of chloride of potassium. In France and Germany, also, nitre is produced artificially (see SALTPETRE).

Saltpetre.

Saltpetre, which is a compound of 54 parts of nitric acid and 46 of potash, acts as a magazine of oxygen in a solid form, one volume of saltpetre containing as much oxygen as about 3000 volumes of atmospheric air. This oxygen, with which it readily parts when raised to a certain temperature, combines violently with the carbon to form carbonic acid and a proportion of carbonic oxide; these with free nitrogen constitute the chief gaseous products of combustion. The potassium is found combined in the solid residue.

Charcoal.

Wood charcoal is the charred woody fibre or residue which remains after the liquid and more volatile parts have been driven off by destructive distillation. The object of charring wood is the removal of moisture, and, which is of great importance, the expulsion of those matters which become volatile before they are burned, and which would absorb a large amount of heat. It may be charred in the ordinary way in pits; but the usual mode of preparing charcoal for gunpowder is by heating it in large iron cylinders or retorts, as hereafter described. By this latter method, the operation is performed with more uniformity and economy, and the charcoal kept more free from particles of grit or earthy matter. Charcoal is best fitted for the manufacture of gunpowder when prepared from light spongy wood, containing a very small proportion of mineral substances; it should be sound, and of not much more than years' growth. The quality of the charcoal exercises the greatest influence upon the rate of combustion, so that both the description of wood used and the mode of burning are of the utmost importance.

By a series of experiments first made by Proust, and since repeated by English chemists, it has been found that 12 grains of various charcoals, mixed with 60 grains of saltpetre, give the following average volumes of gas :—

	Cubic inches.
Dogwood (*Rhamnus Frangula*)	82
Willow (*Salix alba*)	77
Alder	74
Filbert	72
Fir, chestnut, hazel	66
Overheated willow charcoal	63

The production of the strongest powder does not depend alone upon the evolution of the largest volume of gas, but the above table is of interest since the three descriptions of wood which head the list have long been considered by universal consent as the best adapted for the manufacture of charcoal for gunpowder. Dogwood (so-called, but in reality it is alder-buckthorn, *Rhamnus Frangula*, the French *bourdaine*) is an underwood of slow growth, usually obtained from Sussex, Belgium, or Prussia; it is cut about an inch in diameter, and packed in bundles 6 feet long. This wood is now used, both in England and on the Continent, for all military small-arm powders, as well as the best descriptions of sporting gunpowder. It has been found, moreover, that cannon powders made from dogwood charcoal are, other things being equal, much more violent in action than those manufactured with willow or alder charcoal. Accidents with powder made from dogwood charcoal have usually proved more destructive than those made with any other description. Alder and willow charcoal is used for making gunpowders for field and heavy ordnance, as well as for the commoner kinds of commercial powders; these woods are obtained from various parts of England, and should measure about 4 inches in diameter. The willow used is the *Salix alba*, one of the softest and lightest of English woods, white in colour, and of very rapid growth; the pith is circular, and tolerably large. Alder is considerably harder and denser in texture, and of slower growth; its colour is reddish-yellow, and the small pith triangular or bayonet-shaped in section. Dogwood has a very large pith in proportion to its size, circular, and of a red colour, which is preserved even after the wood is converted into charcoal.

The temperature at which the wood is charred exercises the most powerful influence upon the inflammability of the charcoal, and consequently upon the "explosiveness," or rate of combustion, of the gunpowder made from it. The higher the temperature the larger the proportion of hydrogen and oxygen expelled, and the nearer the approach of the charcoal to pure carbon; at the same time, it becomes more dense and incombustible, and the gunpowder made from it is comparatively slow in action, and gives a low initial velocity. Charcoal prepared at a low temperature is softer and more inflammable, and contains more volatile constituents; it makes a quicker burning powder, giving a higher velocity to the projectile, but also producing more strain or pressure upon the metal of the gun. The chief defect, however, of this "slack burnt" charcoal, or *charbon roux*, as it is called from its reddish-brown colour, is its property of absorbing moisture more readily than denser charcoal; the powder manufactured from it is consequently more hygroscopic, and therefore more liable to deteriorate in strength from the effects of damp than that made with a more highly burnt charcoal. To show the great difference in inflammability caused by burning at low and high temperatures respectively, it may be stated that charcoal prepared at 500° Fahr. readily ignites at about 640°, while, if burnt at 1800° Fahr., nearly double the heat previously mentioned is required to inflame it. The following table exhibits concisely the practical effects of different modes of preparing charcoal for gunpowder, the same kind of wood being used in each case; it shows (*a*) the analysis of the charcoals, and (*b*) the comparative initial velocities and pressures given by powders made in a precisely similar manner from those charcoals.

		No. 1 Burnt 7 hours at a low heat.	No. 2. Burnt 4 hours at a greater heat	No. 3. Burnt 3 hours at very high heat.
Charcoal.	Carbon, per cent.	78·23	81·23	87·55
	Oxygen, and trace of nitrogen ,,	16·96	13·19	8·29
	Hydrogen ,,	3·67	3·31	2·91
	Ash ,,	1·41	1·27	1·25
Initial velocity (feet per second).		1417	1399	1353
Mean pressure in powder chamber (tons per square inch)		16·83	13·54	8·85

Sulphur. For the manufacture of gunpowder, only the crystalline electro-negative variety of sulphur soluble in bisulphide of carbon (see CHEMISTRY, vol. v. p. 498) is used. Sublimed sulphur, commonly called "flowers of sulphur," which consists of minute granules of insoluble sulphur enclosing the soluble variety, is considered unfit for gunpowder; the reason assigned has usually been that, from the mode of manufacture, it is impregnated with sulphurous and sulphuric acids, but Professor Bloxam points out that in all probability it is the fact of the sublimed sulphur consisting of the electro-positive insoluble variety, which exerts an injurious influence upon the gunpowder made from it. Sulphur performs the part of a second "combustible" in gunpowder; but there is no doubt that its chief value as an ingredient thereof arises from its great inflammability, owing to its tendency to combine with oxygen at a moderate temperature; it inflames at about 560° Fahr., thus facilitating the ignition of the powder. Its oxidation by saltpetre appears also to produce a higher temperature than is obtained with charcoal, thus accelerating combustion, and increasing by expansion the volume of gas generated. An excess of sulphur would, however, be injurious by increasing the solid residue, in which the sulphur is found combined in various forms after the explosion. Some authorities have considered that, from its non-absorbent properties, sulphur renders gunpowder less hygroscopic, and more compact and durable.

Explosiveness. Powders made from exactly the same materials, mixed in the same proportions, yet differ greatly in "explosiveness," which has been defined as the rate at which the powder burns or is converted into gas. This quality will depend chiefly upon the following properties:—(*a*) extent of incorporation; (*b*) the density of the powder; (*c*) its hardness; (*d*) size of the grains or pieces; (*e*) shape of the grains; (*f*) amount of glaze. Although not altogether synonymous with strength, we may consider "explosiveness" as the quality upon which the value of gunpowder for any particular purpose chiefly depends.

Extent of incorporation. Next to the selection of the precise description of charcoal to be used, no point in the manufacture of gunpowder requires such care and attention as the thorough intermixture of the ingredients,—the object being in fact to form out of the three components a new substance as nearly homogeneous as possible. It is usually considered that there is a limit of time beyond which no advantage is gained by continuing the "milling" or incorporating process; but it is certain that nothing that can be done to the powder afterwards will add to its strength, although we may modify its explosiveness, and that the very best powders, especially for small-arms, are milled the longest time. This question will be farther treated under the head of manufacture.

Density and hardness. No physical property affects the explosiveness of gunpowder as much as its density. By density we mean the quantity of matter actually present in a certain bulk of the powder. Thus, if different quantities of meal powder, containing the same proportion of moisture, be compressed into equal bulks, say, for example, into cylinders of equal size, that which contains the most meal will be the densest. Hardness has not necessarily a relation to density, for a substance may be hard, and yet possess little density. Increase of density can only be given by compressing the meal into a smaller bulk, while increase of hardness can be arrived at by pressing the meal in a moister condition.

Other things being equal, increasing the density decreases the initial velocity, and, *vice versa*, a less dense powder gives a higher velocity, but also a greater strain to the metal of the gun. This is due to the less dense powder burning more rapidly than that with a dense close texture. If two grains, or pieces of powder, of equal size and similar shape but very unequal density, be burnt upon a glass plate, the less dense one will be entirely consumed before the denser one has finished burning.

Freedom from fouling is a very important property in small-arm powders. From the experience gained in selecting a powder for the Martini-Henry rifle, it was found that, with the same description of charcoal, the slower the action of the charge the less fouling took place; this modification of action was easily obtained by raising the density, at, however, a corresponding sacrifice of velocity in the bullet. The reason assigned was that the quicker-burning powder caused a rush of gas past the lubricating wad before the latter had time to act properly. A dense hard powder which will take a high polish or glaze will evidently keep better, and bear transport better, than a more porous and therefore more friable grain, which would easily form dust. It will thus be seen that many considerations enter into this question of density.

Size of grains. The size of grain is one of the most important points to be considered as modifying the explosiveness of powder. Although a charge of powder appears to explode instantaneously, yet both ignition and combustion are comparatively gradual; the flame is communicated from one grain to another, and each burns in concentric layers until it is consumed, so that the combustion of the grains is not *simultaneous*. Meal powder burns more slowly in air than when the powder is granulated, in consequence of the minuteness of the interstices; dust, especially in fine-grain powder, retards ignition by filling up the interstices. To go to the other extreme, as showing the advantage gained by granulating the press-cake, we may quote an experiment made some years ago. A small piece weighing 1·06 oz. was placed in a mortar, and a light ball placed upon it: when it was fired, the ball was not thrown out. An equal quantity broken into 15 pieces, projected the ball 3·3 yards; broken into 50 pieces, the ball ranged 10·77 yards; when the same weight of ordinary grained powder was used, the range was 56·86 yards. It is most unsafe to attempt to apply to the action of gunpowder, when fired under enormous pressure, and especially when employed in large charges, the conclusions arrived at from its combustion in air. We may, however, assert that the weight of charge, the density, and all other conditions being equal, a charge made up of large grains or pieces of gunpowder will burn more slowly, and exert a lesser *initial* strain upon the gun than one composed of small grains, owing to the total surface of combustion being diminished by increasing the size of the pieces; this has been abundantly verified by the results of experiments with heavy rifled ordnance. On the other hand, the larger grains afford larger interstices between them for the passage of the flame, thus facilitating the ignition of large charges. Hence, a gunpowder may possess a low rate of combustion and yet a high rate of ignition, and *vice versa*. For each gun, or charge of gunpowder, there is doubtless a size of grain which would produce a maximum velocity with a minimum initial strain, but as each kind of cannon powder has to be employed in more than one piece of ordnance, it is necessary to select that size which will best suit all of them.

Shape of grains. The same quantity of powder meal made into two grains of equal density, but different shapes, will take different times to burn; the larger the surface exposed the quicker will be the combustion of the grain. A sphere being the smallest form in which a given quantity of matter can be placed, it follows that a certain amount of meal powder compressed into a spherical form will take longer to burn than the same quantity made into the shape of a flat scale, exposing a large surface. The rounded form of grain is the most favourable for the transmission of the flame, the interstices being larger and more regular than in the case of elongated or flat grains fitting into one another. Hence we may conclude that, to secure *uniformity*, it is better to have the constituent grains as nearly as possible of the same shape, and the nearer this shape approaches a sphere the better.

Glazing. The glazing process is one of considerable importance, both with reference to the explosiveness, and also the keeping qualities of the gunpowder. As regards the former point, it undoubtedly modifies the violence of the combustion, and this it probably does by slightly retarding the ignition, a powder with a rough porous surface affording a better hold to the flame than one possessing a highly polished exterior. With the large "cubical" powder, used for heavy rifled ordnance, there is little or no appearance of what is commonly understood as *glaze*, or polish, from this process, but the corners and edges of the cubes are rubbed off, and the shape approximates more nearly to that of a sphere than is the case with the much lighter fine-grain powder; there seems to be also a certain hardening of the surface of the grains or pieces, partly the effects of friction, but probably due in part to the *sweating* the powder undergoes, a considerable amount of heat being generated in the glazing barrels. It is evident that, by taking away the sharp angles which would otherwise easily be converted into dust, and also by giving the grains a harder exterior, this process renders gunpowder the better able to bear transport, and to resist the deteriorating effect of a damp atmosphere. The addition of a thin coating of the purest graphite to cannon powders, although originally intended merely to modify the explosiveness, also renders the surface of the grains less absorbent. Military small-arm powders are never dressed with graphite; good fine-grain gunpowder will take a high finish without it, but, by its aid, a very inferior article can be polished up to a silvery brightness.

Effect of moisture. Moisture in gunpowder reduces the explosiveness by using up a portion of the heat generated by the combustion, to get rid of the water; therefore the property of withstanding the absorption of moisture is a very important one for gunpowder to possess. All powder will take up from a normally dry atmosphere a certain amount of moisture, which will depend to some extent upon its density, but to a much greater degree upon the description of charcoal from which it is made. Slack-burnt or red charcoal is greatly more hygroscopic than black charcoal, or that burnt at a high temperature; and the absorbent properties of gunpowder made from the former are but little reduced by raising the density. Large cannon powder contains a greater percentage of water than the fine grain, and the actual amount present in any given sample will be affected by the prevailing state of the atmosphere, especially if kept in wooden barrels. To show the considerable effect upon the initial velocity of projectile, and pressure in bore of gun caused by comparatively slight variations in the amount of moisture, the following results may be quoted from the experiments of Noble and Abel. The samples of "pebble" powder used were specially prepared for the Committee on explosives, differing only in the amount of moisture contained in them.

[illegible]	[illegible]	[illegible]
0·7	1545	22·02
0·8	1537	21·38
0·9	1530	20·77
1·0	1523	20·18
1·1	1517	19·63
1·2	1512	19·12
1·3	1507	18·63
1·4	1502	18·18
1·5	1497	17·76

Keeping gunpowder in a very damp atmosphere will tend to separate the ingredients by dissolving a portion of the saltpetre, which crystallizes upon the surface of the grains or pieces.

FIRED GUNPOWDER.

Products of explosion.

In the explosion of gunpowder, the products of combustion are very materially affected by the conditions under which it is fired,—whether burnt in the open air, exploded under very great pressure in a tightly closed vessel, or the products allowed to expand in the bore of a gun. It may, however, be stated generally that the oxygen of the saltpetre converts nearly all the carbon of the charcoal into carbonic acid (CO_2), a portion of which combines with the potash of the nitre to form carbonate of potash ($K_2O.CO_2$), the remainder existing in the state of gas. The sulphur is for the most part converted into sulphuric acid (SO_3), and forms sulphate of potash, a large proportion of which, probably by secondary reactions, becomes hyposulphite and sulphide. The nitrogen of the saltpetre is almost entirely evolved in the free state, and the carbon not having been wholly burnt into carbonic acid, there is always a proportion of carbonic oxide (CO) present.

The decomposition is so complicated, and varies so considerably under different conditions of experiment, that it is impossible to represent the transformation by any single equation, but the following expression may give some idea of the primary reaction:—

$$4KNO_3 + C_4 + S = K_2O.CO_2 + K_2O.SO_3 + N_4 + 2CO_2 + CO.$$

There is a very large proportion of residue, which, on cooling, assumes the solid form. The experiments of Noble and Abel prove that it is *liquid* very shortly after the explosion; indeed, it is probable that at the moment of maximum temperature, the ultimately solid products are more or less in a state of vapour, being deposited in a very finely divided state as the temperature falls.

Mechanical effects.

When a charge of gunpowder is exploded in the chamber of a gun, a large quantity of gaseous matter is evolved in a highly condensed state; its tension, or expansive power, is, moreover, greatly increased by the heat generated during the transformation. The pressure being equal in all directions, the work done upon the projectile is due to the expansion of the permanent gases in the bore of the gun, which loss is also considerably retarded—or the reduction of temperature due to the expansion in great measure compensated for—by the heat stored up in the ultimately solid residue. Any calculation which does not take this latter point into consideration will give far too low an estimate of the actual force of fired gunpowder (see EXPLOSIVES).

With our present state of knowledge, it may be stated in round numbers that the gases evolved by gunpowder, *if occupying only the space* in which it is exploded, will occupy at a temperature of 0° C. and 760 mm. barometric pressure, about 280 times the volume of the original powder, and will give a pressure of about 6000 atmospheres, or 40 tons per square inch.

Researches relative to fired gunpowder.

In view of the very different results which have been arrived at by various eminent authorities who have experimented upon fired gunpowder, the following brief account of their researches may be useful:—

Robins.

Robins, the father of scientific gunnery, in 1743 read before the Royal Society a paper describing experiments which showed that gunpowder, when fired, generated permanent gases, which, at the ordinary temperature and atmospheric pressure, occupied a volume 244 times greater than that of the unexploded powder. He further considered that the heat evolved was such that the tension of the permanent gases would be increased fourfold, and hence estimated the maximum pressure to be about 1000 atmospheres. In 1778 Dr Hutton communicated in the same manner an account of his celebrated researches on the combustion of powder; he considered the maximum pressure to be about twice that given by Robins, or a little over 2000 atmospheres, differing from the latter chiefly as to the temperature, for he assumed that the volume of gases generated would occupy, under ordinary conditions, 250 times that of the powder. He also deduced formulæ for giving the pressure of the gas and velocity of the projectile at any point of the bore, but no allowance was made for the loss of heat in proportion to the work done, that fundamental principle of thermodynamics being then unknown; the error thus occasioned is, however, in part compensated for by the heat stored up in the non-gaseous products.

Hutton.

Rumford.

In 1797 Count Rumford sent to the Royal Society his experimental determinations of the pressures given by fired gunpowder, which are remarkable as being the first attempt to do this by direct observation. The closed vessel he used was, however, very small, being able to hold but 28 grains when filled, and he only succeeded in measuring the results up to a charge of 18 grains. His plan of operation was to ascertain by repeated trial the least weight which would just confine the products of explosion, and thence to calculate the pressure; this he deduced from two series of experiments, which, however, gave some very anomalous results, to be as high as 100,000 atmospheres for gunpowder exploded in its own space.

Gay-Lussac.

In 1823 Gay-Lussac, the celebrated French chemist, estimated the volume of the permanent gases evolved at 450 times that of the powder fired, but General Piobert assigns very probable reasons for supposing the quantity of gas determined to have been doubled in error. Gay-Lussac found the percentage composition of the gaseous products to be 52·6 carbonic acid, 5 of carbonic oxide, and 42·4 nitrogen.

Bunsen and Schischkoff.

In 1857 Baron Bunsen and Schischkoff published (*Poggendorff's Annalen*, vol. cii. p. 325) the results of their very important experiments; their determinations established were—(1) that the permanent gases represented only about 32 per cent. of the weight of the charge, and occupied at the standard temperature and pressure about 193 times the volume of the original powder; (2) that the heat generated by exploding gunpowder in a close chamber is about 3340° C.; and (3) that hence the pressure would be about 4374 atmospheres, or 29 tons per square inch.

Rodman.

Major Rodman (Boston, 1861) published the results of extensive experiments carried on for the United States Government, in order to ascertain the pressures given by different powders in the bores of heavy guns. He employed a pressure gauge, which bears his name, and consists mainly of a piston to which is attached a knife-edge acting upon a piece of soft copper, contained in a small cylinder at right angles to, and communicating with, the bore of the gun; this apparatus he also used to ascertain the pressure given by powder exploded in a closed vessel. The chief value of his experiments consists in their having established the fact that the size of the grain should be proportionate to the length and diameter of the bore of the gun. [illegible] In April 186[illegible] carried out experiments from which he estimated [illegible] for small arm powder, the gases evolved occupied about [illegible] the original volume, while cannon powder produced about [illegible]. Captain Andrew Noble, F.R.S., of Elswick, and Professor Abel, C.B., F.R.S., chemist to the British War Department, carried out a most extensive series of experiments on "Fired Gunpowder" (*Phil. Trans. Roy. Soc.*, 1875), [illegible] the first ever made, and undertaken [illegible] with the Government "[illegible] on Explosives;" their main results may be summed up as follows:—

(A.) *When Fired in a Confined Space.*—(1) The products of combustion are about 57 per cent. by weight of [illegible], and 43 per cent. of permanent gases. (2) [illegible] and 280 times [illegible] of the original powder. (3) The tension of the products of combustion, when the powder entirely fills the space in which it is fired, is about [illegible] atmospheres, or 42 tons per square inch. [illegible]

(B.) *When Fired in the Bore of a Gun.*—(1) The products of combustion are of the same nature, both as regards the proportions of solid and gaseous products, as is the case with powder fired in a closed vessel. (2) The work on the projectile is effected by the elastic force due to the permanent gases. (3) The reduction of temperature due to the expansion of the permanent gases is in a great measure compensated by the heat stored up in the liquid residue. (4) An expression is obtained showing the law connecting the tension of the products of combustion with the volume they occupy, and expressions are also deduced for the work that gunpowder is capable of performing in expanding in a vessel impervious to heat, and for the temperature during expansion. Thence the experimenters give a table showing the total work gunpowder is capable of performing in the bore of a gun, in terms of the density of the products of combustion, or the number of volumes of expansion. (5) The total theoretic work of gunpowder when indefinitely expanded is, for example, in a gun of infinite length, is about 486 foot-tons per pound of powder.

They further showed that the fine grain powders furnish decidedly smaller proportions of gaseous products than large grain or cannon powders; that the variations in the composition of the products of explosion, in a closed vessel, furnished by one and the same powder under different conditions as regards pressure, and by two powders of similar composition under the same conditions of pressure are so considerable that no chemical expression can be given for the metamorphosis of a gunpowder of normal composition; and that the proportions of the several constituents of the solid residue are quite as much affected by slight accidental conditions of explosion of one and the same powder in different experiments as by decided differences in the composition, as well as in the size of grain of different powders. It may, however, be remarked here that, while the pressures given in the bore of a gun are very seriously affected by the size of the grains or pieces of the powder, it was clearly demonstrated by these experiments that the *force exerted by fired gunpowder* is not affected by the apparent accidental variations in the nature of the secondary chemical changes resulting from the explosions; this fact renders the exact composition of the products of combustion of less practical importance.

The following table gives concisely the chief results arrived at:—

Authority.	Volumes of Permanent Gas Generated.	Heat Evolved by Combustion.	Tension of the Gases.	Pressure in Tons.
		Cent.	Atmospheres.	Per sq. in.
Robins	244	...	1000	6·75
Hutton	250	...	2000	13·5
Gay-Lussac	450	1850°	2137	14·3
Bunsen and Schischkoff[1]	193	3340°	4374	29
Noble and Abel	280	2200°	6400	42

[1] As before stated, Berthelot gives reasons for halving these figures.

M. de Saint Robert determined experimentally the amount of work lost by the heat communicated to the gun to be about 250 gramme-units per gramme of powder *in the case of a rifled musket.* From the experiments of Noble and Abel this loss becomes reduced to as little as 25 gramme-units per gramme of powder in a 10-inch gun. They have also calculated the energy in foot-tons from the initial velocity obtained, and hence deduced the percentage of the possible theoretic work which is actually realized for every rifled gun in the British service. This percentage, which they term the "factor of effect," is found to be greatest, viz., 93 per cent., in the case of the 38-ton gun, and least, 50·5 per cent., in the 7-pounder mountain gun, weighing 150 lb.

[illegible] To determine the pressures, Noble and Abel employed two methods:—(1) *directly*, by means of "crusher gauges," inserted at various points of the bore; this is an improvement on the Rodman pressure gauge, the pressure being estimated by the amount of compression given to a small cylinder of pure soft copper; (2) *indirectly*, by means of the chronoscope, invented by Captain A. Noble, which measures the velocity of the projectile at given points in the bore, whence the pressure can be calculated (see GUNNERY). These pressures will vary greatly, other conditions being the same, according to the "rapidity of combustion" of the powder; the great object is to obtain a powder suited to the particular arm with which it is to be used.

[illegible] Many foreign physicists are of opinion that the phenomenon of *dissociation* must take place at the moment of maximum temperature, causing the carbonic acid gas, CO_2, to be decomposed into carbonic oxide and oxygen. However, Noble and Abel show that, if such decomposition were to occur, the loss of heat absorbed by the decomposition would more than compensate for the increase of volume.

PREPARATION AND PURIFICATION OF THE INGREDIENTS.

The three ingredients of gunpowder may be purchased in the market in a prepared or refined state, and this is done to a greater or less extent by many private makers. However, the royal gunpowder factory, as well as some of the great private firms, prepare and purify the materials required from the commencement, with the double object of insuring uniformity in the qualities of the powders made, and of avoiding, so far as practicable, the introduction of the least particle of grit or other foreign matters, which might cause serious accidents.

Refining saltpetre. The rationale of the refining process is based upon the fact that saltpetre is far more soluble in hot than in cold water, while the chief saline impurities found in grough nitre are almost equally soluble in either. Water at 212° Fahr. holds about seven times as much nitrate of potash in solution as water at 70° Fahr.; if, therefore, a saturated solution of saltpetre be made at a temperature of 212° Fahr., and the chlorides of sodium and potassium are contained in the liquor, as the solution cools to 70° Fahr., six-sevenths of the nitre will be deposited in the form of crystals, which can easily be removed, whereas the foreign salts will still remain in solution. The following is a brief account of the improved mode of refining saltpetre, introduced some years back at Waltham Abbey, and now adopted at the chief private factories in England. The refining coppers are capable of holding about 500 gallons each, and are fitted with false iron bottoms, which are perforated with holes to allow sand and other mechanical impurities to fall through. Being each charged with 280 gallons of water,—usually the "washings" of saltpetre previously refined,—and 40 cwt. of grough nitre, a fire is lighted beneath. In about two hours the greater part of the saltpetre is dissolved, and the solution begins to boil; the thick scum formed on the surface is carefully taken off, and cold water from time to time thrown in to induce it to rise, the boiling being continued until there is no more scum; the coppers are then filled up with cold water, and the solution again made to boil briskly for a few minutes, after which the fires are allowed to go down. In about two hours more the solution will have fallen to the proper temperature, 220° Fahr. (sp. gr. 1·53), for pumping out; it is then filtered through dowlas bags suspended on a frame, and conducted by troughs to the "coolers" or crystallizing cisterns at about 180° Fahr. These latter are large shallow pans of copper, in which the liquid is kept agitated either by long-handled wooden hoes, or by machinery; as it cools, fine crystals fall to the bottom, and are from time to time thrown upon inclined draining frames by means of perforated copper shovels. When the temperature falls below 70° Fahr., the agitation is ceased, and any large crystals which may afterwards form are left in the mother liquor. After being thus allowed to get rid of some of the liquor, the crystallized saltpetre, having almost the appearance of snow, and technically called "flour," is raked into the "washing-cistern;" it is there subjected to three separate washings with pure water, distilled being preferable, which is allowed to drain off through a plug hole at the bottom of the cistern. These "washings" are carefully conducted to an underground tank, and kept either for using in the refining coppers, or boiled down in "evaporating pots" holding about 300 gallons, until the liquid is sufficiently concentrated for the saltpetre to crystallize, when it is run into small copper pans, and set aside to cool; this course is also pursued with the mother liquor from the large cooling cisterns, and the resulting crystals treated as grough nitre, for these large crystals always enclose liquid containing impurities. After draining for a night the refined saltpetre is removed to store bins, and is ready for use without any further pulverization; the amount of moisture remaining in it, from 3 to 5 per cent., is then carefully ascertained, and allowed for in the mixing house. Neither the solid residue from the pots and coppers nor the mother liquor from crystallizing pans is thrown away, but by repeated boilings and evaporations every ascertainable portion of saltpetre is extracted, and the residue sold; it chiefly consists of chlorides of sodium and potassium, with some sulphates. The jute bags in which the saltpetre is imported are also boiled down.

The large percentage of saltpetre contained in damaged powder makes it worth while to extract the nitre by boiling in large coppers, filtering and crystallizing in small pans as before; the residuum is again boiled, and then thrown away. The sweepings from the powder houses, in various stages of manufacture, are "extracted" in the same manner.

Refined saltpetre for making gunpowder is tested as follows:—(1) with blue and red litmus paper, for acids or alkalies; (2) for the presence of chlorides, with solution of nitrate of silver; (3) for sulphates, with chloride of barium, forming the insoluble sulphate of baryta.

By the old method of refining the solution was left to crystallize in coolers, and the drained crystals fused or melted in iron pots at a heat of about 500° Fahr.; the molten saltpetre was then poured into moulds, broken up when cold, and ground under edge runners.[1]

Charcoal burning. The wood for charcoal is cut in spring, so that the bark may strip off easily, and is stacked for about three years to season it, but a considerably shorter time will suffice. Being cut in lengths of 3 feet, the wood is packed in iron cylindrical cases termed "slips," which are then inserted in the "cylinders" or retorts, the latter being built into the wall in sets of three with a furnace underneath, arranged so as to allow of the complete regulation of the heat; the flames surround the retorts as nearly as possible. An opening is left in the rear end or lid of the slip, corresponding with a similar opening in the retort, through which, by means of pipes, the inflammable gases resulting from the charring of the wood are conducted into the furnace and there burnt; this saves a considerable amount of fuel. There are also pipes which receive and carry off the tar and pyroligneous acid produced. In the powder works of Messrs Hall & Son of Faversham, the retorts are disposed three on each side of the furnace, and the connecting pipes and dampers are so arranged that the gases from either set, or from any single cylinder, can be utilized for the charring of the wood contained in any of the others; by this means it is claimed that little fuel is required beyond the quantity needed to warm the furnace and partially char the first set of retorts.

That the wood is sufficiently charred is shown by the blue colour of the gas flame, which indicates the formation of carbonic oxide; the door of the retort is then opened, and the slip is withdrawn by means of tackling, and placed in a large iron cooler having a close-fitting lid, where it is left a few hours till cool enough to be turned out and put into store. The charcoal is carefully picked over by hand, to ensure its being of uniform quality, and is kept from ten days to a fortnight before being ground, to obviate the danger of spontaneous combustion, to which it is liable if ground too soon after burning; this arises from the heat generated by the very rapid absorption and condensation of oxygen from the air by the finely powdered charcoal.

Characteristics of good charcoal.

Properly-made charcoal for gunpowder should be jet black in colour, and its fracture should show a clear velvet-like surface; it should be light and sonorous when dropped on a hard substance, and so soft as not to scratch polished copper. Slack-burnt charcoal, or that prepared at a very low temperature, is at once known by its reddish-brown colour, especially when ground, and this peculiarity can be recognized in the powder made from it, when reduced to a fine state of division. Charcoal burnt at a very high temperature is known by its hardness, metallic ring, and greater density.

In France, charcoal is prepared by injecting superheated steam into the retorts for a certain period.

Grinding the charcoal.

The charcoal mill in shape resembles an enlarged coffee mill; a cone works within a cylinder, both being provided with diagonal teeth and ribs, wide apart at top, but gradually approaching one another below. The pulverized charcoal is thence conducted by a simple mechanical arrangement direct into a cylindrical frame or "reel," about 8 feet by 3 feet, set at a slope and covered with copper wire-cloth of about 32 meshes to the inch; all that is fine enough to pass through the reel-covering falls into a bin which encases the reel, and the coarser particles pass on to a tub at the farther end, in order that they may be ground over again. The ground charcoal store should always stand by itself, in case of spontaneous combustion taking place.

Sulphur refining.

The sulphur from Sicily known as "Licara firsts" is employed for the best gunpowder; it undergoes a rough purification before importation, leaving from 3 to 4 per cent. of earthy impurities. Formerly these were removed by simply melting the "grough" sulphur in an iron pot, and then ladling it into large wooden moulds or tubs, saturated with water to keep the sulphur out of the cracks; when cool enough, these tubs were unhooped, and the top and bottom of each mould of sulphur cut off. In the present day, however, the sulphur is refined by distillation in a simple apparatus. A large iron "melting pot," or retort, is set in brickwork, about 4 feet above the floor, with a furnace underneath; this retort has a heavy movable lid, which is luted on to the pot with clay, and in the lid is also an opening, closed by an iron conical plug. From the melting pot lead two pipes at right angles to one another, one to a brick chamber or "dome," or subliming chamber, and a second pipe to an iron "receiving pot," placed on a lower level than the retort; the latter pipe has an iron casing or "jacket" round it, through which cold water is allowed to circulate. The communication of these pipes with the retort can be shut off or opened as occasion may require by means of valves worked from without.

A charge of about 5½ cwt. of grough sulphur in small pieces being placed in the retort and the furnace lighted, the pipe leading to the dome is left open, as well as the plug-hole in the lid, but that leading to the receiving pot is closed; after about two hours, a pale yellow vapour rises, when the plug in the lid is put in and the vapour allowed to pass into the dome, where it "sublimes" or condenses on the sides and floor in the form of a fine powder, known as "flowers of sulphur." In about three hours from the commencement, the vapour becomes of a deep [illegible] colour, when the pipe leading into the dome is closed, and that into the receiving pot opened, at the same time cold water from a tank overhead being allowed to circulate through the jacket; the vapour is then condensed in the pipe, and runs into the receiving pot below in the form of a [illegible] fluid. When the retort commences to get cool, the receiving pipe is closed, and the communication with the dome is reopened, so that the rest of the vapour may pass into it, the furnace fires being at the same time drawn back; the impurities remain at the bottom of the melting pot, and are thrown away. The flowers of sulphur thus obtained, being unfit for the manufacture of gunpowder, are placed in the melting pot as grough sulphur. A leaden pipe passes from the lid of the receiving pot into a small wooden chamber lined with lead, in which any vapour still remaining uncondensed may be deposited, as in the dome. The distilled sulphur is allowed to cool down to about 220° Fahr., when it is ladled into wooden moulds, as above described, and set aside to cool. The tests for refined sulphur are the following:—(1) burn a small quantity on porcelain, when the amount of residuum should not exceed 0·25 per cent.; (2) boil a little with water, and test with blue litmus paper, which it should only very feebly redden.

Pulverizing the sulphur.

The sulphur from the moulds, being broken into pieces, is ground under a pair of iron edge runners, similar to those of the incorporating mills, but of less size; after this, it is passed through a reel similar to that used for sifting the charcoal, but covered with even finer copper wire-cloth, having 44 meshes to the inch.

MANUFACTURE OF GUNPOWDER.

Processes of manufacture.

The following list will give a general idea of the chief processes of manufacture, properly so-called, through which gunpowder passes, although it will be understood that more or less variation takes place in some of the very different descriptions of powder now made:—(1) mixing the ingredients; (2) incorporation, or "milling;" (3) breaking down the mill-cake; (4) pressing; (5) granulating, or cutting the press-cake; (6) dusting; (7) glazing; (8) second dusting; (9) stoving, or drying; (10) finishing.

Mixing.

The following is the most approved method of mixing. The ingredients are carefully weighed out in the proper proportions for a 50 lb mill-charge, with an extra amount of saltpetre according to the moisture found to be contained in it; they are then placed in the mixing machine, which consists of a cylindrical gun-metal or copper drum, with an axle passing through its centre, upon which are disposed several rows of gun-metal fork-shaped arms, called "flyers," the machinery being so arranged that the flyers and drum revolve in opposite directions, and at different rates of speed. After being mixed in this machine for about five minutes, the composition is passed through a hand-sieve over a hopper, falls into a bag placed below, and is tied up ready for the incorporating mill; it is now called a "green" charge.

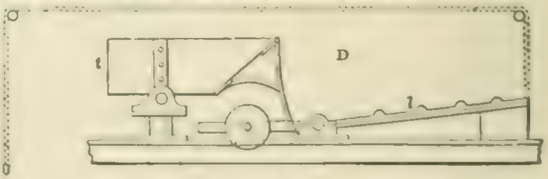


Fig. 1.

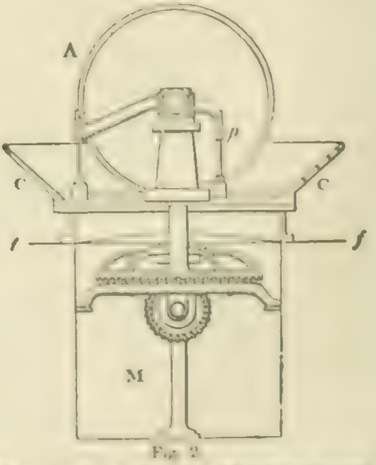


Fig. 2.

Figs. 1 and 2.—A, sectional elevation of incorporating mill, showing one runner and ploughs (p, p); C, curb of bed; M, machinery in tank, underground; D, drenching apparatus; l, lever-board, or shutter; t, tank; f, f, floor line.

Incorporation.

The incorporating mill (see figs. 2 and 3) consists of a circular iron or stone bed, about 7 feet in diameter, firmly fixed in the floor of the building, whereon a pair of iron or stone cylindrical edge-runners revolve; formerly, both were made of a dark grey limestone which took a high polish, but the newer mills have cast iron beds and runners, the edges of the latter being now usually surface-chilled. The average diameter of the runners is 6 feet, and their width about 15 inches; they have a common axle, which rests in gun metal bouches in a solid cross-head attached to a vertical shaft; this shaft passes through a bearing in the centre of the bed, and is in gear with the driving machinery, which is placed above the runners in the old water mills, and beneath the bed in cast-iron tanks in the new steam mills. Each runner weighs about 4 tons, and the speed averages 8 revolutions per minute. The bed has a sloping rim on the outside, called the "curb," and on the inside an edge formed by the "cheese," or bearing, through which the vertical shaft passes. The runners are not equidistant from the centre of the bed, one working the part of the charge near the centre, and the other the outer portion, but their paths overlap. Two "ploughs" of wood, shod with leather, are attached to the cross-head by arms and brackets; one working next the vertical shaft, and the other close to the curb, the ploughs throw the composition under the runners as it works away from the latter.

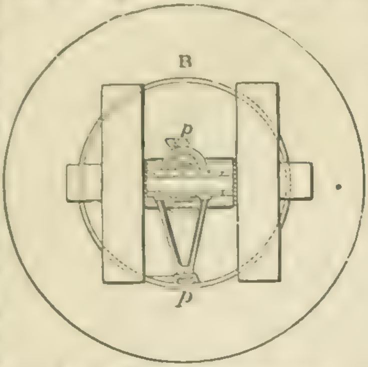


Fig. 3.—Plan of runners and bed.

The charge, when spread evenly on the bed by means of a wooden rake, contains about 2 pints of water (the moisture of the saltpetre) and a further quantity of from 2 to 6 pints is added from time to time, according to the state of the atmosphere, for the threefold purpose of preventing powder dust from flying about, facilitating the incorporation, and reducing the effect of an explosion; if too wet, the runners would lick up the composition from the bed. During the time of working, the millman enters the mill occasionally, takes a wooden "shover," and pushes the outside of the charge into the middle of the path of the runners, so that every portion may be equally incorporated.

The action of the runners is a combination of rolling and twisting, and has, on a large scale, somewhat the effect of a pestle and mortar, crushing, rubbing, and mixing the ingredients, so as to effect an intimate union.

The time of milling depends upon the nature of the powder. For good fine-grain powders it varies from four to eight hours, but the very best sporting gunpowder is said to be as long as twelve hours under the runners; blasting and cannon powders are incorporated from two to four hours, the period being rather longer where the lighter stone runners are used. It is of the greatest importance that the mills should be carefully attended to by experienced men, as the whole goodness and uniformity of the powder depends upon this process, and no after treatment can remedy defective incorporation.

When the composition, which has now become "mill-cake," is ready for removal from the bed, it should be homogeneous in appearance, without any visible specks of sulphur or saltpetre, and of a dark greyish or brownish colour, according to the charcoal used. The mill-cake is carefully tested to ascertain whether it contains the proper amount of moisture; this should be from 2 to 3 per cent. for fine-grain powders, and 3 to 5 per cent. for the larger descriptions. Sometimes a small portion is roughly granulated, and "flashed" on plates of glass or porcelain; a good powder should flash off, leaving nothing but some smoke marks, but, if badly incorporated, the plate will be coated with specks or beads of solid residue.

In former days the ingredients were incorporated in "stamp-mills," which were simply large mortars and pestles, the latter merely raised up by some cam arrangement and allowed to drop by their own weight, the charge being about 12 lb, and the weight of the stamp 50 lb or thereabout. The stamp or *pilon* mills are still used in France and Germany, as well as the *moulins-à-tonneaux*, in which the composition is put, with about an equal weight of brass or lignum vitæ balls, into large barrels, which are made to revolve for a certain time on their axes; this method of incorporation is sometimes employed in conjunction with edge runners.

There is more danger of an explosion during the milling than in any other process of manufacture; but, owing to the limitation by law of the weight of charge permitted to be under the runners at one time to 50 lb, as well as to the great precautions taken, there is seldom any fatal result. The millmen only enter the mill occasionally to "liquor" the charge or give it a shove over, and at Waltham Abbey they wear incombustible clothing with a cap fitting over the ears, and gauntlets of the same material. The roof, and front and rear sides of the mills are usually constructed of very light boards, or even of canvas on a wood frame, while the partitions between each pair of runners are of solid masonry. The force of the explosion of a mill charge materially depends upon the length of time the incorporation has been in progress.

Directly over the bed of each mill is a flat lever-board or "shutter" (see fig. 1) in gear with a tank of water, so arranged that, when the shutter is raised on its pivot by an explosion, the water is upset into the bed; a horizontal shaft connects all the shutters in a group of mills, so that the explosion of one mill at once drowns all the remaining charges. The set of tanks can also be pulled over by hand.

Breaking down.

The process of breaking down, although a subsidiary one, is strictly necessary in order to reduce the mill-cake to a fine meal, so that it may be conveniently loaded into the press box, and receive as uniform a pressure as possible. The breaking-down machine (see fig. 4) consists mainly of two pairs of gun-metal rollers, set in a strong frame of the same material; one roller of each pair works in sliding bearings connected with a weighted lever, so that any hard substance may pass through without dangerous friction. An endless canvas band, having strips of leather sewn across it, conveys the pieces of mill-cake from a hopper, capable of holding 500 lb to the top of the machine,

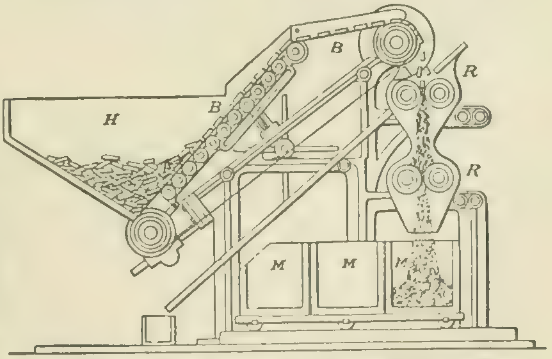


Fig. 4.—Breaking-down machine. H, hopper; B, endless band; R, rollers; M, boxes to receive meal.

whence it falls between the first pair of rollers; after passing through the second pair, which are directly below, the meal is received in wooden boxes, placed upon a carriage, and is ready for the press.

Pressing.

The press-box is usually of oak, with a strong gun-metal frame, and so constructed that three of the sides can turn back on hinges, or be screwed firmly together. Being laid sideways, the top temporarily closed by a board, and the uppermost side alone open, a number of copper plates are placed vertically in the box, and kept apart (at a distance depending upon the description of gunpowder required) by two racks, which are afterwards removed; the box is then loaded with some 800 ℔ of meal, which is rammed evenly down between the plates with wooden laths, and the racks withdrawn, so that the plates are only separated by the meal between them. The *present* upper side of the box being firmly screwed down, the box is turned over, and placed on the table of the hydraulic ram, under the fixed press-block, the plates being now horizontal (see fig. 5). The pumps which work the press (in a separate house) are then set in motion, and the press-block allowed to enter the box a certain distance, when the edge of the latter releases a spring catch and rings a bell as a signal to stop the pumps; the powder is kept under pressure a few minutes, after which the ram is lowered, and the box removed and unloaded. For all granulated powders the press-cake is broken up into pieces and put into tubs, but for the cubical cannon powders the slabs are pressed to the exact thickness required, and are carefully kept whole.

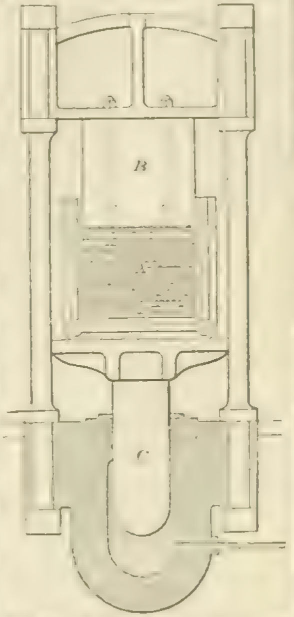


FIG. 5.—Press. A, press-box; B, press-block; C, hydraulic ram.

The above mode of regulating the pressure is found to give more reliable results than trusting to the indicator gauge of the hydraulic press, for the reason that the elasticity, or resistance to pressure, of the meal varies with the amount of moisture present in it, and the state of the atmosphere. To get uniform density, equal quantities of meal, containing equal amounts of moisture, must be pressed at the same rate into the same space. In practice, however, the moisture in the meal will slightly vary, whatever care be taken with the mill-cake, owing to the hygrometric state of the air causing a difference by the time it comes to the press. It is therefore necessary to alter the exact distance the press-block is allowed to enter the box, not only with the nature of the powder, but with the season of the year, and even according to the prevailing state of the weather.

On the Continent, the operation of pressing is sometimes altogether omitted, and the requisite density given merely by the weight of the runners revolving very slowly, the charges being worked with a considerable amount of moisture in them, and the less dense edges of the cake rejected; by this plan it is, however, almost impossible to ensure uniformity in the powder produced. The meal is also sometimes pressed by passing it, on an endless band, between heavy rollers revolving at a slow speed, the less dense edges of the cake being cut off by steel knives.

Granulating.

For some centuries, gunpowder remained in the form of dust or "meal," being, in fact, simply the ingredients ground up together. Granulating or "corning" the powder was a great step in advance, but it is doubtful whether this operation was intended to increase its strength, or merely to render it more convenient for charging small-arms, for which alone corned powder was used for many years, whilst meal powder was still employed for heavy guns; the latter was called "serpentine" powder in the time of Edward VI., probably in allusion to the name of one of the pieces of ordnance then in use. However, during the reign of Elizabeth, the experience of the great additional strength imparted by the corning process, for the reasons already explained, led to the universal introduction of corned powder, except for priming,—both in cannon and small-arms,—for which purpose meal powder remained in use as late as the reign of Charles I.

The old method of granulating was to place the press-cake in sieves, provided with two bottoms of thick parchment prepared from bullock's hides, and perforated with holes, those in the lower bottom being much the smaller; a large number of these sieves were attached to a wooden frame, hung by ropes from the ceiling, which received a violent shaking motion by means of a crank underneath. Into each sieve was put a disk of lignum vitæ, to break up the cake, and force it through the larger apertures; the grain produced was retained between the bottoms of the sieves, the dust passing through the fine holes in the lower ones, and falling on the floor of the house. The grain was afterwards separated into sizes by being passed through wire sieves. These machines were clumsy and dangerous; and the accidents which happened with them have caused them to be generally supplanted by better apparatus, although some of the old frames are still in use.

The granulating machines used in the royal factories in England and in India, as well as in the best private works, are constructed upon a principle introduced by Sir William Congreve, but since improved upon. Three or four pairs of gun-metal rollers with pyramidal-shaped teeth, are fixed obliquely one above the other in a strong framework (see fig. 6); the sizes of the teeth vary according to the kind of grain required, but decrease from the top pair, and for fine grain powders, the lowest pair would be smooth; one roller of each pair works in a sliding bearing, having a counterweight attached to prevent undue friction. Each pair of rollers is connected with that next below, by a short rectangular screen of copper wire, while, underneath all the rollers, are placed, at the same slope, two or more long wire-screens fixed in a frame having a wooden bottom; both the frame and the short connecting screens are hung to the machine by strips of lance wood, and, when at work, a quick vibratory motion is given to all the screens by means of a polygonal wheel upon the main frame working against a loose smooth wheel attached to the screen frame. A large hopper, which rises by the action of the machine, feeds the press-cake upon an endless canvas band, as in the breaking-down machine, and carries it to the top pair of rollers, whence it falls upon the first short screen; all that is fine enough to pass through is sifted out by the shaking action of the long screens below, and travels down upon whichever screen has meshes fine enough to retain it; the pieces too large to pass through the short top screen are carried to the next pair of rollers, and so on. At the lower end of the long screens are placed boxes to receive the different sizes of grain; the "chucks," or pieces too large for any grain, are again passed through the machine, while the dust which falls upon the wooden bottom, and is received in the innermost box, goes to the mills to be worked up for forty minutes as a dust charge. Formerly at Waltham Abbey both musket (F.G.) and cannon powder (L.G.) were granulated in the same machine at the same time, but dogwood charcoal being now used for small-arm powders, one description only is usually made, so that but two long screens are required to determine the higher and lower limits as to size of grain; for example, all that will pass through a 12 mesh and be retained upon a 20 mesh screen would be "rifle fine grain" (R.F.G.) powder, suited as to size for the Snider and Martini rifles. Modifications of this machine are used by private makers, the grain being usually separated into various sizes by hand sieves.

Cube-cutting machine.

Pebble or cubical powders for heavy ordnance are granulated, or "cut," in special machines which divide the press-cake first into strips, and then again cross-ways, into cubes of ⅝ inch and 1½ inch length of edge respectively. This is effected by two pairs of gun-metal or phosphor-bronze rollers, which have straight cutting edges arranged at suitable intervals along their surfaces, the slabs of press-cake being fed vertically between the first pair of rollers. The resulting strips are carried along upon a board, by means of a skeleton band, which receives each strip of cake between two laths of wood; they then drop from the board upon an endless canvas band a little below, travelling in a direction at right angles to their previous motion, and are conveyed *endways* to the second pair of rollers. To prevent the strips of cake from fouling one another, the board upon which they first fall has a reciprocating motion given to it by means of an endless chain, one link of which is studded to a bracket underneath the board; consequently, as the board travels backwards, the strips are deposited at intervals, *in echelon*, upon the canvas band. The diagram (fig. 7) shows a portion of the machine. The cubes, &c., fall into a small reel fixed at a slope beneath the machine, which allows the dust and fragments to pass between its wires while the properly sized pebbles or cubes are delivered into boxes. The large 1½-inch powder has, however, afterwards to be picked over by hand.

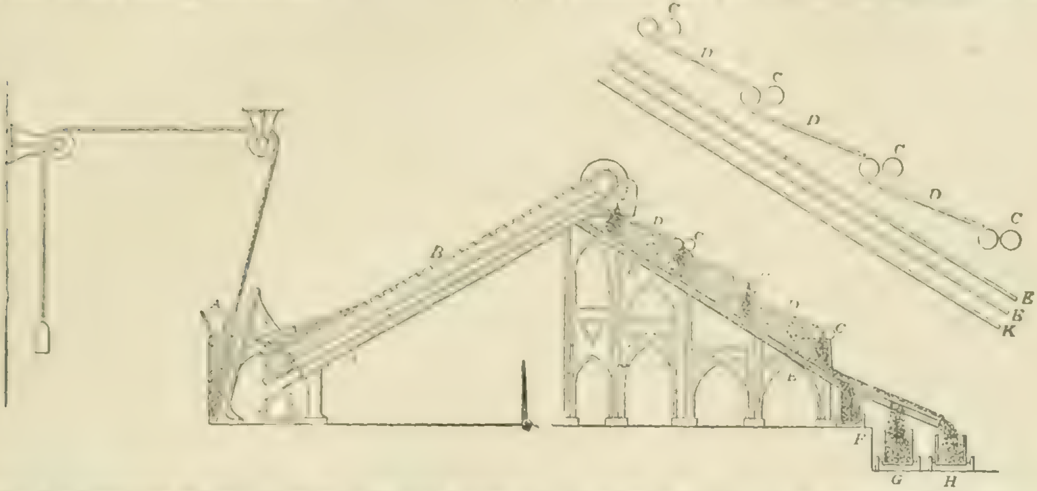


FIG. 6.—Granulating machine. A, hopper, with raising arrangement; B, endless band; C,C,C,C, four pairs of rollers; D,D,D, short screens; E,E, long screens; F, box for dust; G, box for grain; H, box for chucks; K, bottom board.

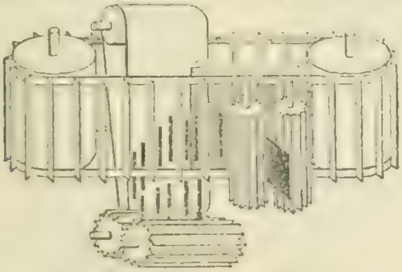


FIG. 7.—Rollers of cube-cutting machine.

Dusting.

All grain from the granulating machine is called "foul-grain," and has to be deprived of its dust in reels, consisting of a cylindrical frame-work about 8 feet long by some 2 feet in diameter, covered with a dusting cloth or canvas of from 18 to 36 meshes to the linear inch, according to the size of grain. These reels are either "horizontal" or "slope," according to the position in which they are fixed and the object in view. Slope-reels are open at both ends, fixed at an angle of about 4°, and are used for fine-grain powders as they come from the machine, when they contain more dust than the larger grain, especially if made from dogwood charcoal; the powder is poured in at the higher end, and received in barrels at the other end. The larger grained powders are dusted for about half an hour in a horizontal reel, with closed ends, the charge being from 250 to 300 lb; one end of the reel is made to lower for the purpose of unloading. Both kinds of reel are enclosed in cases to receive the dust, which, as before, is sent back to the incorporating mills for 40 minutes or so.

Glazing.

The theory of glazing gunpowder has already been discussed. All descriptions are glazed, for varying periods, in glazing barrels or "churns" (fig. 8), which are usually about 5 feet long by 2 to 3 feet in diameter, and revolve some 34 times in a minute; however, barrels of much greater diameter and less length are occasionally employed, revolving at a slower rate. The charge for each barrel is ordinarily 400 lb, and the fine-grain powders are mixed with a pro-

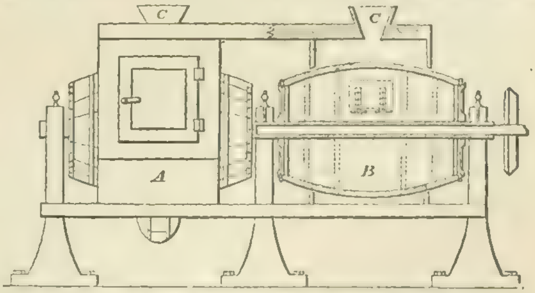


FIG. 8.—Glazing barrels. A, elevation, showing door of case; C, hoppers for loading; B, section through barrel (showing opening in dotted lines).

portion of the "chucks" or larger pieces, which are afterwards sifted out. The glazing process causes a great alteration in the appearance of the grain, especially in that made from dogwood; the dull brownish hue is replaced after a few hours by a fine black colour with more or less polish. Some powders are glazed from 10 to 12 hours, a considerable amount of heat being generated by the friction. Fine-grain powders are again passed through the slope reel after glazing.

Stoving. All kinds of gunpowder are dried in the same manner. The "stove," or drying room, is fitted with open framework shelves or racks, the heat being produced by steam pipes underneath. The powder is spread upon either copper trays or wooden frames with canvas bottoms, each capable of holding about 12 ℔, which are then placed upon the racks. Not more that 50 cwt. may be dried at one time. The length of time required for stoving depends upon the nature of the powder, and the proportion of moisture it contains; it varies from about twelve hours for fine-grain up to three or four days for the very large cannon powders; the heat ranges from 120° to 145° Fahr., the temperature being gradually raised or lowered. It is most important that a stove should be well ventilated, so that a constant current of hot dry air may be supplied, and the air charged with vapour carried off; if this be not done effectually, the moisture would be recondensed upon the powder as the temperature was lowered.

Finishing. The drying process produces a small portion of dust which it is necessary to remove; but the finishing process has, especially upon the fine-grain powder, a much more considerable effect than the mere removal of dust. It is usually finished by being run from two to three hours in a horizontal reel (see fig. 9), the charge being 300 ℔, and acquires a very glossy appearance, if the quality be good, even without the addition of graphite, which is very commonly added to sporting gunpowder. Large cannon powder, such as "pebble" and "cubical," is finished in large skeleton wooden reels, shaped like barrels, and enclosed in cases; after being run for about three quarters of an hour, a small portion of the purest graphite (2 oz. to 400 ℔ of powder) is introduced in muslin bags, and the powder is run for a short time longer. This skeleton reel will hold a whole "glazing," or the contents of four glazing barrels as [illegible], being about 16 barrels of 100 ℔ each, and advantage is taken of this finishing process to mix together a number of glazings, so as to get a batch of 50 or 100 barrels giving uniform results at proof. These batches are afterwards "blended" together in four-way hoppers, with others of a similar character, should they not in all respects be up to standard, and any quantity of gunpowder so [illegible] or blended as to give uniform results at proof is termed a "lot," and receives a distinctive number.

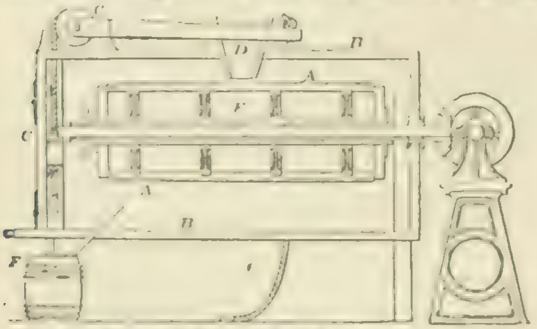


Fig. 9.—Horizontal Dusting Reel (longitudinal section). A, cylindrical reel; B, reel case; C, apparatus for lowering case end for unloading; D, hopper for loading; E, opening in reel for loading; F, barrel for receiving dust.

Powder for very heavy guns. Upon the introduction of very heavy ordnance, firing large charges, it was found that the ordinary (L.G. or R.L.G.) cannon powder was too *sudden* in its action, owing to the whole charge being consumed before the projectile had sensibly moved from its seat in the bore, thus causing a most violent strain to the metal of the gun. To obviate this defect, the grains or pieces were made much larger, so as to diminish the total surface of combustion, and, consequently, the volume of gas evolved at the first instant of explosion; the powder was also given a considerably higher density, which retarded its combustion. These changes resulted in the adoption of the pebble and cubical powders, already mentioned, in England, and in America, of "Mammoth" powder, consisting of large, irregular-shaped grains (*k*, fig. 10) from 0″·6 to 0″·9 in size; an improvement has since been made in this powder by pressing it in uniform-sized pieces, of the shape shown in *i*, fig. 10, being the frusta of two hexagonal pyramids, separated by a prismatic space left rough.

American mammoth powder.

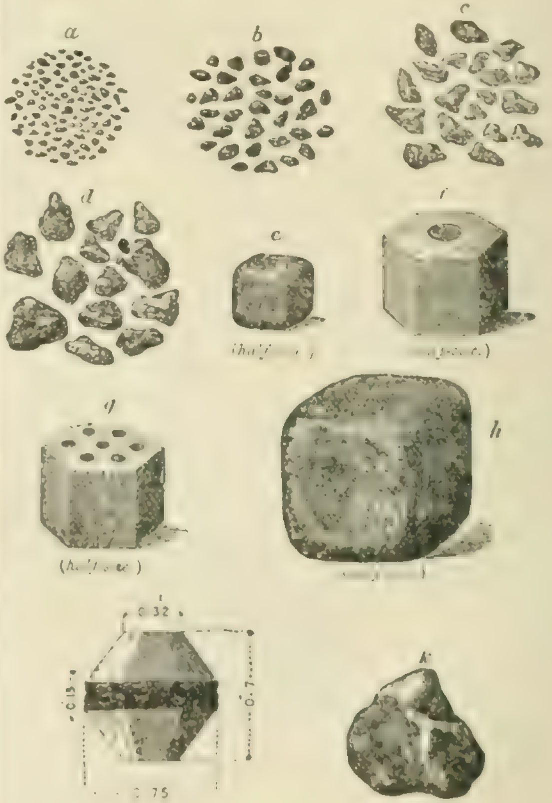


Fig. 10.

The figures *a* to *k* show the relative sizes and shapes of grain now commonly employed for military purposes in Europe and America, except that the three largest powders—pebble (*e*), prismatic (*f*, *g*), and cubical (*h*)—are figured half the real size to save space, whereas the remainder indicate the actual dimensions of the grains. Powder for small arms is represented in *a*; all the other descriptions are intended for cannon of various sizes.

Rodman's perforated cake cartridge. The improvements above described materially lessen the *initial* strain, at the expense of requiring a longer gun to burn the powder completely, but it still remains true that, even with a charge composed of large, dense pieces, the evolution of gas is greatest at the commencement of combustion, and decreases as the grains burn away, although the space occupied by the gases increases as the shot travels along the bore. This is exactly the opposite of what should theoretically take place, and causes the maximum pressure to be exerted before the inertia of the projectile has been overcome. So far back as 1860, these considerations led General Rodman, the eminent American artillerist, to employ, in the experiments with his 15 inch and 20 inch cast iron guns, what he termed a "perforated cake cartridge," composed of discs of compressed powder from 1 to 2 inches thick, and of a diameter to fit the bore, pierced with holes running parallel to the axis of the gun. In his *Properties of Metal for Cannon, and Qualities of Cannon Powder* (Boston, 1861), Rodman demonstrated mathematically that such an arrangement of the charge would relieve the initial strain by exposing a minimum surface at the beginning of the combustion, while a greater volume of gas would be evolved from the increasing surfaces of the cylindrical hollows as the space behind the projectile became larger; this would tend to distribute the pressure more uniformly along the bore. The results of experiment perfectly bore out his theory, but he found it more convenient for several reasons to build up the charge in layers of hexagonal "prisms" of comparatively small size, fitting closely to one another, instead of having the cakes or discs as large as the bore.

Prismatic powder.

The civil war in America most probably interfered with the further development of General Rodman's powder, but the idea was taken up by a Russian military mission in the United States, and resulted in the manufacture on a large scale by Russia of what is now known as "prismatic powder." It has since been adopted in Germany for use in all heavy rifled ordnance; for the very largest guns, such as Krupp's 70-ton gun, this powder has been recently made with one central hole, having a higher density (1·78) than the original seven-hole prisms, which were about 1·68; the external dimensions are the same, 1 inch high by 1·36 in diameter. The prisms are so arranged in the cartridge that the hollows are continuous throughout.

Mode of manufacture.

Prismatic powder represents a distinct class, the peculiarity of which is that each grain or piece is pressed separately in a metal mould. In the British service, powder for heavy rifled guns, in the shape of small cylindrical pellets, with a hollow half-way through, was made some twelve years since, but has been superseded by the pebble or cubical powder cut up from press-cake. To make this class of gunpowder, whether prismatic or cylindrical, we need—(1) a mould in which to place the meal or granulated powder; usually a number of moulds are contained in one plate; (2) a punch to fit each mould accurately with which to compress the powder, and needles to form the perforations; (3) an appliance for pressing the finished pellets or prisms out of the moulds; or this may be done by the punches themselves, if the moulds are closed by a removable upper plate.

The requisite pressure may be given either by hydraulic machinery, as at Waltham Abbey, or by means of a cam or eccentric on a shaft driven by steam or water power, as in the Russian and German prismatic machines. By the former plan a large number of pieces may be pressed slowly at one operation, but by the latter only about six prisms can be formed at a time; the machine, however, works very quickly, and has a small hopper for the meal or grain, and a self-feeding apparatus, the mould plate sliding backwards and forwards, so as to be alternately underneath the hopper and punches. Self-feeding machines of this nature are found to get clogged when used with powder-meal, and this was doubtless the chief reason why granulated powder was first used; the size of grain is about that shown in fig. 10, *b*. It is probable that a more uniform density could be given to the prisms by hydraulic pressure than by the cam arrangement; the latter is said to exert a maximum pressure of 2000 lb on the square inch. The prismatic powder only needs careful drying at a moderate heat to finish it.

It has been found that all powders thus made possess less explosiveness than those granulated or cut up from press-cake; the smooth surfaces of the pieces apparently afford little hold for the flame, and thus they ignite slowly; by some this is considered a defect, but by others an advantage. For this reason, as well as those already detailed, prismatic powder strains the metal of the gun less, in proportion to the velocity obtained, than pebble or cubical, but, to give the projectile an equal velocity, the charge of prismatic must be considerably larger. The cost would probably be also greater, weight for weight.

PROOF OF GUNPOWDER.

The tests to which powder is subjected are as follows:—

1. *For proper Colour, amount of Glaze, sufficiently hard and crisp Texture, and Freedom from Dust.*—These points can be judged by the hand and eye alone, and require a certain amount of experience in the examiner. The cleanness of the powder is tested by pouring a quantity from a bowl held 2 or 3 feet above the barrel; if there be any dust it will be thus easily detected. If it is injured by damp there will be little or no dust, but the grain will be "rotten," and may be broken between the fingers; minute crystals of saltpetre may be also detected on the surface in a good light.

2. *For proper Incorporation.*—By "flashing," that is, burning a small quantity on a glass, porcelain, or copper plate. The powder is put in a small copper cylinder, which is then inverted on the flashing plate; this provides for the particles being arranged in nearly the same way each test, which is very important. If the powder be very large, it must be broken up and sifted to a certain size through a small hand-sieve. Properly made gunpowder should "flash," or puff off, when touched by a hot-iron, with few "lights" or sparks, leaving only some smoke marks on the plate. A badly incorporated powder will give out a quantity of sparks, and leave specks of uncombined saltpetre and sulphur, forming a dirty residue. Powder made from very slack-burnt charcoal, or which has been injured by damp, will always flash badly.

3. *For Shape, Size, and Proportion of the Grains.*—Shape can be judged by the eye only, and the size of large powders can be measured, or the number of pieces to 1 lb counted; granulated powder may readily be sifted upon the two sieves which determine its higher and lower limits of size. The proportion of different sized grains is ascertained by using three or more sieves. For example, the Government small-arm powder is sifted with 12-mesh, 16-mesh, and 20-mesh sieves; all must pass the first, not less than three quarters be retained upon the second, and only one-sixteenth part is allowed to pass the last-named sieve.

4. *Density.*—Formerly this was ascertained by "cubing," or finding the exact weight of a carefully constructed box of known contents, when filled with powder in a particular manner. But as this plan gave only an approximate result, a mercurial densimeter has been substituted, by means of which the density can be ascertained to three places of decimals. Briefly, the machine determines with great accuracy the weight of a globe when it is (*a*) filled with mercury alone under a certain pressure, and (*b*) filled with a known weight (say 100 grammes) of powder and mercury under precisely similar conditions; then, if S be the specific gravity of mercury at the time of experiment, W the weight of globe filled with mercury alone, and W′ the weight when filled with powder and mercury,

$$\text{Density} = \frac{S \times 100}{W - W' + 100}.$$

5. *Moisture and Absorption of Moisture.*—The amount of water contained in gunpowder is found by drying a carefully-weighed sample in a water oven for a certain period; from the weight lost, when allowed to cool out of contact with the air before weighing, the percentage of moisture can be calculated. The hygroscopic test consists in exposing a dried sample in a box, kept at a uniform temperature, to an atmosphere artificially saturated with moisture, and ascertaining the increase of weight in a certain time.

6. *Firing Proof.*—The nature of this will depend upon the purpose for which the powder is intended. For sporting powders, it will consist in the "pattern" given by the shot upon a target at a given distance, or, if fired with a bullet, upon the "figure of merit," or mean radial deviation of a certain number of rounds; also upon the penetration it effects through boards. For military purposes the powder is now always fired from the rifle or piece of ordnance with which it is to be used, and the initial or "muzzle" velocity ascertained by the Le Boulengé electric chronograph (see GUNNERY), which measures the exact time the bullet or other projectile takes to traverse a known distance between two wire screens. By means of the "crusher gauges" already referred to, the exact pressure per square inch upon certain points in the interior of the bore can be found; the maximum pressure can be considerably modified by increasing the cubic air-space given to the charge in the powder chamber. The figure of merit is also taken for small-arm powder.

All gunpowder made by or for the British Government is subjected to very strict limits of specification upon all the above-named points.

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GUNPOWDER PLOT. See FAWKES.

GUNS (Hungarian, *Köszeg*), the second town in importance of the Hungarian megye or county of Vas (Eisenburg), near the Styrian frontier, is favourably situated on the Gyöngyös, 47° 23′ N. lat., 16° 31′ E. long. It is the see of a bishop, and from 1648 until the recent administrative changes of 1876 was a royal free town. Among the more noteworthy buildings are the cathedral, episcopal palace, a seminary for priests, a gymnasium, the county-hall, a hospital, three monastic houses, a museum of Roman antiquities, a house of correction, and several manufactories of cloth and of earthenware. The agricultural products of the neighbourhood consist principally of fruit and wine; the trade in the latter especially is considerable. In 1870 the number of inhabitants was 6916, mostly of German extraction. The heroic defence of the fortress of Guns by Nicolas Jurisics against the army of Sultan Soliman, in August 1532, has given the town a special historical interest. In 1621 it suffered from the attacks of Gabriel Bethlen's troops, and in 1705 the suburbs were plundered and burnt by the forces of Francis Rákóczy. In 1729 and 1777 the town suffered much from fire, and in 1813, 1814, and 1821 from floods. The Esterházy family long held valuable possessions in the neighbourhood, and one of their castles stands at the northern end of the town.

GUNTER, EDMUND (1581-1626), was of Welsh extraction, but was born in Hertfordshire in 1581. He was educated on the royal foundation at Westminster school, and in 1599 was elected a student of Christ Church, Oxford. After graduating bachelor and master of arts at the regular times, he took orders, became a preacher in 1614, and in November 1615 proceeded to the degree of bachelor in divinity. Mathematics, however, which had been his favourite study in youth, continued to engross his attention, and on 6th March 1619 he was appointed to the professorship of astronomy in Gresham College, London. This post he held till his death, which took place on 10th December 1626. With Gunter's name are associated several useful inventions, descriptions of which are given in his treatises on the *Sector, Cross-staff, Bow, Quadrant, and other Instruments.* He had contrived his sector about the year 1606, and written a description of it in Latin. Many copies were transcribed and dispersed, but it was more than sixteen years afterwards ere he allowed the book to appear in English. In 1620 he published his *Canon Triangulorum*, a table of logarithmic sines and tangents (extended to 7 decimal places) for every degree and minute of the quadrant. In later editions an account of the general use of the canon is prefixed, and Briggs's logarithms of the first 1000 numbers are appended. There is reason to believe that Gunter was the first to discover (in 1622 or 1625) that the magnetic needle does not retain the same declination in the same place at all times. By desire of James I. he published in 1624 *The Description and Use of His Majesty's Dials in Whitehall Garden*, the only one of his works which has not been reprinted. He introduced the words cosine and cotangent for sine and tangent of the complement, and he suggested to Briggs, his friend and colleague, the use of the arithmetical complement (see Briggs's *Arithmetica Logarithmica*, cap. xv.). His practical inventions are briefly noticed below.

Gunter's Chain, the chain in common use for measuring land, is 22 yards long and is divided into 100 links. Its usefulness arises from its decimal or centesimal division, and the fact that 10 square chains make an acre.

Gunter's Line, a logarithmic line, usually laid down upon scales, sectors, &c. It is also called the *line of lines* and the *line of numbers*, being only the logarithms graduated upon a ruler, which therefore serves to solve problems instrumentally in the same manner as logarithms do arithmetically.

Gunter's Quadrant, an instrument made of wood, brass, or other substance, containing a kind of stereographic projection of the sphere on the plane of the equinoctial, the eye being supposed to be placed in one of the poles, so that the tropic, ecliptic, and horizon form the arcs of circles, but the hour circles are other curves, drawn by means of several altitudes of the sun for some particular latitude every year. This instrument is used to find the hour of the day, the sun's azimuth, &c., and other common problems of the sphere or globe, and also to take the altitude of an object in degrees.

Gunter's Scale (generally called by seamen the *Gunter*) is a large plane scale, usually 2 feet long by about 1½ inches broad, and engraved with various lines of numbers. On one side are placed the natural lines (as the line of chords, the line of sines, tangents, rhumbs, &c.), and on the other side the corresponding artificial or logarithmic ones. By means of this instrument questions in navigation, trigonometry, &c., are solved with the aid of a pair of compasses.

GUNTHER, Johann Christian (1695–1723), German poet, was born at Striegau in Lower Silesia, on the 8th April 1695. After attending the academy at Schweidnitz, where he composed a number of verses of more than usual promise, he entered in 1715 the university of Wittenberg with the view of studying medicine; but he became idle and dissipated, contracted heavy debts, and came to a complete rupture with his father. In 1717 he went to Leipsic, where he obtained the friendship of Menck, and published a poem on the peace of Passarowitz, which acquired him an immediate reputation. Menck recommended him to the king of Poland, but unhappily the first time he appeared at court he was in a state of intoxication. From that time he led an unsettled and dissipated life, depending for an uncertain subsistence partly on money obtained for occasional poems and partly on the charity of his friends. He died at Jena, 15th March 1723, when only in his 28th year. Goethe pronounces Günther to have been a poet in the fullest sense of the term. As a lyrical poet he stands alone among his contemporaries for freedom, spontaneity, and sincerity of utterance; and his works as a whole give evidence of deep and lively sensibility, fine imagination, clever wit, and a true ear for melody and rhythm. An air of cynicism, however, which was the necessary consequence of his aimless life, is more or less present in most of his poems, and dull, vulgar, or impure witticisms are not unfrequently found side by side with the purest inspirations of his genius.

His collected poems were published in four volumes, Breslau, 1723–1735. They are also included in Tittmann's *Deutsche Dichter des 17ten Jahrh.*, Leipsic, 1874. A pretended autobiography of Günther appeared at Schweidnitz in 1732, and a life of him by Steinbach at Leipsic in 1738. See also Hoffmann, *J. Ch. Günther, ein literarhistorischer Versuch*, Breslau, 1833; and Roquette, *Leben und Dichten J. Ch. Günther's*, Stuttgart, 1860.

GUNTOOR, a town in Kistna district, Madras, situated on the Grand Trunk road, about 46 miles from Masulipatam, 17° 42′ N. lat., 80° 29′ E. long.; population 18,033. It is the headquarters of the sub-collector and the district judge of Kistna; and there is a considerable trade in grain and cotton. Guntoor was formerly the capital of a Circar (Sarkár) under the Mahometans; it was ceded to the French by the nizam in 1753. At the time of the cession of the Circars to the English in 1766, Guntoor was specially exempted during the life of Basálat Jang, whose personal *jágír* it was. In 1788 it came into British possession, and was finally confirmed in 1803.

GURDÁSPUR, a British district in the lieutenant-governorship of the Punjab, lying between 32° 30′ and 31° 36′ N. lat., and between 74° 56′ and 75° 45′ E. long. Bounded on the N. by the native Himálayan states of Kashmir and Chamba, on the E. by Kangrá district and the river Bias, on the S.W. by Amritsar district, and on the W. by Siálkot, the district of Gurdáspur occupies the submontane portion of the Bári Doáb or tract between the Bias and the Rávi. An intrusive spur of the British dominions runs northward into the lower Himálayan ranges, to include the mountain sanatarium of Dalhousie. This station crowns the most westerly shoulder of a magnificent snowy range, the Dháola Dhár, between which and the plain two minor ranges intervene. Below the hills stretches a picturesque and undulating plateau covered with abundant timber and made green by a copious rainfall, and watered by the streams of the Bari Doáb, which, diverted by dams and embankments, now empty their waters into the Bias directly, in order that their channels may not interfere with the Bari Doáb canal. The district contains several large and important *jhíls* or swampy lakes. Few facts can now be recovered with regard to the early annals of Gurdáspur. Our first distinct historical knowledge begins with the rise of the Sikh confederacy. The whole of the Punjab then was distributed to the chiefs who triumphed over the imperial governors. In the course of a few years, however, the famous Ranjít Sinh acquired all the territory which those chiefs had held. Pathánkot and the neighbouring villages in the plain, together with the whole hill portion of the district, formed part of the area ceded by the Sikhs to the East India Company after the first Sikh war in 1846. In 1861–62, after receiving one or two additions, the district was brought into its present shape, having its headquarters at Gurdáspur.

Owing to the numerous transfers of territory which took place between the census of 1855 and 1868, it is impossible to give a detailed comparison of their results. The enumeration of 1868 was taken over an area of 1822 square miles, and it disclosed a total population of 906,126 persons,—males, 501,247; females, 404,879. Classified according to religion there are—Hindus, 303,107; Mahometans, 422,196; Síkhs, 79,387; and "others," 101,436. Only six towns have a population exceeding 5000, namely, Batála, 26,897; Derá Manak, 7199; Dinánagar, 6626; Sujanpur, 6556; Kalanaur, 6030; and Srigovindpur, 5531. Gurdáspur, the chief town and administrative headquarters of the district, had only 4137 inhabitants in 1875. The sanatarium of Dalhousie, 7687 feet above sea-level, though only returned as containing 2019 inhabitants, has a large fluctuating population during the warmer months. The district possesses throughout an excellent soil, except in some small patches on the Bias side, where sand covers the surface. The chief agricultural staples comprise wheat, barley, and gram for the spring harvest, with rice, pulses, cotton, and sugar-cane for the autumn crop. Abundant means of irrigation exist where required, either from canals, wells, or mountain streams; but in no part of the Punjab province can better crops be produced without such artificial aid. In 1875–76 the total cultivated area amounted to 855,675 acres, of which 140,639 acres were protected by irrigation against the effects of drought. The trade of the district consists mainly in the export of its agricultural produce. The imports are insignificant,—English piece-goods, salt, and fancy articles forming the main items. The local traffic centres on Batála. The principal road of the district connects Amritsar with Pathánkot, at the foot of the hills, and passes through Batála, Gurdáspur, and Dinánagar. The total mileage of highways in 1875–76 showed 54 miles of metalled and 507 miles of unmetalled road. The total revenue in 1876 was £123,608. In 1875–76 the district contained 12 civil and revenue judges; and 14 officers exercised magisterial powers. In the same year the police force numbered 596 men, supplemented by a large body of rural watchmen. In 1875–76 there were 112 schools, having an aggregate roll of 5708 pupils. The climate of Gurdáspur is not unhealthy, but large swamps and excessive irrigation expose some neighbourhoods to malarious fevers and ague. The mean temperature for 1871 was 86·85° in May and 53·8° in December at Gurdáspur, and 67·8° in May and 46·96° in December at Dalhousie. The average annual rainfall for eight years ending 1873–74 was 30·96 inches. Seven charitable dispensaries afforded relief (1875–76) to 80,614 persons.

GURGÁON, or Goorgaon, a British district in the lieutenant-governorship of the Punjab, between 27° 39′ and 28° 30′ 45″ N. lat., and 76° 20′ 45″ and 77° 35′ E. long. Bounded on the N. by Rohtak, on the W. and S.W. by portions of the Ulwar, Nábha, and Jínd native states, on the

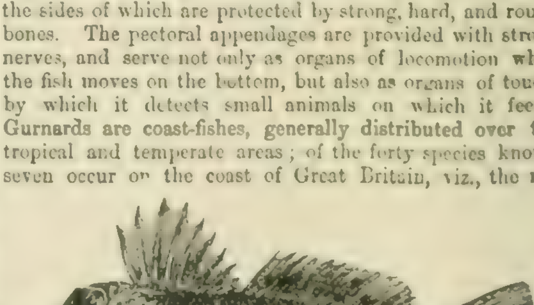
S. by the Muttra district of the North-Western Provinces, on the E. by the river Jumna, and on the N.E. by Delhi, the district of Gurgáon comprises the southernmost corner of the Punjab province, and stretches away from the level plain towards the hills of Rájputáná. Two low rocky ranges enter its borders from the south and run northward in a bare and unshaded mass toward the plain country. East of the western ridge the valley is wide and open, and essentially extends to the banks of the Jumna. To the west lies the subdivision of Rewári, consisting of a sandy plain dotted with isolated hills. Numerous torrents carry off the drainage from the upland ranges, and the most important among them empty themselves at last into the Najafgarh *jhíl*. This swampy lake lies to the east of the civil station of Gurgáon, and stretches long arms into the neighbouring districts of Delhi and Rohtak. Salt is manufactured from lime in wells at several villages. The mineral products are iron ore, copper ore, plumbago, and ochre. Wolves, leopards, deer, jackals, hares, and foxes are found in the district. In 1803 Gurgáon district passed into the hands of the British after Lord Lake's conquests, and under their influence improvements made steady and rapid progress. On the outbreak of the mutiny at Delhi in May 1857, the nawáb of Farrukhnagar, the principal feudatory of the district, rose in rebellion. The Meos and many Rájput families followed his example. A faithful native officer preserved the public buildings and records at Rewári from destruction; but with this exception, British authority became extinguished for a time throughout all Gurgáon. After the fall of the rebel capital, a force marched into the district and either captured or dispersed the leaders of rebellion. The territory of the nawáb was confiscated on account of his participation in the mutiny. Civil administration was resumed under orders from the Punjab Government, to which province the district was formally annexed on the final pacification of the country.

The census of 1868 was taken over an area of 2015 square miles, and it disclosed a population of 696,646 persons—males, 370,251; females, 326,395. The Hindus number 480,307; Mahometans, 216,147; Sikhs, 130; and "others," 62. In 1875–76 there were four municipal towns, with populations as follows:—Rewári, 25,237; Ferozepore (Firozpur), 10,580; Palwal, 13,542; Farrukhnagar, 10,611. Gurgáon, the administrative headquarters, had in 1868 a population of 3539. Out of a total area of 1,267,335 acres, as many as 967,449 were returned in 1875–76 as under cultivation. The principal products are wheat, barley, *joár*, *bájra*, gram, oil-seeds, pulses, cotton, and tobacco. Owing to the deficiency of artificial irrigation, Gurgáon must always be exposed to drought. Seven periods of dearth have occurred since the disastrous year of 1783. In 1833 and 1837 many villages, according to report, lost their whole population through death and emigration. The traffic of Gurgáon district centres entirely upon the town of Rewári, which ranks as one of the chief trading emporiums in the Punjab. Its merchants transact a large part of the commerce between the states of Rájputáná and the northern provinces of British India. Salt from the Sámbhar Lake, together with iron, forms the principal import; sugar and English piece-goods form the chief items of the return trade. In 1871–72 the imports of Rewári were valued at £208,892, and the exports at £60,028. The means of communication are not of the highest order. One good metalled road traverses the district, from Delhi to Muttra, but the lines of greatest mercantile importance are unmetalled. The Rájputána State Railway now passes through the district, with stations at Gurgáon, Jharsa, Jatauli, Kálipur, and Rewári. The total revenue in 1875–76 was £111,885. In the same year 13 civil and revenue judges had jurisdiction, and the police force numbered 635 men, supplemented by a body of village watchmen. The number of schools was 66, with a joint roll of 1500 pupils. The summer heat of Gurgáon reaches a great intensity; no record of temperature, however, exists. The average annual rainfall for the eight years ending 1873–4 was 23·12 inches. The district contained 4 charitable dispensaries, affording relief (1875) to 18,634 persons.

GURNALL, William (1616–1679), author of the *Christian in Complete Armour*, was born in 1616 at Lynn, Norfolkshire. He was educated at the free grammar school of his native town, and in 1631 was nominated to the Lynn scholarship in Emmanuel College, Cambridge, where he graduated B.A. in 1635 and M.A. in 1639. Nothing is known of his history from the time that he left the university till 1644, when he was made rector of Lavenham in Suffolk; but it would appear from one of his letters that when he received that appointment he was officiating as minister at Sudbury. At the Restoration he signed the declaration required by the Act of Uniformity, and on this account he was the subject of a libellous attack, published in 1665, entitled *Covenant-Renouncers Desperate Apostates*. He died October 12, 1679, and was buried at Lavenham. The work by which Gurnall is principally known, *The Christian in Complete Armour*, was published in three separate volumes in 1655, 1658, and 1662, and soon became so popular that in 1679 a sixth edition had been called for. In consists of a series of sermons on the latter portion of the 6th chapter of Ephesians, and is more fully described in the title page as a "Treatise of the Saint's War against the Devil; wherein a discovery is made of that grand enemy of God and his people, in his policies, power, seat of his empire, wickedness, and chief designs he hath against the saints;" and a "Magazine from whence the Christian is furnished with spiritual arms for the battle, helped on with his armour, and taught the use of his weapon; together with the happy issue of the whole war." The work is more practical than theological; and its quaint fancy, graphic and pointed style, astonishing variety of scriptural application and allusion, and fervent religious tone render it still popular with a certain class of readers.

An Inquiry into the Life of the Rev. W. Gurnall, by H. M'Keon, appeared at Woodbridge in 1830, and a biographical introduction by the Rev. J. C. Ryle, chiefly founded on this pamphlet, was prefixed to an edition of the *Christian in Complete Armour* published in London in 1865.

GURNARD (*Trigla*). The gurnards form a group of the family of "mailed cheeks" (*Triglidæ*), and are easily recognized by three detached finger-like appendages in front of the pectoral fins, and by their large, angular, bony head, the sides of which are protected by strong, hard, and rough bones. The pectoral appendages are provided with strong nerves, and serve not only as organs of locomotion when the fish moves on the bottom, but also as organs of touch, by which it detects small animals on which it feeds. Gurnards are coast-fishes, generally distributed over the tropical and temperate areas; of the forty species known seven occur on the coast of Great Britain, viz., the red gurnard (*T. pini*), the streaked gurnard (*T. lineata*), the sapphirine gurnard (*T. hirundo*), the grey gurnard (*T. gurnardus*), Bloch's gurnard (*T. cuculus*), the piper (*T. lyra*), and the long finned gurnard (*T. obscura* or *T. lucerna*). Although never found very far from the coast, gurnards descend to depths of several hundred fathoms; and as they are bottom fish they are caught chiefly by means of the trawl. Not rarely, however, they may be seen floating on the surface of the water, with their broad, finely-coloured pectoral fins spread out like fans. In very young fishes, which abound in certain localities on the coast in the months of August and September, the pectorals are comparatively much longer than in the adult, extending to the



Trigla pleuracanthica.

end of the body, they are beautifully coloured and kept expanded, the little fishes looking like butterflies. When caught and taken out of the water, gurnards emit a grunting noise. Their flesh is very white, firm, and wholesome.

GURWAL. See GARHWAL.

GUSTAVUS I. (c. 1496–1560), king of Sweden, commonly known as GUSTAVUS VASA, the surname being derived from the family arms, which were a bundle or sheaf, is justly celebrated as the founder of modern Sweden; he delivered it from the yoke of Denmark, introduced the Reformation, established law and order, and laid the foundation of its industrial prosperity. His family name was Ericson; he was born about 1496 of a noble house; and he was related to the powerful family of Sture. Gustavus was at a very early age called upon to suffer for his country. Sweden was still joined to the other Scandinavian kingdoms under the union of Calmar, Denmark being the leading state. Sweden was a reluctant member of this union, and King Christian of Denmark was obliged to maintain his supremacy with a high hand. In an expedition to Stockholm this king treacherously carried off the young Gustavus and other nobles as hostages to Denmark. After being detained in Jutland for above a year, Gustavus managed to escape in disguise to Lübeck, and the great Hanse town, ever jealous of the power of Denmark, furnished him with the means of returning to Sweden, where he landed in 1520. He had now formed the resolution to deliver his country from the oppression of the Danes. He went about from place to place trying to incite the people to revolt, but on all hands he met with apathy and even resistance. For some time his life was in extreme danger; he was hunted by the Danish authorities, and worked in disguise on the farms and in the mines of Dalecarlia. The barn in which he threshed corn is preserved as a state monument. He was on the point of fleeing over the hills into Norway, when tidings came of the Blood-bath of Stockholm, in which ninety of the nobles and leading men of Sweden, including the father of Gustavus himself, were executed by the Danish king. This deed roused the slumbering patriotism of the Swedes, especially of the hardy people of Dalecarlia, who now chose Gustavus as their leader (1520). They repeatedly defeated the Danish forces, and took the principal towns. By 1523 Stockholm was taken and Sweden delivered from the Danish yoke. At a great diet held at Strengnâs in that year Gustavus was elected king of Sweden. Finland was speedily recovered. After liberating his country, Gustavus set himself to the far harder task of reforming and settling it. Sweden was in a very backward and disorderly condition. The nobles had great power and many selfish privileges; the clergy were wealthy, and in the war of freedom had taken the side of the Danes; the peasants were poor and discontented. There was little respect for law; the whole country was demoralized and disorganized. The reforms of Gustavus began with the church. The two brothers Peterson had already introduced the doctrines of Luther, and the chancellor Anderson had translated the New Testament into the native tongue. Vasa encouraged their efforts; in a great diet held at Westerås in 1527 he succeeded under the threat of abdicating in passing measures, by which the lands of the bishops were placed at his disposal, and full liberty was granted of preaching the gospel; but the support of the nobles had to be gained by a share of the spoils. The Reformation soon took deep root, but the troubles of Gustavus continued. He required to deal with a turbulent nobility; he had to beat off the exiled king of Denmark; thrice he needed to pacify a revolt in Dalecarlia; and he was forced to put forth the whole strength of his kingdom to quell a peasants' war in the south. The pretensions of Lübeck, which had given him real help in the war of freedom, and to which he owed a considerable sum of money, involved him in a war, by which he curtailed their commercial privileges. In all these difficulties Gustavus bore himself with equal energy and wisdom. In 1544 his position was so secure that the elective sovereignty was changed by the diet into an hereditary one. From this time till his death in 1560, except an unimportant war with Russia on the Finnish frontier, there was little to disturb the quiet progress of Sweden. Gustavus's home policy made an era in Swedish history. Law, order, and national spirit were encouraged and developed; schools were everywhere established, roads made, and foreign trade extended by advantageous commercial treaties with England and Holland. Nothing was too homely or minute for the supervision of the king; he was ready to encourage, scold, or instruct, whenever an opportunity offered in any department of industry. He even established model farms. His second and best-loved queen Margaret had a dairy farm on which twenty-two maidens tended the cows. While he avoided foreign war he did not neglect national defence; he left an excellent army of 15,000 men, and he created a considerable naval force. Altogether, few kings have done so much for any country as Gustavus Vasa did for Sweden. He was succeeded by his son Eric.

See Geijer's *History of the Swedes*; also an anonymous *History of Gustavus Vasa*, London, 1852.

GUSTAVUS II., or GUSTAVUS ADOLPHUS (1594–1632), the hero of Protestantism in the Thirty Years' War, and the first king of Sweden who played a great rôle in European history, was the grandson of Gustavus Vasa, and the son of Charles IX. He was born at Stockholm in 1594, and received an excellent education. As we learn from his friend and chancellor Oxenstierna, he gained in his youth "a complete and ready knowledge of many foreign languages, so that he spoke Latin, German, Dutch, French, and Italian as purely as a native, and besides had some foretaste of the Russian and Polish tongue." Even during his busier years, after ascending the throne, it is said that he was fond of reading the great work of Grotius, *De Jure Belli et Pacis*; also that he knew Greek, preferring Xenophon as a military historian to any other. He was introduced to the business of government at an early age; when he was only ten, his father required his presence at meetings of council and at the audiences given to foreign ambassadors. This early experience was needed; for, his father dying in 1611, he ascended the throne of Sweden in his eighteenth year. His position was a difficult one; after fifty years of civil strife, Sweden had lost the strong and compact organization which it had received from Gustavus Vasa; the finances were exhausted, the nobles were discontented, and the spirit of the people had declined. Abroad, Sweden was surrounded with enemies, Denmark, Russia, and Poland being in a state of chronic hostility with it.

To the difficult task before him the young king applied himself with equal skill and resolution. He attached the nobles to himself by his respect for their privileges and his genial manner, showed them a more honourable field of activity in a patriotic war, and even induced them to bear their due share of its financial burdens. The administration was reformed in all its branches, industry encouraged, and education greatly improved. In this way the national spirit was wonderfully raised; and Sweden was gradually prepared to play for the first time a great part in Europe,—a part which seemed so disproportionate to her natural resources. At his accession Gustavus was engaged in a difficult war with Denmark, which, besides its supremacy over Norway, occupied what is now southern Sweden. The peace of 1613 left their respective frontiers very much as they had been before the war. The war with Russia ended much more advantageously for Gustavus in the peace of Stolbova (1617), by which Sweden was confirmed in the possession of the Baltic provinces stretching from Finland to Livonia. Gustavus clearly foresaw the advantage to Russia and the danger to Sweden if the former power were allowed to plant itself on the Baltic coast; and he now congratulated his country on a peace which secured her against such a risk. In 1620 Gustavus married a sister of the elector of Brandenburg, with whom he lived happily till his death. After being for many years engaged in an intermittent war with Poland, Sweden (1621) entered upon a more active conflict with that power. With some interruptions the struggle lasted till 1629, and proved an excellent training for Gustavus. Sigismund king of Poland, was his cousin, and had at one time been king of Sweden, but had been forced to resign owing to his Catholic opinions. He still laid claim to the crown of Sweden. In this war Gustavus took Riga, and made many other conquests in Livonia as well as in Courland and Prussia, part of which he retained by the peace of Altmark, concluded under the mediation of Richelieu.

That great statesman wished to get Gustavus's hands free for a more important conflict, in which the king himself had long been eager to engage. While Gustavus had been involved in his Baltic war, the Catholic house of Austria had been swiftly raising itself on the ruins of German Protestantism to a position of absolute supremacy. In this early period of the Thirty Years' War which dates from 1618, the armies of Protestantism had been everywhere overthrown by Tilly and Wallenstein. The latter, raising a host at his own cost and leaving desolation wherever he went, garrisoned Brandenburg and Pomerania, occupied Mecklenburg, and overran the continental dominions of Denmark. The only town that successfully resisted the imperial general was Stralsund; the king of Denmark was obliged to make peace. Such a colossus, with its gigantic force of oppression and devastation and its invincible armies, Gustavus now ventured to attack. It seemed a foolhardy undertaking which excited the laughter of his enemies, when in midsummer 1630 he landed on the coast of Pomerania with his little army of 15,000 men. Yet there were many things in his favour,—the despair of the Protestant princes, who saw a great part of their lands threatened by the Edict of Restitution; the dissensions of the Catholics, who forced the emperor to dismiss Wallenstein shortly after the landing of Gustavus; the help of Richelieu, who now inaugurated the French policy of weakening Germany by dividing it. This help was formally secured him by the treaty of Barwalde (January 1631). Yet the German princes showed no haste to join Gustavus; the duke Bogislav reluctantly consented to receive the Swedish army into his capital—Stettin. But the marvellous discipline of the Swedes, so different from the wild barbarism of the imperial army, soon gained the confidence of the German people; robbery and license were unknown; morning and evening the soldiers assembled for prayer round their regimental chaplains; such an army had never been seen in Europe. It was not less distinguished for its hardy bravery in war; keeping the field in winter as well as summer, it soon drove the imperialists out of Pomerania and the lower basin of the Oder, and stormed Frankfort on the Oder. In the midst of these successes, Gustavus was greatly moved by the sack of Magdeburg (May 1631). Fearful of being cut off from his base of operations, he could not advance to the relief of the city without the cooperation or consent of the electors of Brandenburg and Saxony. During the delay thus caused, Magdeburg was taken by Tilly, and became a scene of the most fearful atrocities. Too late Gustavus forced the elector of Brandenburg to hand over to him the fortresses required; a devastating invasion of Saxony by Tilly compelled even the Saxon elector to seek the aid of Sweden. The union of the Swedish and Saxon forces was followed by the battle of Breitenfeld (near Leipsic), in which Tilly was completely overthrown, and the supremacy of Catholic Austria shattered at a single blow (September 1631). While the Saxons overran Bohemia, Gustavus, now hailed as the liberator of Protestantism, marched westwards towards the Rhine, gathering round him the friendly Germans, and driving out the imperial garrisons. Wurtzburg and Frankfort were occupied; at Oppenheim he forced the passage of the Rhine against the Spaniards; he spent Christmas in the ecclesiastical city of Mainz. Early next spring he advanced into Bavaria, forcing the passage of the Lech in the face of Tilly (who was mortally wounded). Munich had to pay a war contribution to the Swede.

In this overwhelming reverse of fortune, the emperor Ferdinand was obliged to invoke the aid of Wallenstein, who soon changed the course of the war. He gathered a mighty host, cleared the Saxons out of Bohemia, and marching westwards threatened the wealthy city of Nuremberg. Afraid of a repetition of the horrors of Magdeburg, Gustavus hastened northwards and threw himself into the city with a small force. In the neighbourhood Wallenstein threw up a fortified camp resolving to starve his rival out; and here the great captains watched each other for several weeks. After drawing his scattered forces together, Gustavus offered battle to the enemy, and when that was declined assaulted his intrenched position, but without effect. Leaving a sufficient garrison to defend the exhausted city, he advanced a second time into Bavaria, where he hoped to draw Wallenstein after him, and thus transfer the seat of war to the enemy's country. But Wallenstein made a desolating march through Thuringia into Saxony, which he resolved to make his winter quarters; and again Gustavus was obliged to leave his Bavarian conquests to save his ally from such a cruel guest. On a misty November day (1632) he attacked the army of Wallenstein at Lutzen (near Leipsic). The numbers engaged were not great: according to Ranke, the Swedes were 14,000, the imperialists only 12,000 at the beginning of the conflict; but the battle was one of the fiercest recorded in history. The Swedes had carried the strong positions of the enemy and turned his own cannon against him, when the cavalry of Pappenheim, which had left the main army shortly before the battle, appeared on the field. The Swedes were hurled back; and the king, too eagerly hurrying forward to re-form the battle, was separated from his guards and shot. Wild with rage and sorrow the Swedes renewed the attack, overthrew the enemy, and won his artillery again. Without making any effort to recover it, Wallenstein retreated into Bohemia, while the Swedes carried the disfigured body of their king from the battle-field. It was laid to rest in the Riddarholm church at Stockholm.

Gustavus Adolphus is justly regarded as one of the noblest and greatest figures in history. Even in the art of war he made an epoch. To the huge and unwieldy masses of Tilly he opposed a light and flexible formation of three deep, which he manœuvred with unwonted rapidity. The activity of his movements was equalled by the dexterity with which his artillery and muskets were handled; at Leipsic his guns fired three shots for the enemy's one. The political plans which Gustavus entertained have been the subject of some discussion. That he aimed at founding a Swedish empire of the Baltic, and succeeded in doing so, is certain; he meant also to unite under his protection the *corpus evangelicorum* of Germany. Probably too he aspired to become a candidate for the empire; and if so, he had only one disqualification, that he was a foreigner. Even with this drawback it would have been the best course available for Germany; to have enjoyed for a generation the rule of such a man would have been an unspeakable blessing, at any rate infinitely better than the supremacy of Austria, or that process of desolation and disunion which actually took place. In any case his premature death at the age of thirty eight was an irreparable loss for German Protestantism. The Thirty Years' War, which for two years had been rendered heroic by his presence, degenerated again into a scene of the wildest barbarism, by which Germany was reduced to a wilderness, and flung back at least a century in the march of civilization.

See Geijer, *History of the Swedes*; Fryxell, *History of Sweden*, English translation by Mary Howitt, Lond. 1844, and *Geschichte Gustav Adolfs*, Leipsic, 1852; Gfrörer, *Gustav Adolf*, 4th ed., edited by Klopp, Stuttgart, 1863; Droysen, *Gustaf Adolf*, Leipsic, 1869-70; Ranke, *Geschichte Wallensteins*, 3d ed., Leipsic, 1872; S. R. Gardiner, *The Thirty Years' War*; E. C. Otté, *Scandinavian History*, Lond. 1875; Felix [illegible] de Parau, *Gustave Adolphe*, Paris, 1875. Schiller's *Geschichte des dreissigjährigen Kriegs* is a brilliant production, but written without a careful study of the sources. (T. K.)

GUSTAVUS III. (1746–1792), king of Sweden, succeeded his father Adolphus Frederick at the age of twenty-five. He was in Paris when his father died, and was an enthusiastic admirer of everything French. His manners were popular; he was brave, resolute, and eloquent. At the beginning of his reign he found the royal power completely overshadowed by the nobles, who in the council virtually dictated the government of the country, and had involved it in frequent disturbance and disgrace. A revolt, contrived for the purpose by one of his adherents, gave Gustavus a pretext for marshalling his guards, whom he won over and employed to make a complete change in the constitution. As the nobles were disliked by the people, they were obliged to submit. Surrounded by soldiers, the diet accepted the new form of government, by which the entire administrative power including taxation was entrusted to the king. In many respects Gustavus made an excellent use of his great power; he improved the army and navy, reformed the administration of justice, abolished torture, and built hospitals. But his foolish aping of French fashions, and his dream of reviving the knightly exercises and accomplishments, led him into great extravagance. His arbitrary attempt to introduce a national dress, as well as the conversion of brandy, the national drink of Sweden, into a royal monopoly, lost him his popularity. In 1788 in his campaign against Russia, several nobles, officers of his army in Finland, refused to carry on the war because it had not been sanctioned by the estates. Angry at this Gustavus summoned the hardy Dalecarlians to his aid, deprived the nobles of their exclusive privileges, and made his power absolute. He continued the Russian war with great bravery and even success till the peace of 1790, which made no change on the Finnish frontier. Gustavus's next project, which he prosecuted with his usual energy and disregard of consequences, was a war to save King Louis XVI. from the Revolution. This war the estates, already weary of his expensive undertakings, refused to support. To avert a new *coup d'état* some nobles formed a conspiracy against him; and Ankarström, formerly an officer in the guard, shot him at a masked ball at Stockholm (1792).

GUSTAVUS IV. (1778–1837), king of Sweden, was son of the preceding. He was only fourteen years of age when his father was cut off, and his uncle Duke Charles acted as regent during the minority. Gustavus early gave proof of an obstinate strength of will and of a highly-wrought temperament bordering on insanity. Thus he went to St Petersburg, according to agreement, to marry a granddaughter of the empress Catherine, and the whole court was assembled for the ceremony. The bridegroom however did not appear, and the company dispersed after waiting several hours. Gustavus had drawn back at the eleventh hour, refusing to sign the marriage treaty because it bound him to grant his future queen the free exercise of her religion. He spent his whole reign under the mastery of a fixed idea, that Napoleon was the Great Beast spoken of in the Apocalypse; and he joined the great coalition of 1805 against the conqueror. In this war Swedish Pomerania was occupied by the French. Even after Tilsit, Gustavus prosecuted the war with unbroken resolution. Sweden suffered fearfully by this obstinacy of the king; the Russians conquered Finland; the Danes invaded the southern provinces; his English allies, wearied of his irrational obstinacy, left him to his fate. Sweden also grew sick of his wrong headed policy. The officers of the army conspired against him. He was dethroned and detained in captivity, while his uncle Duke Charles was elected to the crown (1809). After the new arrangements had been made, he was banished with the assurance of a considerable income. Under the name of Colonel Gustavson he passed a wandering life abroad, dying at St Gall in 1837.

GUSTAVUS ADOLPHUS UNION (GUSTAV-ADOLF-STIFTUNG, GUSTAV-ADOLF-VEREIN, EVANGELISCHER VEREIN DER GUSTAV-ADOLF-STIFTUNG), a society formed of members of the Evangelical Protestant churches of Germany, which has for its object the aid of feeble sister churches, especially in Roman Catholic countries. The project of forming such a society was first broached, in connexion with the bicentennial celebration of the battle of Lutzen, on the 6th of November 1832; a proposal to collect funds for a monument to Gustavus Adolphus having been agreed to, it was suggested by Superintendent Grossmann that the best memorial to the great champion of Protestantism would be the formation of a union for propagating his ideas. For some years the society was somewhat limited in its area and operations, being practically confined to Leipsic and Dresden, but at the Reformation festival in 1841 it received a new impulse through the energy and eloquence of the Hofprediger Zimmermann of Darmstadt, and in 1843 a general meeting was held at Frankfort-on-the-Main where no fewer than twenty-nine branch associations, belonging to all parts of Germany except Bavaria and Austria, were represented. The want of a positive creed on the part of the Union tended from the first, however, to make many of the stricter Protestant churchmen doubtful of its probable usefulness; though on the other hand its purely negative attitude in relation to Roman Catholicism secured for it the sympathy of the masses. At a general convention held in Berlin in September 1846 a keen dispute arose about the admission of the Königsberg delegate Rupp, the founder of the "Free Congregations"; his exclusion, which was carried by a majority, called forth many energetic protests, and at one time it seemed likely that the society would be completely broken up. A peaceful solution of the difficulty, however, was reached at Darmstadt in 1847. Amid the complications of the Revolution of 1848 the whole movement fell into stagnation; but in 1849 another general convention (the seventh), held at Breslau, showed that, although the society had lost both in membership and income, it still was possessed of considerable vitality. From that date the Gustav-Adolf-Verein has been more definitely "evangelical" in its tone than formerly; and under the direction of Zimmermann of Darmstadt it has greatly increased both in numbers and in wealth. In 1853 the income was £13,500; in 1858 it had risen to £21,000; while in 1876 there was divided among 1406 congregations a sum of nearly £35,000. The total number of congregations assisted up to that date was 2558, and the sums distributed amounted to an aggregate of nearly £637,000. Apart from any influence it may have had in advancing the cause of Protestantism in places where it was struggling or weak, there can be no doubt that the Union has had a very great effect in helping the various separate Evangelical churches of Germany realize the number and importance of their common interests. It ought to be added that the stricter Lutherans still continue to hold aloof from it.

The Verein has numerous special organs, of which the most important are the *Darmstädter Bote des Evangelischen Vereins der Gustav-Adolf-Stiftung* and *Fliegende Blätter*. See Zimmermann's *Geschichte des Gustav-Adolf-Vereins*, Darmstadt, 1858.

GÜSTROW, the chief town of the Wendian circle of the grand duchy of Mecklenburg-Schwerin, Northern Germany, is situated on the Nebel and on the railway from Lübeck to Stettin, 20 miles south of Rostock. The principal buildings are the castle, erected in the middle of the 16th century, now used as a workhouse; the cathedral, dating from the 13th century, and lately renovated, containing many fine monuments and possessing a square tower 100 feet high; the town-hall, dating from the 16th century; the court-houses, the music hall, and the theatre. Among the educational establishments are the ducal gymnasium, which possesses a library of 15,000 volumes, the town real-school, the city school, the trade school, and four female schools. The town is one of the most prosperous in the dukedom, and has breweries, foundries, tanneries, sawmills, brandy distilleries, and manufactories of tobacco, glue, candles, and soap. There is also a considerable trade in wool, corn, wood, butter, and cattle, and an annual cattle show and horse races are held. Population (1875), 10,923.

Gustrow was a place of some importance as early as the 12th century, and in 1219 it became the residence of Prince Henry Burewin II., from whom it received Schwerin privileges. From 1556 to 1695 it was the residence of the dukes of Mecklenburg-Gustrow. In 1628 it was occupied by the imperial troops; and Wallenstein resided in it during part of the years 1628 and 1629.

GUTENBERG, JOHN, was born about 1410 at Mainz of noble parents, his father being Frielo zum Gansfleisch, and his mother, whose name he adopted, Else zu Gudenberg. In 1420 the citizens of Mainz drove the patricians out of the city, and as Gutenberg's name appears about ten years later at Strasburg the family probably took refuge there. When the expelled families were recalled to Mainz, Gutenberg did not avail himself of the privilege. We next hear of him at Strasburg, where in 1434 he seized and imprisoned the town clerk of Mainz for a debt due by the corporation of that city, releasing him, however, at the urgent representations of the mayor and counsellors of Strasburg. In 1437 Gutenberg was sued before the ecclesiastical court by Emmeline zu Iserne-Thüre for breach of promise of marriage, the case being settled by his making her his wife. The active mind of Gutenberg had adopted several plans for making money before he invented the art of printing with movable types, which is his great claim upon the gratitude of mankind. Before 1425 he engaged in some experiments requiring money, when Andrew Dritzehn, a fellow-citizen, became security for him; and the same year a partnership between them was arranged to carry out Gutenberg's new plan for polishing stones. Next came an improvement in the manufacture of looking glasses, for which money was lent by other two friends. For these a lucrative sale was expected at the approaching pilgrimage to Aix la Chapelle, which, however, was unfortunately postponed. In 1438 was arranged a partnership between Gutenberg, Andrew Dritzehn, Andrew Heilmann, and Anton Heilmann, and that this concerned the new art of printing appears from the long law proceedings which soon after followed. The action was brought by the brothers of Dritzehn, who was dead, to force Gutenberg to reveal the secrets of the partnership. The decision was in favour of Gutenberg. In January 1441 Gutenberg obtained 80 livres by mortgaging some house property, and again in 1442 he borrowed money of Martin Brether for carrying on his experiments. For four years after this nothing is known of Gutenberg except that his wife paid taxes in his name. He now returned to his native city, Mainz, where he borrowed 100 guilders of his kinsman Arnold Gelthus, and established himself in the house Zum Jungen, which was part of the family possessions. At this time Gutenberg must have been able to show some solid and convincing results of his new invention, for he obtained substantial aid from a shrewd goldsmith, John Fust or Faust, who advanced 800 guilders to promote the work, taking as security a mortgage on all the printing materials to be purchased. Gutenberg at once set to work upon a large folio Latin Bible, the printing of which was ended before August 1455. During the progress of this great undertaking several forms of indulgence and other small things were printed, the earliest with a date being the Indulgence of 1454 in the library at Althorp. But the new art was certainly not a success commercially, and again Fust had to come forward with another 800 guilders to prevent a collapse. In November 1455 Fust determined to dissolve his connexion with Gutenberg, and demanded payment of his advances. Gutenberg not being able to refund so large a sum, Fust took legal proceedings against him, and he was eventually compelled to yield up the whole of the printing materials, which at once were removed by Fust to his own house at Mainz. Here with the assistance of Peter Schöffer he continued to print until the sack of the city in 1462 by Adolphus II. Gutenberg, now in the evening of life, had to make a fresh start in the world, and fortunately in Dr Humery of Mainz found a friend who assisted him with capital. Embarrassment, however, still pursued him, and the press made slow progress. It is uncertain whether the new press of Gutenberg was in Mainz or at the neighbouring town of Eltvill. On January 17, 1465, Gutenberg accepted the post, at the court of Archbishop Adolphus, of salaried courtier. He received annually a suit of livery together with a fixed allowance of corn and wine. Meantime the printing materials were lent to the brothers Bechtermunze, who printed some inconsiderable works, and upon the death of Gutenberg were claimed and taken by Dr Humery. On February 2, 1468, died Gutenberg, poor, childless, and almost friendless, after laying the foundations of an art which was soon to dominate the world. Arnold Gelthus erected a monument to his memory near his grave, and forty years afterwards Ivo Wittig set up a memorial tablet at the legal college in Mainz.

No portrait of Gutenberg is known, those appearing upon medals, statues, or engraved plates being all fictitious. The latest authority upon his life and work is *Gutenberg*, by Dr Van der Linde.

GUTHRIE, THOMAS (1803–1873), Scottish clergyman and philanthropist, was born at Brechin, Forfarshire, on July 12, 1803. He entered the university of Edinburgh at the early age of twelve (November 1815), and continued to attend classes there for more than ten years. During that period he seems to have read widely in general literature, although he did not distinguish himself as a student in the strict sense. On the 2d of February 1825 the presbytery of Brechin licensed him as a preacher in connexion with the Church of Scotland; but it was not till 1830 that he was inducted to his first charge, Arbirlot, in Forfarshire, where he laboured for seven years. In 1837 he became the colleague of the Rev. John Sym in the pastorate of Old Greyfriars, Edinburgh, and at once attracted notice as a great pulpit orator. Towards the close of 1840 Guthrie was chosen minister of St John's Church, Victoria Street, Edinburgh. His increasing popularity brought him flattering invitations both from London and from India; but these he firmly declined. He was an enthusiastic supporter of the movement which led to the Disruption of 1843; and his name is thenceforth associated with the Free Church. In 1847 he began the great work of his life by the publication of his first *Plea for Ragged Schools*. This pamphlet, amid a multitude of other encomiums, elicited a beautiful and sympathetic letter from Lord Jeffrey. A ragged school was opened on the Castle Hill, which has been the parent of many similar institutions elsewhere. Guthrie insisted on bringing up all the children in his school as Protestants; and he thus made his ragged schools not only elementary but proselytizing institutions. This interference with religious liberty led to some controversy; and ultimately those who differed from Guthrie founded the United Industrial School, which is managed on the principle of combined secular and separate religious instruction. In April 1849 the degree of D.D. was conferred on Guthrie by the university of Edinburgh; and in 1850 Dr Hanna, the biographer of Dr Chalmers, was inducted as his colleague in Free St John's Church.

In 1850 Guthrie published *A Plea on behalf of Drunkards and against Drunkenness*, which was followed by *The Gospel in Ezekiel* (1855); *The City, its Sins and Sorrows* (1857); *Christ and the Inheritance of the Saints* (1858); *Seed-time and Harvest of Ragged Schools* (1860), consisting of his three *Pleas for Ragged Schools*; and *The Way to Life* and *Speaking to the Heart* (1862). These works had an enormous sale, and carried his fame to distant parts of the world. Portions of them were translated into French and Dutch. In 1862 he was moderator of the Free Church General Assembly; but he seldom took a prominent part in the business of the Church courts. In connexion with the total abstinence movement he often appeared on the platform, where his oratorical talents, rich humour, genuine pathos, and inimitable power of story-telling eminently qualified him to shine. He was also greatly interested in the work of the Evangelical Alliance, of which he was one of the vice-presidents. In 1864, his health being seriously impaired, he resigned public work as pastor of Free St John's (May 17), although his nominal connexion with the congregation ceased only with his death. Guthrie had occasionally contributed papers to *Good Words*, and, about the time of his retirement from the ministry, he became editor of the *Sunday Magazine*, himself contributing several series of papers which were afterwards published separately. In 1865 he was presented with £5000 as a mark of appreciation from the public. His closing years were spent mostly in retirement; and after an illness of several months' duration he died at St Leonards-on-Sea, February 24, 1873.

Dr Guthrie's fame rests on his labours as a social reformer and his extraordinary oratorical power as a preacher and platform speaker. He will always be remembered as one of the most successful and warm-hearted of Christian philanthropists; and his influence over the masses of his countrymen was very great. His theology was the moderate Calvinism generally accepted by the Evangelical school. His style is distinguished by great graphic power and richness of illustration; but, although admirably adapted for effect on a popular audience, it is far too florid and Asiatic in its rhetoric to please a sound literary critic.

See *Autobiography of Thomas Guthrie, D.D., and Memoir* by his sons, 2 vols., London, 1874-5.

GUTS MUTHS, Johann Christoph Friedrich (1759–1839), a German teacher and the principal founder of the German school system of gymnastics, was born at Quedlinburg 9th August 1759. He was educated at the gymnasium of his native town and at Halle university; and in 1785 he went to Schnepfenthal, where he taught geography and gymnastics in Salzmann's academy. His method of teaching gymnastics was expounded by him in various handbooks; and it was chiefly through them that gymnastics very soon came to occupy such an important position in the school system of Germany. He also did much to introduce a better method of instruction in geography. He died May 21, 1839.

His principal works are *Gymnastik für die Jugend*, 1793; *Spiele zur Übung und Erholung des Körpers und Geistes für die Jugend*, 1796; *Lehrbuch der Geographie*, 1810; and a number of [illegible] *Schwimmens*, and [illegible] *Literatur Deutschlands*. He also contributed to the [illegible] *Handbuch der neuesten Erdbeschreibung*, and along with Jacobi published *Deutsches Land und deutsches Volk*, the first part, *Deutsches Land*, being written by him.

GUTTA PERCHA (Gutta Taban, &c.). This name[1] is applied to the concreted or inspissated juice of various plants belonging to the natural order *Sapotaceæ*, growing in the Malay Peninsula. To what particular tree the name "gutta percha" properly belongs, there is no evidence to show; but it has been generally given to *Dichopsis Gutta* (Bentley and Trimen) or *Isonandra Gutta* (Hooker), the vernacular name of which is "taban."[2]

The *Dichopsis Gutta* attains a height of 60 to 80 feet, with a diameter of 2 to 4 feet. The leaves are obovate-oblong and entire, pale green on the upper side, and covered beneath with short reddish-brown shining down. The flowers are arranged in clusters of 3 or 4 in the axils of the leaves. The fruit, about an inch long, is of an ovoid shape, and is eaten by the Malays. In Siák (Sumatra) a vegetable butter is prepared from the seeds. The wood is soft, fibrous, spongy, of a pale colour, and marked with black lines, these being reservoirs of gutta percha.[3] The gutta, as it flows from the tree, is of a greyish hue, occasionally with a somewhat roseate tinge, probably arising from the colour vessels of the bark becoming ruptured through surcharge, and their contents mixing with the gutta. This species does not furnish all the gutta percha of commerce; indeed there are other trees which yield larger quantities. In all there are about thirty varieties known; but some of the vernacular names in different districts may prove mere synonyms.

The geographical distribution of the trees producing gutta percha is very restricted. Gützlaff defines the limits as 6° N. and S. lat. and 100° to 120° E. long.; whilst Captain Lingard (who has great personal experience on the subject) gives the limits as 4° N. and 3° S. lat., still further restricting the finer varieties to 3° 50′ N. and 1° S., with a temperature ranging between 66° and 90° Fahr., and a very moist atmosphere. These limits are well within the isotherm of 80° Fahr. Many of the best varieties are found only on the hill slopes at a distance from the sea-coast, each variety forming a separate grove of from 200 to 500 trees, with high forest trees above them. They grow best in a rich light loam, with a rocky subsoil.

The collection of gutta percha generally takes place directly after the rainy season, as in the dry season the gutta does not flow so readily, while during the rains ague and jungle fever are most prevalent, and the gutta is liable to be washed away from the felled trees. The yield of a well-grown tree of the best variety is from 2 to 3 lb of gutta percha, such a tree being about thirty years old, 30 to 40 feet high, and 1½ to 3 feet in circumference. A full-grown tree sometimes measures 100 to 140 feet to its first branches, with a girth of 20 feet at a distance of 14 feet from the base, and may yield 50 to 60 ℔ of gutta percha, which loses in six months about 35 per cent. of its weight in drying.

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[1] Gutta, or getah, is variously written gutah, gatta, gittáh, gátta, is the Malayan term for gum, and Percha (pronounced as in perch, *not* hard as perka), a contracted variously as percha, pertja, perchá, is the name of the tree; hence the term may be translated "gum of the percha tree." The old name of Sumatra was Pulo or Pulau Percha, *i.e.*, "island (Pulau) of the percha tree."

[2] Tuban, tuban, taban is the name of the tree, and, according to Logan, a new word has been added to the Malay language, viz., Menában (Meng-taban), *i.e.*, to collect gutta taban. The greater number of Malay nouns are capable of conversion into verbs by a prefix.

[3] For figures and botanical descriptions see *Lond. Journ. Bot.*, 1848; De Vriese, *De Handel in Getah-Percha*; and Bentley and Trimen's *Medicinal Plants*, part 35, p. 16 (1878).

The methods of extracting the gutta percha are much the same amongst the Malays, Chinese, and Dyaks. The trees are cut down just above the buttresses, or *banirs*, as they are called; and for this purpose a staging about 14 to 16 feet high is erected. The tools used in felling are either "billiongs" or "parangs." A billiong is a kind of axe used by the Malays in felling, building, &c. The blade is of a chisel-like form, and the tang is secured at right angles to a handle by means of a lashing of "ratan" or cane. The Chinese sometimes use an axe perfectly wedge-shaped. The parang looks more like a sword-bayonet, and in the hands of a Malay is a box of tools in itself, as with it he can cut up his food, fell a tree, build a house, or defend himself.

When the tree is felled the branches are speedily lopped off, to prevent the ascent of the gutta to the leaves. Narrow strips of bark, about an inch broad and 6 inches apart, are then removed, but not all round the tree, as its underpart in its fall becomes buried in the soft earth, much sap being thus lost. Some natives beat the bark with mallets to accelerate the flow of milk or gutta. The milk flows slowly (changing colour the while) and rapidly concretes, and, according to its source, may vary from yellowish-white to reddish or even brownish in hue. The gutta as it flows is received into hollow bamboos, doubled-up leaves, spathes of palms, pieces of bark, cocoa-nut shells, or in holes scraped in the ground. If the quantity obtained is small, it is prepared on the spot by rubbing it together in the hands into a block, in one end of which a hole is made to carry it by. In this state it is known in the market as "raw gutta" or "gutta muntah." If water gets mixed with the juice, the gutta becomes stringy and is considered deteriorated, but after boiling appears quite as good. Sometimes the gutta is kept in a raw state for a month or two, and then undergoes the next step in the preparation, that is, boiling. The boiling is generally conducted in a "kwali" or pan of cast or hammered iron, of about 15 inches in diameter and 6 inches deep. The boiling is either simply with water, or with the addition of lime juice or cocoa-nut oil. If one pint of lime juice be added to three gallons of gutta juice, the latter coagulates immediately on ebullition.

On arriving at the port of shipment the gutta, before exportation, generally undergoes examination and classification into parcels, according to quality. As received in the "godowns" or warehouses it presents great diversities in condition, shape, size, and colour,—from crumbling, hardly coherent, whitish or greyish "raw" or "getah muntah" fragments, to reddish or brownish blocks as hard as wood. Sometimes it is made up into all manner of grotesque shapes of animals, and it is nearly always largely adulterated with sago-flour, sawdust, clay, stones, &c. The Chinese are great adepts in assorting and classifying gutta, and frequently prepare from different varieties a certain "standard sample" by cutting or rasping the material into thin slices and boiling with water in large shallow iron pans, keeping the contents constantly stirred with poles, and adding good gutta percha and even cocoa-nut oil to give a better appearance. When sufficiently boiled the gutta is pressed into large moulds, and is then ready for shipment. This process of refining is wholly unnecessary, and in some cases is done only to get rid of stuff which has no right to be called "gutta percha."

The amount and value of gutta percha imported into Great Britain in 1875-77 were as follows:—

	1875	1876	1877
Cwts	[illegible]	[illegible]	[illegible]
Value	£[illegible]	£[illegible],441	£[illegible]

The price of gutta percha ranges from 4d. to 3s. per lb, according to quality and demand.

History.—The early history of the use of gutta percha is somewhat obscure; the Malays and Chinese are said to have long known and used it. One of the earliest notices of it in England occurs in a catalogue of the collection of the famous Tradescants.[1] Dr Montgomerie, a surgeon in the East India Company's service, was the first to direct attention to gutta percha as likely to prove of great utility in the arts and manufactures. Having observed the substance in Singapore in 1822 in the form of whips, he commenced experimenting with it. In 1842, being again stationed at Singapore, he followed up the subject, and his recommendation of it to the medical board of Calcutta as useful for making of splints and other surgical apparatus met with high approval. He also sent specimens, with relative information, to the Society of Arts of London, which society warmly took up the subject, and on Montgomerie's return to England in 1844 presented him with its gold medal. Some have claimed the honour of introducing gutta percha to the notice of the commercial world for Dr (afterwards Sir) José D'Almeida, who sent a specimen merely as a curiosity to the Royal Asiatic Society in 1843, but careful investigation clearly decides the question of priority in favour of Montgomerie. The Society of Arts having requested him to lay before them the result of his experiments, he delivered a lecture in the autumn of 1844, and many patents were at once taken out, the chief being those of Mr C. Hancock, Mr Nickels, Mr Keene, Messrs Barlow and Forster, Mr E. W. Siemens, and others. After this the substance soon came into general use.[2]

Properties.—Gutta percha, like many other milky juices, occurs in the laticiferous tissue of the plant, which exists in greatest abundance in the middle layer of the bark. See BOTANY, vol. iv. p. 87.

Gutta percha is resolvable into two resins, *albin* and *fluavil*. Like caoutchouc or india rubber, it is a hydrocarbon; Soubeiran gives its composition as—carbon 87·80 and hydrogen 12·20. In commercial gutta percha we have this hydrocarbon or pure gutta, plus a soft resin, a resultant of oxidation of the hydrocarbon. M. Payen gives the following analysis of commercial gutta percha:—

Pure gutta (milk-white in colour and fusible), 75 to 82 per cent.

Resins soluble in boiling alcohol:—

1. Crystalline resin albin ($C_{20}H_{32}O_2$), white, and crystallizing out of the alcohol as it cools, 6 to 14 per cent.
2. Fluavil ($C_{20}H_{32}O$), yellow, falling as an amorphous powder on the cooling of the alcohol, 6 to 14 per cent.

It is thus apparent that the change of pure gutta into a resin like mass takes place naturally if means be not taken to stop it. Many a good parcel has been thus lost to commerce, and the only remedy seems to be thorough boiling as soon after collecting as possible. It must be remembered too that, in cutting through the bark to arrive at the laticiferous vessels, many other vessels and cells become ruptured, containing tannic and gallic acids, &c., and the presence of these no doubt accelerates oxidation. In opening blocks of the milky juice a turbidity and effervescence are often noticed, owing to the formation of a brownish liquid, the colour being probably due to the presence of gallic acid. In improperly prepared blocks of gutta also, these foreign substances induce the presence of a brown fermented and putrid liquid, which decomposes the material itself. Many of these substances, being soluble in water, are removed by the process of boiling.

Gutta percha as met with in commerce is of a reddish or yellowish hue, but when quite pure is of a greyish-white colour. In this state it is nearly as hard as wood, only just receiving the impression of the nail; it is of a porous structure, and when viewed under the microscope has the appearance of a mass of variously bent plates. When rendered into thin sheets, or drawn into threads, it acquires a fibrous structure in the direction of its greatest length, in which direction consequently it can be stretched without rupture. If, however, a strip be cut across the fibres, it will be found [illegible], the structure of the fibrous direction is developed in an opposite direction. The [illegible] properties of gutta percha were first noticed by Faraday. It is readily electrified by friction, and electric sparks can be obtained [illegible] vol. xxxii. p. 56.

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[1] In the *Musæum Tradescantianum, or a Collection of Rarities preserved at South Lambeth near London, by John Tradescant*, London, 1656, the following entry occurs on p. 44:—"VIII. Variety of Rarities.—The plyable mazer wood, being warmed in water, will work to any form." [illegible]

[2] See [illegible] "Gutta Percha" in *British Manufacturing Industries* (Stanford & Co.), and the very interesting volume of *Specifications of Patents on Caoutchouc, Gutta Percha*, &c. issued by the Patent Office.

At a temperature of 32° to 77° Fahr., gutta percha has as much tenacity as thick leather, though it is inelastic and less flexible. In water at 115° Fahr. it becomes less hard; towards 120° Fahr. it becomes doughy, though still tough; and at from 145° to 150° it grows soft and pliable, allowing itself to be easily rolled and moulded. In this state it has all the elasticity of caoutchouc, but this it loses as it cools, gradually becoming hard and rigid again, and retaining any form impressed on it whilst in its plastic condition. It is highly inflammable, and burns with a bright flame dropping a black residue like sealing wax. The specific gravity of gutta percha has been variously stated at from 0·9[illegible] to 0·9923. It is insoluble in water, alcohol, dilute acids, and alkalies, but dissolves in warm oil of turpentine, bisulphide of carbon, coal tar oil, caoutchin or oil of caoutchouc, and its own oil,—for it yields by destructive distillation an oil similar to that yielded by caoutchouc under the same treatment. Ether and some of the essential oils render it pasty, and it is softened by hot water, absorbing a small quantity of the water, which is slowly parted with in drying.

Manufacture and Applications.—Gutta percha, as received in England, is in irregular clumps or blocks, and is frequently adulterated with massive stones, sawdust, bark, sago flour, and other foreign matters; and the first step in its manufacture is to cleanse it thoroughly. The blocks are first sliced by means of a powerful circular wheel driven by machinery, and having fixed in it two or three strong chisel-like knives, by which it is divided into thin slices. These are placed in wooden troughs filled with water and heated by steam. As soon as the gutta percha becomes soft, it is taken out in baskets and placed in a toothed iron cylinder, called a "[illegible]" machine, which tears it into fragments; these fall into a trough of water, and the impurities sink to the bottom, leaving the purified gutta floating in the form of a spongy mass. This mass is then taken out by means of perforated shovels, thoroughly washed in cold water, and dried in baskets. It is then packed in jacketed iron chests heated by steam, and left till it becomes soft, when it is at once removed, and kneaded or masticated by means of a cast-iron cylinder, with a movable lid and an internal revolving toothed iron axis,—the result being a homogeneous dough-like reddish-brown mass. Sometimes various substances are introduced into this machine, which is called a "masticator," to increase the hardness or density of the gutta, or to colour it,—such as orange or red lead, chrome, vermilion, yellow ochre, sulphur, caoutchouc, gypsum, or resin, care being taken to use such substances only as are not affected by the heat necessary in the operation. The mastication is conducted with great nicety, as at the will of the operator a soft and elastic or a hard and horny substance can be produced. When sufficiently masticated, the gutta is placed whilst still hot between two steel cylinders, and thoroughly rolled. By means of an endless band of felt the gutta is returned again to the cylinders, the distance between which is gradually diminished so as to compress and completely drive out any contained air from the gutta percha. There are various machines for cutting driving bands, &c., to a uniform width, and for rounding off the edges and finishing. Soles for boots are made by cutting a long strip of the requisite width, and then passing the strip under a hollow die.

In making piping a machine is used consisting of a cylinder, with a die-piece attached of the requisite size. By means of a piston the gutta percha, which is introduced into the cylinder in a plastic condition, is driven through the die-piece, and the piston gives the inner diameter of the piping. As the piping issues from the machine, it passes immediately into a trough of water, which "sets" it, and prevents it from collapsing. The value of gutta percha piping is very great: it does not contaminate water as lead piping does; it withstands insects, damp, &c., and is easily manipulated, being shortened, lengthened, or repaired without trouble or expense; and its acoustic properties have led to its employment largely in the manufacture of aural, stethoscopical, and other instruments. Gutta percha speaking-tubes are now to be seen in nearly every office. The substance too, from the fact that few acids and alkalies affect it, especially if dilute, is largely employed for funnels, siphons, and other chemical apparatus.

In telegraphy gutta percha is of the very highest importance, being a cheap, lasting, and powerful insulator, easily applied to telegraphic wires. The general method of coating telegraphic wire is by charging a cylinder with plastic gutta percha, and forcing it through a die-piece, the wire forming a central core. As the wire is drawn through this "die" or "moulding" piece, it becomes coated to the required thickness, and after passing through water it is wound on drums ready to be coated with tarred rope, and with galvanized iron wire, if required for submarine cables.

The readiness with which gutta percha, whilst in its plastic condition, receives an impression, which it retains when cold, largely led to its employment in the decorative and fine arts, since it reproduces the finest lines, as in the taking of moulds for electrotypes. See ELECTROMETALLURGY.

In the production of imitations of oak and other ornamental woods, gutta percha has been largely used, since by the admixture of various substances "graining" or "marbling" can be very naturally represented, and a coating of a solution of gutta percha gives a varnish of great brilliancy.

Substitutes.—Many substances have been recommended as substitutes for, or as supplementary to, gutta percha. Among these Balata gum undoubtedly holds the first place. It is obtained from the *Mimusops Balata* (Gaertner), a tree found in British and French Guiana, Jamaica, &c. Prof. Bleekrod seems to have been the first to direct attention to this substance, by bringing it before the notice of the Society of Arts in 1857.[1] The Balata gum combines in some degree the elasticity of caoutchouc with the ductility of gutta percha, freely softening and becoming plastic, and being easily moulded like gutta percha. What small parcels have been sent to England have met with a ready sale, and were remarkably pure and free from adulteration. But unfortunately, through the difficulty of collection, the occupation being dangerous and unhealthy, the supply of this excellent article has fallen off. It is procured by making incisions in the bark of the tree about 7 feet from the ground, a ring of clay being placed around to catch the milk as it exudes. A large tree is said to yield as much as 45 ℔ of "dry gum."[2] *Pauchontee*, the produce of *Dichopsis elliptica*, Collins (*Bassia elliptica*, Dalzell), is a most interesting substance, and may yet prove an article of commerce if properly treated; at present, although by heat it becomes plastic and ductile, it is brittle and resin-like when cold. The tree is found very generally distributed in Wynaad, Coorg, Travancore, &c.

Many of the euphorbias yield milky juices which have some at least of the properties of gutta percha. The chief amongst these are the cattimandoo (*Euphorbia Cattimandoo*, Elliot) and the Indian spurge tree (*E. Tirucalli*, Linn.) of India, and some euphorbias at the Cape of Good Hope. The alstonia or pala gum (*Alstonia scholaris*, R. Br.) and the mudar gum (*Calotropis gigantea*, R. Br.), have also been recommended as substitutes for gutta percha. But the attempts made to utilize these substances have as yet been unsuccessful.

Future Supplies.—A very important matter for consideration is the question of the future supplies of gutta percha. It is after all only a spontaneous natural product. If a Malay or Chinese wishes to plant pepper, gambier, &c., he burns down a portion of the forest, and when he has raised two or three crops he clears a new portion, and thus finely wooded spots become denuded of trees, and covered with rank grass rendering them unfit for further cultivation. Again, to obtain the gutta percha the trees are cut down, and none are planted in their stead, so that in districts where they were in abundance one or two only are now preserved as curiosities. It is a wonder indeed that a single tree is left. A writer in the *Sarawak Gazette* says that from 1854 to 1875 over 90,000 piculs (of 133⅓ ℔ each) of gutta percha was exported from Sarawak alone, and this meant the death of at least 3,000,000 trees. In fact the only thing that preserves the tree at all is that it is of no use to cut one down till it is 25 to 30 years old. Sooner or later recourse must be had to cultivation and conservation. (J. CO.)

GUTZKOW, Karl (1811–1878), one of the most distinguished of modern German novelists and dramatists, was born 17th March 1811 at Berlin, where his father held a clerkship in the war office. After completing his education at the Friedrichswerder gymnasium, he entered upon the study of theology and philosophy at the university of his native town, where, having had his interest awakened by the political and social questions of the time by the Paris revolution of July 1830, he, while still a student, began his chequered literary career by the publication in 1831 of a periodical entitled *Forum der Journalliteratur*. Although, as was to be expected, the serial was a failure and was soon discontinued, it procured for him the notice of Wolfgang Menzel, who invited him to Stuttgart to assist him in the editorship of the *Literaturblatt*. At the same time he continued his university studies, first at Jena, then at Heidelberg, and latterly at Munich. In 1832 he published anonymously at Hamburg *Briefe eines Narren an eine*

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[1] *Journ. Soc. Arts*, Oct. 8, 1857, also Aug. 24, 1860, and March 4, 1864.

[2] *Trinidad Chronicle*, Sept. 2, 1873.

Novellen, and in 1833 appeared at Stuttgart *Maha-Guru, Geschichte eines Gottes*, a fantastic and satirical romance intended to ridicule the current conceptions of the divine. In 1835, on account of a difference with Menzel, he discontinued his contributions to the *Literaturblatt*, and went to Frankfort, where he became collaborateur with Duller on the *Phönix*, and also founded the *Deutsche Revue*. In the same year appeared *Wally, die Zweiflerin*, from the publication of which may be said to date the school of writers who, from their opposition not only to Romanticism but to all the time-honoured literary, social, and religious traditions, have received the name of "Young Germany." The work was directed specially against the institution of marriage and the belief in revelation; and whatever attention it might have attracted from its own merits was tenfold increased by the action of the Government, which, besides condemning its author to three months' imprisonment, decreed the suppression of all he had written or might yet write, and prohibited him from exercising the functions of editor within the states of the *Bund*. During his term of imprisonment Gutzkow employed himself in the composition of his treatise *Zur Philosophie der Geschichte*, published at Hamburg in 1836, in which he opposed the Hegelian theory as to the nature and ends of history. On obtaining his freedom he went to Frankfort, where, shortly afterwards, he was married, and where he wrote several volumes on various subjects which he published at Hamburg and Stuttgart; but finding himself hampered in his literary undertakings by the prohibitions of the Prussian Government, he removed in 1837 to Hamburg. Here he inaugurated a new epoch of his literary activity by bringing out his tragedy *Richard Savage*, which immediately made the round of all the German theatres, and first decidedly won the ear of Germany for the modern drama. Of his numerous other plays the majority are now neglected; but a few have obtained an established place in the repertory of the German theatre,—especially the comedies *Zopf und Schwert* (1844) and *Das Urbild des Tartüffe* (1847), and the tragedy *Uriel Acosta* (1847), the deep tragic interest, fine dramatic situations, and terse and pregnant diction of the last entitle it to rank among the best dramas of modern times. In 1842 Gutzkow paid a visit to Paris, of which he gave an account in *Briefe aus Paris* (Leipsic, 1842). After his return to Germany he resumed his stay at Frankfort, where he was chiefly occupied in preparing for the press an edition of his collected works, published in 12 volumes, 1845-46, but in 1847 he went to Dresden, where he succeeded Tieck as director of the court theatre. About the same time began that period of his literary activity to which belongs the series of remarkable works of fiction intended to depict the action and tendency of the principal intellectual, social, and religious forces in modern society. The chief of these novels are *Die Ritter vom Geiste* (9 vols., Leipsic, 1850-52) and *Der Zauberer von Rom* (9 vols., Leipsic, 1858-61). The latter, a study of Roman Catholic life in southern Germany, is generally regarded as his masterpiece; and the vigorous and trenchant delineations of character are not more notable than the keen analysis of the motives underlying religious profession, and the subtle penetration into the characteristics and tendencies of the various forms of religious opinion. In regard, however, to both works, it may be objected that their great length, their somewhat tedious dwelling over unimportant details, the intricate and involved complexity of their plots, and the frequent intrusion of their controversial purpose, lessen considerably the legitimate effect of their striking sketches and original character-portraits, their skilfully contrived episodes and frequently powerfully dramatic scenes, and the unceasing interest in which the incidents are blended into one whole. The success of *Die Ritter vom Geiste* suggested to Gutzkow the establishment of a journal on the model of Dickens's *Household Words*, entitled *Unterhaltungen am häuslichen Herd*, which first appeared in 1852, and was continued till 1862. In 1864 he had an attack of insanity, during which he made an attempt upon his life; and although after his recovery he continued to write as voluminously as formerly, his productions show henceforth decided traces of failing powers. To this period belong the historical novels *Hohenschwangau* (5 vols. 1868) and *Fritz Ellrodt* (3 vols. 1872); *Lebensbilder* (3 vols. 1870-72), consisting of autobiographic sketches; and *Die Söhne Pestalozzi's* (3 vols. 1870), the plot of which is founded on the story of Kaspar Hauser. On account of a return of his nervous malady, Gutzkow in 1873 made a journey to Italy, and on his return took up his residence in the country near Heidelberg. Although some time before his death he had been confined to his sick chamber at Frankfort, its occurrence, 16th December 1878, was due to accidental suffocation from smoke.

The writings of Gutzkow suffer in character from the controversy which embittered his life. His didactic purpose was too strong to allow his fine artistic faculty full freedom of action, and notwithstanding his true dramatic insight, firm grasp of character, rich vein of original thought, and wonderful comprehension of the principles at work in modern society, he did not possess that command of his materials which is necessary to mould them into poetic completeness. But although his popularity has not been commensurate even with his merits, no recent writer has exerted a more powerful influence on the opinions of modern Germany; and if his works are not destined to live by virtue of their inherent value, many of them will always be of interest as the mirror in which the intellectual and social struggles of his time are best reflected.

An edition of Gutzkow's collected works appeared at Jena, 1873-76. Since his death the issue of a popular edition has been undertaken, the first volume of which, containing the autobiography of his boyhood and his miscellaneous poems, has already appeared. His *Rückblicke auf mein Leben*, published in 1875, deals specially with that period of his life when he was director of the Dresden theatre. A complete biography by Johannes Proelss is now in process of preparation.

GUTZLAFF, Karl Friedrich August (1803-1851), a missionary to China, was born at Pyritz in Pomerania, 8th July 1803. At an early age he cherished a strong desire to become a foreign missionary, but the poverty of his parents made it impossible for them to aid him in attaining his wishes, and he became apprentice to a saddler in Stettin. In 1821, however, he made known his inclination to the king of Prussia, through whom he obtained admission to the Pædagogium at Halle, and afterwards to the mission institute of Jänicke in Berlin. In 1826, under the auspices of the Netherlands Missionary Society, he went to Batavia, where by intercourse with the Chinese residents he perfected himself in the Chinese language. He, however, severed his connexion with the Netherlands Society in 1828, and went to Singapore; and in August of the same year he removed to Bangkok, the capital of Siam, where he occupied himself with translating the Bible into Siamese. In 1829 he married an English lady, who aided him in the preparation of a dictionary of Cochin China, but she died in August 1831 before its completion. Shortly after her death he sailed to Macao in China, where, and subsequently at Hong Kong, he worked at a translation of the Bible into Chinese, published a Chinese monthly magazine, and wrote in Chinese various books on subjects of useful knowledge. He also at different times undertook voyages on the coast of China, and in 1834 he published at London an account of them under the title *Journal of Three Voyages along the Coast of China in 1831, 1832, and 1833*. He was appointed in 1835 joint Chinese secretary to the English commission, and during the opium war and the negotiations connected with the peace that followed he rendered valuable service by his knowledge of the country and people. On account of the continued refusal of the Chinese authorities to permit foreigners to penetrate into the interior, Gützlaff in 1844 founded an institute for the training of native missionaries, which was so successful that during the first four years as many as forty-eight Chinese were sent out from it to carry on missionary labours among their fellow-countrymen. He died at Hong Kong, August 9, 1851.

Besides two works already mentioned, Gützlaff was the author of *A Sketch of Chinese History, Ancient and Modern*, London, 1834, and a similar work published in German at Stuttgart in 1847, *China Opened*, 1838, and the *Life of Taou-Kwang*, 1851. German [illegible] published at Berlin in 1850. A considerable collection of his Chinese writings is preserved in the library of Munich.

GUY, Thomas (1644–1724), founder of Guy's Hospital, London, was the son of a lighterman and coal dealer at Southwark. After serving an apprenticeship of eight years with a bookseller, he in 1668 began business on his own account. He dealt largely in Bibles, which had for many years been poorly and incorrectly printed in England. These he at first imported from Holland, but subsequently obtained from the university of Oxford the privilege of printing. Thus, and by an extremely thrifty mode of life, and more particularly by investment in Government securities, the subscription of these into the South Sea Company, and the subsequent sale of his stock in 1720, he became master of an immense fortune. He died unmarried, December 17, 1724. In 1707 he built three wards of St Thomas's Hospital, which institution he otherwise subsequently benefited; and at a cost of £18,793, 16s. he erected Guy's Hospital, leaving for its endowment £219,499; he also endowed Christ's Hospital with £400 a year, and in 1701 built almshouses at Tamworth, his mother's birthplace, which was represented by him in parliament. The residue of his estate, which went to distant relatives, amounted to about £80,000.

See *A True Copy of the Last Will and Testament of Thomas Guy, Esq.*, London, 1725; J. Northouck, *A New Hist. of London*, bk. iii., chap. i., p. 684, 1773; Nichols, *Literary Anecdotes*, vol. iii. p. 599, 1812; and Charles Knight, *Shadows of the Old Booksellers*, pp. 3-27, 1865.

GUY OF WARWICK, an old English metrical romance which is known to have existed in French as early as the end of the 13th century. Its authorship has been assigned to Walter of Exeter, a Franciscan monk of the 13th century, and, although this supposition has been generally disputed, Tanner regards it as probable. The romance has been retouched by some French or Anglo-Norman minstrel, but is evidently of Saxon origin, and is allied to the story of Guido Tyrius in the *Gesta Romanorum*, and probably to the romance *Sir Guy*, quoted by Chaucer in his *Rime of Sir Topas*. The hero of the story is Sir Guy of Warwick, who is said to have been the son of Siward, baron of Wallingford, to have married Felicia, the only daughter of Rohand, a famous Saxon warrior, to have become earl of Warwick in his wife's right, and after conquering Colbrond the Dane to have lived as a hermit till his death in 929. The earliest English chronicler who mentions the story as historical is John Harding. Tanner is of opinion that the first germ of the romance dates from the battle of Brunanburgh, the "Vinheide" of the *Egilssaga*, but though the story has since been in tradition, the chief events of the hero's life are plainly mythical. Although the romance had once great popularity, it now appears dull and tedious, and has no other than an antiquarian interest.

An edition of the romance in French prose appeared at Paris in 1525 printed by Anthoine Couteau, and it is also referred to in the old Spanish romance, *Tirante el Blanco*, written about 1480. The earliest English edition is that without date printed at London by William Copland, who died in 1568 or 1569. There exist also an edition printed at London by John Cawood without date, another by Samuel Rowlands in 1667, and three by C. Bates in 1700. The earliest English manuscript of the romance is that contained in the Auchinleck MS. in the Advocates' Library, Edinburgh, which is, however, imperfect at the commencement and in the middle. It was printed by the Abbotsford Club in 1840. There is a similar copy in the library of Caius College, Cambridge, but [illegible]. A fragment of the romance from a MS. in the British Museum, was privately printed by Sir Thomas Phillipps, 1838, and the same fragment was reprinted in the Abbotsford edition. The manuscript in the University Library, Cambridge, was printed for the first time in the *Romance of Guy of Warwick*, edited for the early English Text Society by Zupitza, 1875. All these English versions appear to have been translated from the Anglo-French version. There are, according to Zupitza, at least eight French MSS. in existence, three in London, one at Oxford, two at Cambridge, one at Cheltenham, and one at Wolfenbüttel. There is also a copy in the Imperial Library of Paris, and there was one at Bruges in 1467, and one at Brussels in 1487. A portion of the Wolfenbüttel MS. has been edited by G. A. Herbing in the *Programm der grossen Stadtschule zu Wismar als Einladung zur Michaelisprüfung*, 1872. See also Zupitza, *Zur Literaturgeschichte von Guy von Warwick*, 1873; *The Percy Folio MS.*, edited by Hales and Furnivall, vol. ii.; and A. Tanner, *Die Sage von Guy von Warwick*, 1877.

GUYON, or Guion, Jeanne Marie Bouvières de la Mothe (1648–1717), a leading exponent of the quietistic mysticism of the 17th century, was born of wealthy and aristocratic parents at Montargis (dep. Loiret), on the 13th of April 1648. From infancy a sickly and excitable child, she was at the age of two years and a half placed for a short time under the charge of the Ursuline nuns of Montargis, and in 1652 she became resident in the Benedictine convent for a somewhat longer period; but the state of her health rendered it necessary that she should again be taken home, where for a time she was left almost exclusively to the care of domestics. From her seventh to her tenth year she was once more with the Ursulines, and after another short interval at home she next passed eight months in the Dominican cloister, where she spent much time in reading the Bible, and in committing large portions of it to memory. In her 12th year she communicated for the first time, and also began to form some acquaintance with the writings of St Francis de Sales and of his disciple Madame de Chantal, "la Sainte de Monthélon." In imitation of the latter, she tells us in her autobiography that she at this time carried the name of the Saviour visibly inscribed on her person, subjected herself to severe bodily austerities, and made a solemn vow ever to aim at the highest perfection in an absolute surrender of her will to God. She earnestly wished also to take the veil, and in fact made an attempt, by means of a forged letter purporting to be signed by her mother, to gain admission into the order of the Visitation of Mary, but her father interfered. In 1663 she removed along with her parents to Paris, and went much into society, where her youth, beauty, and talent secured for her a very flattering reception; in the following year, before she was quite sixteen, she was married to M. Guyon, a man of some wealth and position, but of weak health, and twenty-two years her senior. The union, on her side at least, had not been dictated by love; her husband's affection, though probably genuine enough, appears to have been of a somewhat tepid kind; and disparity of age, as well as wide differences of taste and habit between herself and M. Guyon, combined with other circumstances, such as the jealousy of her mother-in-law, and her own eager temper, to make her married life anything but happy. She "began to eat the bread of sorrow and to mingle her drink with tears," and her lonely and desolate heart was not comforted until it found quiet in God. It was in her twenty-first year, on the 22d of July 1668, she tells us, that, after much reading of Thomas a Kempis, St Francis de Sales, and other religious writers, much spiritual conversation with those who knew best about the mysteries of the "inner life" and the happiness of the state of "recollection in God," much groping in deep darkness, and much wrestling in agonized [illegible] she at last experienced the change of heart which [illegible] her with joy and peace in the life of faith. The [illegible] in which she describes that crisis, if indeed they are not coloured by later experiences, are interesting and important, as showing that thus early she had already [illegible] that was distinctive of her quietism. "Nothing was more easy to me now than to practise prayer. Hours passed away like moments, while I could hardly do anything else but pray. The [illegible] of my love [illegible]. It was a prayer of rejoicing and of [illegible], wherein the taste of God was so great, so pure, unblended, and uninterrupted, that it drew and absorbed the [illegible] of the soul into a profound [illegible], a state of confiding and affectionate rest in God, existing without [illegible]. For I had now no sight but of Jesus Christ alone. All else was excluded in order to love with greater purity and energy, without any motives or reasons for loving which were of a selfish nature." In the months and years that followed she learned, by much experience [illegible] to keep even such heights as the soul has [illegible]; but her aim, ever more clearly seen and more steadily followed, continued to be "entire consecration, [illegible] perfect faith and love." Amongst those who were helpful to her during this period was Geneviève Granger, the prioress of a Benedictine community in Paris, under whose [illegible] she, on July 22 (St Mary Magdalene's day), 1672, drew up a solemn act of consecration, sealed with [illegible] and signed with her blood, in which she surrendered herself to Christ as His spouse, accepting as a part of her marriage portion "the temptations and sorrows, the crosses and [illegible], which fall to Him." In the beginning of 1674 she passed into a state of "privation" or "desolation," which [illegible] to have continued with but short [illegible] for more than six years; during the [illegible] period, however, she had the benefit of the spiritual direction of Bertot, a kindred spirit, whose [illegible] writings she afterwards edited. On the 21st of July 1676 she was left a widow, with three surviving children, [illegible] and a [illegible] daughter, and began to live a life of still deeper seclusion and isolation than before, interesting herself, however, in works of charity, and in the [illegible] of her family, in connexion with the latter [illegible] and made some progress in the [illegible]. Her [illegible] continued [illegible], she began to [illegible], and to [illegible] wholly [illegible] by God; in her deep [illegible] with Francis de la [illegible] at Thonon, Savoy, [illegible] from the time of the first [illegible] I had the [illegible]

[illegible]

jected. Gradually, in the course of 1681, she had almost, though with hesitation, reached the conclusion that she was called to active religious work, and the field to which inward intimations seemed to point was that part of France and Savoy which borders on Geneva, if not Geneva itself. The advice of D'Aranthon, titular bishop of Geneva, was asked and obtained; he approved of the proposal. After making some important arrangements with regard to her property, and entrusting her two sons to the care of suitable guardians, she accordingly secretly left Paris accompanied only by three female attendants and her daughter, then a child of five years of age. The party arrived at Annecy on the 21st of July; on the following day, at the tomb of St Francis de Sales, Madame Guyon renewed her spiritual marriage with the Redeemer; and finally she fixed her [illegible] at Gex under the spiritual care of D'Aranthon, by whom La Combe was assigned to her as her director in the place of Bertot, who had died some time before. Here she at once began her labours, tending the sick and poor, praying with them and giving them religious instruction; yet still it seemed to her as if the "seal of her mission was not yet broken." Something within her whispered that she had not yet found the great and special work to which God had been calling her. Amongst other things the state of her director caused her much solicitude. She saw that he had much, but felt that he ought to have more. Her vocation at last was revealed to her, to become to him a spiritual mother, and her efforts towards the fulfilment of that vocation were not in vain; La Combe at last became [illegible] with the doctrine of present sanctification by faith in the Saviour, and began to preach accordingly. Opposition and persecution almost immediately began. Bishop D'Aranthon did not fail to take notice of the new doctrines, though on this occasion it escaped formal condemnation by the authorities at Rome. Learning, however, that Madame Guyon was the real author of the [illegible], it [illegible] involve a theory of perfection hardly compatible with Catholicism, he resolved that she should [illegible] her activities within his diocese unless she should consent to accept a sphere where the facilities for doctrinal propagandism would be less than those for the exercise of ordinary benevolence. He accordingly proposed that she should give what property still remained to her [illegible] at Gex, and that she should herself become prioress. The proposal, however, she declined, chiefly on the ground that it did not seem to be in accordance with the designs of God in regard to her. The [illegible] of the bishop now made her stay at Gex to be far from comfortable, and accordingly, at the close of a residence of rather more than six months, she removed early in 1682 to Thonon, apparently in the expectation of being near her adviser La Combe. Here she remained for upwards of two years, engaged in religious work of various kinds, especially in spiritual conversation with the people of the neighbourhood, and in tending a small hospital which, at the suggestion of her director and with the approval of [illegible] of Thonon, she had founded. Meanwhile her doctrines of "pure love" and "[illegible]," which consist in the complete identification of the human will with the will of God, were taking [illegible], and in [illegible] they first found literary expression in her [illegible], probably the best of her writings, and [illegible] a [illegible], which [illegible] the progress of the soul from the commencement of its inward life to its union with God, by a reference to [illegible] torrents flowing from the mountain tops with [illegible] rapidity and with greater or less directness, and [illegible] at last in the ocean." Although Madame Guyon was not herself conscious of any disharmony with the teaching and practice of the Catholic Church, her doctrines could hardly fail to be regarded by the ordinary orthodoxy of that time as more or less hostile to the generally accepted views as to the nature and mode of sanctification, and as to the normal state of the graciously renewed heart; and thus they soon gave deep offence, and ultimately it was intimated both to her and to La Combe, on the part of Bishop D'Aranthon, that both must leave the diocese. Her next resting place for a few weeks was Turin, whence in the autumn of 1684, she removed to Grenoble, where she again became a centre of attraction and influence. Here, for the direction of the many who flocked to her for instruction and advice, she wrote and circulated her *Moyen court et très facile de faire oraison*, a treatise in which she pointed out, doubtless in a manner highly susceptible of misconstruction, that prayer might often well be both silent and wordless. The commencement of her commentaries on the Bible also dates from this stay in Grenoble. Her numerous and popular "conferences" or meetings for conversation and prayer or "self-recollection in God," and the effect produced by the *Moyen court de faire oraison*, however, speedily excited ecclesiastical opposition similar to that which she had already encountered at Gex, and although the bishop (Camus) was himself disposed to be tolerant, if not friendly, she was ultimately constrained, in the spring of 1686, to yield to strong representations, and seek an abode elsewhere. Nice, Genoa, and Vercelli (where she again met La Combe) were visited in turn; but it was finally resolved, with the advice and concurrence of her friends, that Paris now offered itself as the field of labour most suited to her powers. Here accordingly she arrived on the 22d of July 1686, and soon she and her teaching began to meet with a very favourable reception in the higher circles of society. But meanwhile the doctrine of Molinos and the *Guida Spirituale* had been formally condemned by the Inquisition at Rome, and the sentence had been taken up as a signal, especially in France, for the persecution of all suspected persons. In October 1687 La Combe was suddenly arrested by a royal "lettre de cachet" and committed to the Bastile; and by the same authority Madame Guyon herself was, three months later (29th January 1688), ordered to be detained as a prisoner in the convent of St Marie in the Faubourg Sainte Antoine. The charges brought against her were the maintenance of heretical opinions; the holding of private religious assemblies, contrary to the practice and rules of the Catholic Church, for the spread of these opinions; the publication of a dangerous book containing opinions similar to those of the *Spiritual Guide* of Molinos; and correspondence with Molinos. These, however, were not destined to come to a definite issue, for through influence which friends succeeded in bringing to bear upon Madame de Maintenon a release was obtained in the following October. Madame Guyon now went to live for the most part with her daughter, who had become the Comtesse de Vaux, at the family seat in the neighbourhood of Paris; but while on a visit with the duchess of Charost she became acquainted with Fénelon, and a considerable correspondence began. Her influence continuing to make itself felt at Paris, Dijon, Versailles, and other places, especially in the institution of St Cyr, founded by Madame de Maintenon in 1686, the attention of theologians was drawn afresh to the "new spirituality," as it was called; and among others both the Port-Royalist Nicole and Bossuet, bishop of Meaux, sought personal interviews. The latter, to whom she had submitted not only all her printed works but also the manuscript of an autobiography which she had written when in confinement in 1688, after more than one long conference, is understood to have expressed himself as on the whole satisfied of her orthodoxy; but the publication by Nicole of the *Réfutation des principales Erreurs des Quiétistes* appears to have had an exciting influence on the public mind; rumours prejudicial not only to the orthodoxy of Madame Guyon's faith, but also to the purity of her life, were industriously spread, and caused great scandal in the highest quarters, so that at last she was constrained to write to Madame de Maintenon requesting that a number of suitable persons might be selected for the purpose of judging both of her doctrine and her morals, and offering at the same time to submit to any degree of confinement and restraint until it should please the king to appoint such persons. A commission was duly nominated, consisting of Bossuet, Bishop (afterwards Cardinal) De Noailles, and Tronson, the superior of St Sulpice. To this tribunal she at their request submitted the *Moyen Court*, *Les Torrens*, and the manuscripts of her commentaries along with her autobiography, to which she added her *Justification*. The outcome of many deliberations, extending over some months, was the preparation of twenty-four articles, usually called the "Articles of Issy," relating to the doctrine of "pure love." Her refusal to sign a "condemnation of religious errors," as drawn up and presented to her by Bossuet in a pastoral ordinance and letter, now led to an open rupture which resulted in her reimprisonment, on this occasion at Vincennes, on the 27th of December 1695. Bossuet now set himself to prepare his *Instruction sur les états d'oraison*, which he submitted before publication to De Noailles, and, amongst others, to Fénelon for approval. The latter after reading the manuscript withheld his imprimatur, not on account of its doctrine (with which he did not disagree), but on account of its personalities, which he held to be uncalled for and unjust. Almost forced thus into the position of a champion of Madame Guyon, he published in 1697 his *Maximes des Saintes*, a statement of the leading principles laid down by approved writers on the subject of the higher inward experience and of holy living. In the course of the controversy which followed several important works appeared, which can only be alluded to here; the dispute, as is well known, issued in the formal condemnation of Fénelon (12th March 1699), in which achievement the hostility to Madame Guyon seems to have almost exhausted itself. She was not released, however, until 1702, in which year she was banished to Blois, where the remainder of her life was spent. Numbers of persons of all ranks, and many of them from foreign countries, visited her in this retirement; and both in correspondence and conversation she continued to manifest considerable activity, although feeling herself "called on to glorify God by submission and by private prayer, rather than by active labours." She heard mass daily, received the sacrament every alternate day, and died in full communion with the Roman Catholic Church, after an illness of three months, on the 9th of June 1717.

La Vie de Madame de la Mothe Guyon, écrite par elle-même, first appeared at Cologne in 1720. It is based upon the autobiography which at the instance of La Combe she is known to have written during her imprisonment in 1688; it afterwards received additions and corrections from her own hands, and was finally entrusted to a confidential friend on the understanding that it should not be published until after her death. In addition to *Les Torrens Spirituels*, and the *Moyen court et très facile de faire oraison*, which were published in the *Opuscules Spirituels* in 1704, there appeared in her lifetime the *Poésies Spirituelles* (1689); and *La Bible, traduite en français, avec des Explications et des Réflexions qui regardent la Vie Intérieure* (1715). There are also several volumes of *Lettres Chrétiennes et Spirituelles*, addressed by her to Metternich, Fénelon, and other correspondents, many of them distinguished. The edition of the collected *Œuvres* extends to 40 vols. (1767–1791). English and German translations of the various works are numerous. Apart from the *Autobiography*, the only memoir of Madame Guyon as yet in existence, is the diffuse but somewhat vague and meagre *Life*, by Thomas C. Upham (1854). (J. S. BL.)

GUYTON DE MORVEAU, Louis Bernard, Baron (1737–1816), a distinguished French chemist, was born January 4, 1737, at Dijon, in the university of which town his father was professor of civil law. As a boy he evinced a remarkable aptitude for practical mechanics. On leaving college at the age of sixteen he became a law student in the university of Dijon, and after three years he was sent to Paris to acquire a knowledge of practice at the bar. He obtained in his twenty-fourth year the office of advocate-general in the parliament of Dijon, of which he fulfilled the duties till 1782. Before long, piqued by a slighting remark of Dr Chardenon of Dijon, made in reply to a criticism at the close of a lecture on chemistry, De Morveau set himself to acquire a thorough knowledge of that science. With "pestle for his master, and melted crucibles and retorts for tutors," as he once observed to Baumé, he speedily obtained such a mastery over his subject as to draw from Chardenon the public acknowledgment that he was "born to be an honour to chemistry." In 1772 he published at Dijon the *Digressions Académiques*, in which were set forth his views with respect to phlogiston and the phenomena of crystallization; and in 1773 he discovered the efficacy of hydrochloric acid gas as an atmospheric disinfectant.[1] He was the means, in 1774, of founding in Dijon courses of public lectures on mineralogy, materia medica, and chemistry, the last of which he himself during thirteen years gratuitously delivered. It would appear that his fellow-citizens were as yet far from holding exalted views with regard to the prerogatives of science. Accusing him of "presumptuously disarming the hand of the Supreme Being," they about this time sought to destroy his lightning conductors at the house of the academy, and were restrained from carrying out their intentions only by the assurance of M. Maret, the secretary of that institution, "that the astonishing virtue of the apparatus resided in the gilded point, which had purposely been sent from Rome by the Holy Father." In 1777–78 appeared the *Élémens de Chymie Théorique et Pratique* (3 vols 12mo) of De Morveau, Maret, and Durande, a work highly appreciated by their contemporaries. The chemical articles in vol. i. of the section "Chymie, Pharmacie, et Metallurgie" of the *Encyclopédie Méthodique* (1786), as also some few of those of vol. ii. (1792), were from the pen of De Morveau. Of these the longest is a masterly exposition of the facts and conclusions that had up to that time been arrived at by chemists on the subject of acids.

De Morveau's first essay on a new chemical nomenclature, the origin of the present system, was published in the *Journal de Physique* for May 1782, and was the subject of much adverse criticism. Repairing to Paris, the author successfully met the objections of his opponents; and in 1787, in conjunction with Lavoisier, Berthollet, and Fourcroy, he published *Méthode d'une Nomenclature Chimique*, the principles of which were speedily adopted by chemists throughout Europe. Constantly in communication with the leaders of the Lavoisierian school of chemistry in Paris, which he frequently visited, De Morveau soon became convinced of the unsoundness of the old phlogistic doctrine, his reasons for renouncing which are stated in the volume of the *Encyclopédie Méthodique*, p. 625 *sqq.* With Lavoisier, Laplace, Monge, Berthollet, and Fourcroy, he in 1788 produced a French translation of Kirwan's *Essay on Phlogiston*, with annotations effectually disposing of the author's arguments against the new chemistry. The first manufactory of carbonate of soda in France was established by De Morveau in 1783. In 1791 he represented the department of Côte d'Or in the Legislative Assembly, and next year in the National Convention, of which he was re-elected a member in 1795. Having already become famous for aeronautical experiments at Dijon in 1783–84, he was appointed in 1794 to superintend the construction of balloons for military purposes (see AERONAUTICS, vol. i. p. 199). About the same time he rendered important service to his country by perfecting the processes for the manufacture of gunpowder and saltpetre. In 1796 De Morveau was made a member of the Institute. He retired from political life in 1797, and in 1798 became provisional director of the Polytechnic School, in the foundation of which he had been actively concerned. He held during 1800–14 the appointment of master of the mint, received in 1803 the cross of the legion of honour, and was made in 1805 an officer of the same order, and in 1811 a baron of the French empire. He died January 2, 1816.

Besides the above mentioned and other works, and numerous scientific papers in the *Collection académique de Dijon*, the *Journ. de Physique*, *Journ. de l'Ecole Polytechnique*, *Mém. de l'Institut*, *Journ. des Sçavans*, *Bull. des Sci. de la Soc. Philomatique*, and *Ann. de Chimie*, to which last he was one of the principal contributors, De Morveau wrote—*Mémoire sur l'éducation publique*, 1762; a satirical poem entitled *Le Rat Iconoclaste, ou le Jésuite croqué*, 1763; *Discours publics et Éloges*, 1775–82; *Plaidoyers sur plusieurs questions de droit*, 1785; *Traité des moyens de désinfecter l'air*, 1801, &c.; *Rapport fait à l'Institut sur la restauration du tableau de Raphael connu sous le nom de la Vierge de Foligno* (with Vincent, Tannay, and Berthollet), 1802; *Mém. sur les mortiers*, &c., 1805; various governmental reports; and translations, with notes, of treatises by Bergman, Scheele, and Black.

See Berthollet, "Discours," *Inst. R. de France, Funérailles*, &c. 1816; A. B. Granville, *An Account of the Life and Writings of Baron Guyton de Morveau, F.R.S.*, 1817; T. Thomson, *Hist. of Chemistry*, ii. 1831; *Biog. Univ. et Portative des Contemporains*, ii. p. 761, 1834; and Cuvier, [illegible] pp. [illegible], 466. (F. H. B.)

GUZERAT or GUJARÁT, the name given to the northern seaboard of the Bombay Presidency, extending from 20° to 24° 45′ N. lat., and from 69° to 74° 20′ E. long. It is to the northern part of the presidency what the Konkan is to the south, and is bounded on the N. by Rajputana, on the E. by the spurs of the Vindhya and Satpura ranges, on the S. by the Konkan, and on the W. by the sea. On the mainland it comprises the British districts of Surat, Broach, Kaira, Panch Mahals, and Ahmedabad, with a total area of 10,082 square miles and a population (1872) of 2,810,522; together with the great but scattered territories of the Gaikwar of Baroda, and the other native states of the Mahi Kanta and Rewa Kanta agencies, Palanpur, Radhanpur, Balasinor, Cambay, Dang, Chorasi, Baroda, Pent, Dharampur, Bansda, Sachin, Wasravi, &c. The term Guzerat is sometimes employed to include the peninsula of Kathiawar, with its 188 petty states. The total area, inclusive of the peninsula of Kathiawar, is 41,536 square miles. For an account of the history, geography, &c., of Guzerat, see the articles on the various states and districts. Guzerat gives its name to the vernacular of northern Bombay, viz., Gujaráthi, one of the three great languages of that presidency.

GUZMICS, IZIDOR (1786–1839), Hungarian theologian and scholar, was born 7th April 1786 at Vámos-Család, in the county of Sopron. His early education was conducted at Kőszeg (Güns), Szombathely (Steinamanger), and Sopron (Oedenburg), in the last-mentioned town he was instructed in the art of poetry by Paul Horváth. On the 25th October 1805 he entered the Benedictine order, but left it on the 30th August of the following year. However almost immediately repenting this step, he again assumed the monastic garb on the 11th November 1806. At the monastery of Pannonhalma he applied himself to the study of Greek under Farkas Rath. In 1808 we find him at Győr (Raab), in the middle school of which town he was teaching during the two following years. In 1811 he was again at Pannonhegy, whence in 1812 he was sent to Pesth to study theology. Here he became acquainted with the works of the best German and Hungarian authors, and also took part in the editorship of the *Nemzeti* (National) *Plutarchus*, and in the translation of Hübner's *Lexicon*. After a four years' stay at Pesth, he obtained the degree of doctor of divinity, and returned to Pannonhegy, where he devoted himself to dogmatic theology and literature. So great was his activity that it is said that there was hardly an Hungarian periodical to which Guzmics was not a contributor. The most important of his theological works are *A kath. anyaszentegyház hitbeli tanitása* (The doctrinal teaching of the Holy Catholic Church), and *A vallásbeli egyesülésről* (On Religious Unity among Christians), both published at Pesth in 1822; also a Latin treatise entitled *Theologia Christiana fundamentalis et theologia revelata* (Győr, 1828-29, 4 vols.). Of the other literary labours of Guzmics the most meritorious is a translation of Theocritus in hexameters published in 1824. His versions of the *Œdipus* of Sophocles and of the *Iphigenia* of Euripides were rewarded by the Hungarian Academy, of which in 1838 he was elected honorary member. From 1832 to the date of his death he was editor of the *Egyházi Tár* (Ecclesiastical Treasury). In 1832 he was appointed abbot of the wealthy Benedictine house at Bakonybél, a village in the county of Veszprém. While there he built an asylum for 150 children, and founded a school of harmony and singing. He died at Bakonybél on the 1st September 1839.

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[1] [illegible]

GWALIOR, a native state in political relationship with the Central India Agency and the Government of India. The state consists of several detached districts, the principal of which is bounded on the N.E. by the Chambal river, dividing it from the British districts of Agra and Etawah; on the E. by Bundelkhand and Ságar (Saugor) districts; on the S. by the states of Bhopál and Dhar; on the W. by those of Rajgarh, Jhálawar, and Kotah; and on the N.W. by the Chambal, separating it from Karauli (Kerowlee), and Dholpur in Rajputana. The extreme points of the Gwalior territory are in 23° 21′ and 26° 52′ N. lat., 76° 31′ and 79° 21′ E. long. The area, including part of the ancient province of Agra and most of Malwa, is 33,119 square miles. The extreme north-eastern part is generally level, bare, and of no great fertility. A little farther south the surface rises into hills. The country is dotted over with small hills, which start abruptly out of the level plain. On one of these stands the fortress of Gwalior. The geological formation of these rocky eminences is a very fine-grained sandstone, yielding an excellent building stone. The middle tract is a plateau, having probably an average elevation of about 1500 feet. The Mandu range running east and west forms the southern boundary of the plateau, sloping gently northwards towards it, and dipping precipitously southwards towards the Narbada (Nerbudda). The state is watered by numerous rivers. The Nerbudda, flowing west, forms the boundary of the most southern part of the state. The greater part of the drainage is discharged into the Chambal, which forms the north-western and northern and eastern boundary. The Sind, with its tributaries the Kuwari, Asar, Sankh, and other smaller streams, flows through the state. The chief products are opium, known as Malwa opium, wheat, gram, pulses of various kinds, *joár*, *bájra*, *mug*, maize, rice, linseed and other oil-seeds, garlic, tumeric, ginger, sugar-cane, indigo, *al* yielding a fine red dye, tobacco, and cotton. Many species of wild beasts and birds are found throughout the state. The rivers abound in fish, especially of the carp kind.

Burhanpur is the site of a considerable manufacture of fine cottons, silks, and rich brocades. Iron ore is raised and smelted in many places. The principal imports are British woollens, cottons, silks, cutlery, cashmere shawls, pearls from the Persian Gulf, Ceylon diamonds, and agates from Bundelkhand, gold, silver, mercury, copper, lead, and zinc. The chief exports are opium, cotton, tobacco, dyes, and iron. The Indore and Ajmere narrow-gauge railway, now (1879) in course of construction, will pass through the west of Gwalior state, while a railway on the broad gauge, to connect Gwalior town with Agra, is approaching completion.

During the hot and dry seasons the climate is not unhealthy, but during the rainy season fevers prevail, especially in the north. The range of the thermometer is unusually small, except during the sultry season, when it sometimes rises to nearly 100° during the day. The average rainfall during the rainy season is 50 inches.

The population of the north-eastern part of this territory is of many elements, comprising, besides Marhattás (the ruling race), Bundelas, Jats, and Rájputs, with some less distinctly defined divisions of Hindus and Mahometans. There is perhaps no part of India where the tribes of Brahmans are so various and their number so great as in the southern and south-western parts. The Mahometan population is estimated at about a twentieth of the whole. Including the cessions to Sindhia under the treaty of 1860, the territories of the Gwalior state were in 1875 estimated to contain a population of about 2,500,000 souls. The total revenue in 1875 was £1,200,000. Education is afforded by 92 schools attended by 3206 pupils.

The Gwalior family, whose armies and chiefs have played so conspicuous a part in the history of India, and whose representative now rules over a state larger than Scotland and Wales united, and richer than many independent kingdoms, was founded by Ranoji Sindhia, whose father was *patel* (head-man) of a Deccan village. Once in the household of the peshwá, Ranoji's rise was rapid, and he was soon at the head of the bodyguard. After leading many Marhatta raids through Malwa into Hindustan, he was at the time of his death the acknowledged possessor of lands which still form part of the Gwalior state. He was succeeded by his son Mahádaji Sindhia, whose ability as a statesman and a soldier has rarely been surpassed. At his death he was succeeded by his grand-nephew Daulat Ráo Sindhia. The power of Sindhia was at this time most dangerous to the British Government, who now began to take measures to check the power of this chief. Sindhia entered into a league with the rájá of Berar to defeat their aim, but their allied armies were defeated in 1803 at Assaye by a British force commanded by General Sir Arthur Wellesley, subsequently duke of Wellington. By the end of the same year, the Marhattas were completely overthrown, and Sindhia was compelled to sue for peace and to sign a treaty by which he resigned his conquered territories. Eventually, by a treaty concluded in 1805, Gwalior and Gohad were ceded to Sindhia. Daulat Ráo died at Gwalior in 1827 without an heir. On his deathbed, he left the state and succession in the hands of the British Government. The succession of a boy of the Sindhia family, Mugat Ráo, to whom it was thought the wishes of Daulat Ráo turned, was admitted by the British Government. The young mahárája was subsequently married to the granddaughter of Daulat Ráo, and took the name of Janakji Sindhia. In 1843 he died without issue. His widow, with the concurrence of the chief nobles, adopted Bajirát Ráo, a lad eight years of age. The British Government recognized the adoption, and Bajirát Ráo, under the name of Baji Ráo Sindhia, succeeded, and is the present ruler (1879). Early in the regency disturbances took place, and the advance of British troops on Gwalior became necessary to restore order. Two battles, Mahárajpur and Panniar, were fought on the same day—the 29th December 1843—between the British forces and the mutinous army. They both resulted in the total defeat of the Gwalior troops. No event of historical importance has taken place since, except the revolt between the Gwalior contingent and Sindhia's army in 1857. The mahárája's conduct throughout has been conspicuous for its loyalty. In recognition of his services, the Government conferred upon him the right of adoption, together with lands yielding a revenue of £30,000.

GWALIOR, the capital of Gwalior state, and fortress residence of the Mahárájá Sindhia, is situated in 26° 13′ N. lat. and 78° 12′ E. long., 65 miles S. from Agra, and 277 N.W. of Allahábád. Gwalior city has a threefold interest—first, as a very ancient seat of Jain worship;

secondly, for its example of palace architecture of the best Hindu period (1486–1516); and thirdly, as the fortress capital of one of the greatest native chiefs of India.

Jain Remains.—There are several remarkable Hindu temples in Gwalior. One, known as the Sas Bahu, was erected to the Jain [illegible] is beautifully [illegible], and is now [illegible] to worship by the Vaishnava and Saiva sects. It was finished in 1093 A.D., and, though never completed, still forms a most picturesque fragment. An older Jain temple has been used as a mosque. Another temple in the fortress of Gwalior is called the *Teli-ka-Mandir*, or "Oilman's Temple." The building was originally dedicated to Vishnu, but afterwards converted to the worship of Siva. The most striking part of the Jain remains at Gwalior is a series of caves or rock-hewn sculptures, excavated in the rock on all sides, and numbering nearly a hundred, great and small. Most of them are mere niches to contain statues, though some are cells that may have been originally intended for residences. One curious fact regarding them is that, according to inscriptions, they were all excavated within the short period of about thirty-three years, between 1441 and 1474. Some of the figures are of colossal size; one, for instance, is 57 feet high, which is taller than any other in the north of India.

Hindu Palace Architecture.—The palace built by Man Singh (1486–1516) forms the most interesting example of early Hindu work of its class in India. Another palace of even greater extent was added to this one in 1516; both Jahangir and Shah Jahan added palaces to these two,—the whole making a group of edifices unequalled for picturesqueness and interest by anything of their class in Central India. Among the apartments in the palace was the celebrated chamber, named the *Baradari*, supported on 12 columns, and 45 feet square, with a stone roof, forming one of the most beautiful palace-halls in the world. It was, besides, singularly interesting from the expedients to which the Hindu architect was forced to resort to imitate the vaults of the Moslems. Of the buildings, however, which so excited the admiration of the emperor Baber, [illegible].

Rock Fortress.—The fort of Gwalior stands on an isolated rock. The face of the rock is perpendicular, and where the rock is naturally less precipitous it has been scarped. Its greatest length from north-east to south-west is a mile and a half, and the greatest breadth 300 yards. The rock attains its maximum height of 342 feet at the northern end. A rampart, accessible by a steep road, and farther up by huge steps cut out of the rock, surrounds the fort. The citadel stands at the north-eastern corner of the enclosure, and presents a very picturesque appearance. The old town of Gwalior, which is of considerable size, but irregularly built, and extremely dirty, lies at the eastern base of the rock. It contains the tomb of Muhammad Ghaus, which was erected during the early part of Akbar's reign. The fort of Gwalior, according to Wilford, was built in 773 A.D. by Surya Sen, the raja of the neighbouring country. In 1196 Gwalior was captured by Mahmud Ghori; it then passed into the hands of several chiefs until in 1556 Akbar gained possession of it, and made it a state prison for captives of rank. On the dismemberment of the Delhi empire, Gwalior was seized by the Jat rana of Gohad. Subsequently it was garrisoned by Sindhia, from whom it was wrested in 1780 by the forces of the East India Company. A contest took place about the successor of Jankoji, governor of Gwalior, the adopted son of Daulat Rao Sindhia, who died in 1843 without an heir. A revolution was impending, and the British Government had to interfere. Troops crossed the Chambal, and unexpectedly found the insurgent forces drawn up at Maharajpur, a few miles distant from the fortress. A battle ensued on the 29th December 1843, resulting in the complete overthrow of the Mahrattas. The British contingent stationed in the town was increased, and affairs were placed on a peaceful footing.

GWILT, Joseph (1784–1863), author of the *Encyclopædia of Architecture*, was the younger son of George Gwilt, architect surveyor to the county of Surrey, and was born at Southwark, January 11, 1784. He was educated at St Paul's school, and after a short course of instruction in his father's office was in 1801 admitted a student of the Royal Academy, where in the same year he gained the silver medal for his drawing of the tower and steeple of St Dunstan in the East. In 1811 he published a *Treatise on the Equilibrium of Arches*, and in 1815 he was elected a fellow of the Society of Antiquaries of London. After a visit to Italy in 1816, he published in 1818 *Notitia Architectonica Italiana, or Concise Notices of the Buildings and Architects of Italy*. In 1825 he published, with notes and valuable additions, an edition of Sir William Chambers's *Treatise on Civil Architecture*, and among his principal other contributions to the literature of his profession are a translation of the *Architecture of Vitruvius* (1826), a *Treatise on the Rudiments of Architecture, Practical and Theoretical* (1826), and his valuable *Encyclopædia of Architecture* (1842), which has passed through a great many editions, and was published with additions by Wyatt Papworth in 1867. In recognition of Gwilt's advocacy of the importance to architects of a knowledge of mathematics, he was in 1833 elected a member of the Royal Astronomical Society. In addition to the sciences bearing on his profession he took a special interest in philology and music, and is the author of *Rudiments of the Anglo-Saxon Tongue* (1829), and of the article "Music" in the *Encyclopædia Metropolitana*. His works as a practical architect are not of much importance, the principal being Markree Castle near Sligo in Ireland, and St Thomas's Church at Charlton in Kent. He succeeded his father as a surveyor of sewers for the county of Surrey, and held that office till 1848. He died September 14, 1863.

GWYNIAD is the name given to a fish of the genus *Coregonus* (*C. clupeoides*), inhabiting the large lakes of North Wales and the north of England. At Ullswater it is known by the name of "schelly," at Loch Lomond by that of "powen." It is tolerably abundant in Lake Bala, keeping to the deepest portion of the lake for the greater part of the year, but appearing in shoals near the shores at certain seasons. It is well flavoured, like all the species of *Coregonus*, but scarcely attains to the weight of a pound. The name gwyniad is a Welsh word, and signifies "shining"; and it is singular that a similar fish in British Columbia, also belonging to the family of Salmonoids, is called by the natives "quinnat," from the silvery lustre of its scales, the word having in their language the same meaning as the Welsh "gwyniad."

GYARMAT, a Magyar term signifying *colony*, and applied to several places in Hungary. Of these the following two towns have the largest number of inhabitants.

Balassa Gyarmat, capital of the Cis-Danubian county of Neograd, is situated on the Ipoly (Eipel), about 40 miles N.N.E. of Budapest, 48° 6′ N. lat., 19° 16′ E. long. It is the seat of a royal court of law and of the assizes, and has Roman Catholic and Lutheran churches, also a Jews' synagogue, a fine county hall, a house of correction, a religious institute for girls, and tax, post, and telegraph offices. In 1870 the population was 6435, Magyars and Slavs by nationality.

Füzes Gyarmat, a market-town in the Trans-Tibiscan county of Bekes, is somewhat unfavourably situated in the extensive marshy tract of country known as the Sárret, 47° 5′ N. lat., 21° 13′ E. long. The town has few noteworthy buildings, with the exception of the Calvinist church and some elegant private residences. The chief products of the rich, dark, alluvial soil of the neighbourhood are wheat, tobacco, hay, grapes, and other fruits. Horned cattle, pigs, and sheep (both merino and Hungarian) are bred on the wide-spreading pasture lands, and numerous water-fowl and wading birds, especially herons, inhabit the reed-covered marshes. The water used for drinking purposes is, however, frequently muddy and warm, and unpleasant to the taste. In 1870 the population was 5735, of whom the great majority were Magyars.

GYARMATHA, a market town in the county of Temes, Hungary, situated in a level but productive agricultural district to the north-east of Temesvár, 45° 50′ N. lat., 21° 17′ E. long. For some distance round the town the cultivation of wheat, barley, oats, maize, and the vine is largely carried on. Horse-breeding is another source of employment to many of the inhabitants. Gyarmatha has few buildings of special interest with the exception of a Roman Catholic church and the ruins of a fort. In 1870 the population amounted to 5125, consisting of Germans, Magyars, and Wallachs.

GYERGYÓ-SZENT MIKLÓS, a market-town of Hungary, in the Transylvanian county of Csik, is situated in a mountainous but well-wooded district, 96 miles E. of Klausenburg, and about 25 W. of the Moldavian frontier, 46° 42′ N. lat., 25° 33′ E. long. Among the more important buildings are a Roman and a Greek Catholic church, a fine public school, a royal court of justice, and the post and telegraph offices. There are also cattle and timber trading houses, an office of woods, a financial commission agency, and a police station. Cattle and sheep are reared in great numbers in the surrounding country, which is noted also for its cheeses, and for the preparation of gin. The number of inhabitants at the commencement of 1870 was 5645, consisting of Magyars, Wallachs, and Magyarized Armenians, the descendants of a band of wanderers who settled here in 1668.

GYGES, founder of the third dynasty, called Mermnad, of Lydian kings, reigned about 687–654 B.C. (*v.* Gelzer in *Rhein. Mus.*, xxx.). The kindred name Gygæa, applied by Homer (*Il.*, ii. 684) to the Mæonian lake, mother of the Mæonian leaders, supports the statement of ancient historians that he belonged to an old Lydian family. In the reign of Candaules, Gyges, perhaps after banishment, attempted during the troubles caused by the Cimmerian invasions into Asia Minor, to gain the royal power. He was aided by foreign, especially Carian, mercenaries, but was strenuously resisted by the native population. At last it was agreed to refer the decision between the old Heraclid dynasty and the new claimant to the national god Heracles; but, to ensure impartiality, they appealed to him under his Greek form of Apollo. The Delphic oracle gave its answer in favour of Gyges, and the presents with which his gratitude enriched the shrine were seen and described by Herodotus. This story points to familiar and friendly intercourse between Lydia and the Greek states; and that the circumstance impressed itself on the Hellenic mind is shown by many romantic tales current about the fortunes of Gyges (Plato, *Rep.*, ii. p. 369; Herod., i. 8). The contemporary poet Archilochus speaks of the riches of Gyges. Under the Heraclid dynasty Ionian settlers had occupied the whole coast of Lydia, and in friendly relation with the country had rapidly prospered. But the warrior king who now began to rule was not content to leave the sea-coast in the undisturbed possession of foreigners. He and his successors maintained almost constant war with the Ionian cities. Gyges captured Magnesia and the lower city of Colophon; but the inroads of the Cimmerians diverted his attention from conquest to the defence of his own capital. At one time he was so hard pressed that he applied to Assyria for help (about 660 B.C.), and paid tribute to Assurbanipal in return for protection against these barbarians. But he afterwards threw off allegiance and assisted Psammetichus, who had revolted in Egypt against the Assyrian rule. It is mentioned in an inscription of Assurbanipal that Gyges was slain in battle by the Cimmerians, and that his son Ardys renewed the tribute.

For a full account of the reign of Gyges, and the ancient authorities for it, see Duncker, *Gesch. d. Alterthums*, vol. ii.

GYLLEMBOURG-EHRENSVÄRD, THOMASINE KRISTINE, BARONESS (1773–1856), the most eminent female writer of Denmark, was born November 9, 1773, at Copenhagen. Her maiden name was Buntzen. Her great beauty early attracted notice, and before she was seventeen she married the famous political writer Peter Andreas Heiberg. To him she bore in the following year a son, afterwards illustrious as the poet and critic Johan Ludvig Heiberg. In 1800 her husband was exiled and she obtained a divorce, marrying in December 1801 the Swedish Baron Ehrensvärd, himself a political fugitive. Her second husband, who presently adopted the name of Gyllembourg, died in 1815. In 1822 she followed her son to Kiel, where he was appointed professor, and in 1825 she returned with him to Copenhagen. In 1827 she first appeared as an author by publishing her romance of *The Polonius Family* in her son's newspaper *The Flying Post*. In 1828 the same journal contained *The Magic Ring*, which was immediately followed by *An Everyday Story*. The success of this anonymous work was so great that the authoress adopted until the end of her career the name of "the Author of *An Everyday Story*." From this time forward she took a foremost place among the writers of her time, but preserved her anonymity with entire success. In 1833–34 she published three volumes of *Old and New Novels*. *New Stories* followed in 1835 and 1836. In 1839 appeared two novels, *Montanus the Younger* and *Ricida*; in 1840, *One in All*; in 1841, *Near and Far*; in 1843, *A Correspondence*; in 1844, *The Cross Ways*; in 1845, *Two Generations*. From 1849 to 1851 the Baroness Ehrensvard-Gyllembourg was engaged in bringing out a library edition of her collected works in twelve volumes. On the 2d of July 1856 she died in her son's house at Copenhagen. Not until then did the secret of her authorship transpire; for throughout her life she had preserved the closest reticence on the subject even with her nearest friends. The style of Madame Ehrensvärd Gyllembourg is clear and sparkling; for English readers no closer analogy can be found than between her and Mrs Gaskell, and *Cranford* might well have been written by the witty Danish authoress. She introduced into the literature of her country a novel vein of realism and domestic humour, and, although she has had many imitators, she is still without a rival.

GYMNASIUM was the name applied by the Greeks to a building designed for the practice of physical exercises. From the earliest times we hear of athletic sports in honour of heroes and gods. Sometimes they are celebrated among the funeral rites of a deceased chief, sometimes they form part of a periodic festival. At first competitors exercised stript of their outer garments (γυμνοί); hence arose the name gymnasium. Afterwards the habit of exercising naked became universal. In the continuance of their history the Greeks grew more attached to such sports; their free active life, spent to a great extent in the open air, fostered the liking almost into a passion. The victor in any athletic contest, though he gained no money prize, was rewarded with the honour and respect of his fellow-citizens; and a victory in the great religious festivals was counted an honour for the whole state. In these circumstances the training of competitors for the greater games became a public concern; special buildings and officials were provided for the purpose by the state. But, as gymnastics became more and more an institution of social life, the gymnasia were applied to other uses even more important. The most interesting points are the connexion with education on the one hand, with medicine on the other. Due training of the body and maintenance of the health and strength of children were the chief part of earlier education. Except the time devoted to letters and music, the education of boys was conducted in the gymnasia, where their moral training was as carefully attended to by special officers as their physical exercises. As they grew older conversation and social intercourse took the place of the more systematic discipline. Philosophers and sophists assembled to talk and to lecture in the gymnasia, which became places of general resort for the purpose of all less systematic intellectual pursuits, as well as for physical exercises. Plato, when treating of education, devotes much consideration to gymnastics (see especially *Rep.* iii. and various parts of *Leges*). Gymnastic exercises proper were designed, not merely as in Sparta, to foster the taste for war and the activity and strength needed for using weapons, but also to produce graceful carriage and healthy tone of the body. According to Plato, the sophist Prodicus first pointed out the connexion between gymnastics and health. Having found such exercises beneficial to his own weak health, he formulated a method which was adopted generally, and which Hippocrates improved on. Galen lays the greatest stress on the proper use of gymnastics, and throughout ancient medical writers we find that special exercises are prescribed as the cure for special diseases. The regulation of the gymnasium at Athens is attributed by Pausanias (i. 39, 3) to Theseus; Solon made several laws on the subject; but, according to Galen, it was reduced to a system in the time of Clisthenes. Ten gymnasiarchs, one from each tribe, were appointed annually. These performed in rotation the duties of their office, which were to maintain and pay the persons that were training for public contests, to conduct the games at the great Athenian festivals, to exercise general supervision over the morals of the youths (they could, for example, remove any philosopher whose teaching they thought injurious), and to adorn and keep up the gymnasium. This office was one of the ordinary λειτουργίαι, and great expense was entailed on the holders. Under them were ten sophronistæ, with a salary of a drachma per day. Their duty was to watch the conduct of the youths at all times, and especially to be present at all their games. The practical teaching and selecting of the suitable exercises for each youth were in the hands of the pædotribæ and gymnastæ. The latter also superintended the effect on the constitution of the pupils, and prescribed for them when they were unwell. Aliptæ oiled and rubbed dust on the bodies of the youths, acted as surgeons, and administered the drugs prescribed.

The gymnasia built to suit these various purposes were large buildings which contained, not merely places for each kind of exercise, but also a stadium, baths, covered porticos for practice in bad weather, and outer porticos where the philosophers and men of letters read public lectures and held disputations. In Athens there were three great public gymnasia,—Academy, Lyceum, and Cynosarges,—and every Greek city of consequence seems to have possessed one. Remains of them exist at Pergamus, Ephesus, Alexandria in Troas, &c., from which, and from the accounts of Vitruvius (v. 11), it would appear that all were constructed on much the same plan. The details will be found most clearly given in Rich's *Dictionary of Greek and Roman Antiquities*.

Much of the healthy buoyant elasticity of mind for which the Greek race is remarkable, as well as the active and beautiful physical development which no other race has ever equalled, is due to the love of gymnastics. The plastic art also owes its perfection in the treatment of the human form to the constant opportunity which artists had of observing the nude body in various attitudes. But abuses were liable to occur. The careful provisions made by Solon and later legislators to keep up the moral character of the gymnasia did not prevent them from fostering the vice which appears so much in Greek life. Though introduced in Rome, where Nero built the first public gymnasium, gymnastics did not suit Italian habits, and never became popular.

Gymnasium, in its modern use, generally signifies a school for gymnastic exercises, but it is sometimes used also to denote a higher school intended to give immediate preparation for the universities. The latter application of the term is specially prevalent in Germany.

GYMNASTICS, in the general acceptation of the term, denotes every exercise which tends to develop and invigorate the bodily powers, such as walking, running, riding, fencing, rowing, skating, dancing, and many others. In another sense gymnastics include those manly and healthful games which have been encouraged by all high-minded nations as calculated to improve the physical strength and keep alive the martial spirit of their people. In a more limited sense, the term has been employed to denote the modern system of bodily exercises. Physical strength was the veritable god of antiquity, and we therefore find the elements of a system of gymnastics in most nations from the earliest times. In the infancy of society, when the individual was valued according to his personal strength and prowess, it was only natural that the utmost care should be bestowed on those arts which most surely led to distinction. All education then consisted chiefly in the practice of such exercises as were best calculated to develop muscular strength and make the tenure of life as secure as possible. The first gymnastic exercises, both of those nations that reached the highest civilization and of barbarians, were the same, viz., running, leaping, swimming, and the throwing of missiles. These exercises were at a very remote period systematized and reduced to a science by the Greeks (see GYMNASIUM). Among the Romans of the republic, the games in the Campus Martius, the duties of camp life, and the preliminary military exercises to which the soldier devoted himself, besides the enforced marches which were imposed upon him, and the part he took in the erection of public edifices, served to take the place of the gymnastic exercises required by the Greeks. In the Middle Ages, chivalry with its jousts, its feats of horsemanship, and encouragement to the arts of fencing, single stick, &c., took the place of the ancient gymnastic exercises. The invention of gunpowder, which modified the system of warfare, and the increasing value of individual life,—in a word, the progress of civilization—closed the career of the champions and votaries of physical strength, and gymnastic exercises in the course of time were neglected. Rousseau, in his *Émile*, was the first to call attention to the injurious consequences of such indifference; and it is in a large measure to his eloquent appeals that gymnastics have in recent times been held to constitute an integral part of school education, although it cannot be said that in every country the practical application of his views has met with much success. The good effects of the innovation which he advocated have nowhere been more strikingly exemplified than in Germany. When many parts of that country groaned under the iron yoke of Napoleon, Jahn and his followers, encouraged by the Prussian minister Stein, were establishing *Turnplätze* or gymnastic schools, from which issued the well-trained youth who in due time drove the French invaders across the Rhine.

Of late years public attention has been drawn to the increasing deterioration in the physique of the population of England, and several proposals have been put forward to check an evil which [illegible]. These proposals may be arranged under the banners of two rival camps. The one maintains the views put forward in a work just published on exercise and training, in the following words (*Exercise and Training*, 1878):—

> "In our opinion the natural [illegible] of cricket, football, [illegible] &c., form [illegible] at [illegible] sufficient for a proper [illegible] of the body, [illegible] with the [illegible] of [illegible] for the [illegible] of special [illegible], &c., [illegible] a system of gymnastics [illegible]. [illegible] at our schools, [illegible] in our large towns, [illegible] and daily sports are [illegible] of [illegible] that the national games [illegible] by the English [illegible] greatly superior to any system of artificial exercise ever devised."

On the other side we have the advocates of physical education by means of regular gymnastic exercises superintended by trained and educated teachers, the whole placed under competent medical supervision. Among the staunch supporters of the latter view may be named Dr Roth, and Mrs Westlake, a member of the London School Board. The following considerations appear to be of great weight as supporting the views put forward by the advocates of physical education. While the national games may seem to some sufficient for the physical development of the wealthy youth and manhood of a country, it must not be forgotten that there is a vast and rapidly increasing portion of the population, especially in large cities, to whom the "national games" are quite unknown diversions, and that it is among this class that the most marked deterioration in physical development is only too apparent. The children of this class dwell cooped up in narrow, ill-lighted, and worse-ventilated courts, from which they are often brought to undergo a certain amount of mental training, in many cases perhaps too severe to be sustained by their debilitated and enfeebled bodies. Whilst so much is being done for the mental culture of the rising generation, their physical culture is left very much to inclination or chance. But there is another source of danger put forward by those who advocate the sufficiency of the national games, viz., "the neglect of any classification of games at school, and allowing the weak and strong to engage in them indiscriminately, to the detriment of the physical wellbeing of the more delicate;" and they proceed to show the injury that may be done by the present system of competitive outdoor sports unregulated by judicious restraint. Important information on this subject will be found in two papers published in the *St George's Hospital Reports* for 1874–76, by Mr C. Roberts, F.R.C.S., and by Mr Street, and another in the *Tenth Annual Report of the State Board of Health of Massachusetts*, by Professor Edward Hitchcock. Mr Roberts points out that between the ages of fifteen and seventeen the greatest amount of physical development takes place, and that if at this period a boy is subjected to a great strain upon his strength his future growth may be interfered with, or the foundation laid of constitutional disease. Prof. Hitchcock's paper embodies the experience of seventeen years of careful observation. Acting upon the well-grounded opinion that neither mental serenity nor mental development can exist with an unhealthy animal organization, and admonished by "the sad deaths of two promising young men, and the breaking down in health of others just at the end of their college courses," the authorities of Amherst College were impelled to demand that the college officials should give a proper attention to physical health as well as to the culture of those powers for which departments were ordinarily created and endowments made. In 1859 a department of physical education and hygiene was created, concerning which we read in the catalogue of 1861–62 that—

> "Its design is to secure healthful daily exercise and recreation to all students, to instruct them in the use of the vocal organs, movements of the body, and manners, as connected with oratory; and to teach them, both theoretically and practically, the laws of health. This daily physical training is a part of the regular college course. The professor is an educated physician, and has not only a general oversight of the health of the college, but students have the privilege of consulting him without charge. While the gymnasium will afford opportunities for the highest physical training, the required exercises will be such as can be performed without undue effort or risk of injury."

Each class, at a stated hour on four days of the week appears at the gymnasium, and all perform their part in systematic and methodical exercises timed to music. The statistics of this department show some interesting facts in reference to the duration of sickness among students. While the average amount of time lost on account of sickness by each labourer in Europe is found to be 19 or 20 days each year, the returns of Amherst College sick-list for term time give 2·64 days as an annual average of time lost to every student and 11·36 days to each sick student for 17 years. A decrease in the amount of sickness during the course is also an important feature in the health of the college.

From replies to questions put by Dr Roth to the heads of the educational bodies, and also from the recorded personal experience of his son, Mr B. Roth, F.R.C.S., it appears that considerable attention is now being paid to the best methods for improving the physical education of the people in nearly all the Continental states. The greatest activity is perhaps shown by Sweden, Germany, France, Belgium, and Italy; and even in Russia the question is attracting much public attention, Dr Berglind having been ordered to write a special book on the subject. In Hungary also the Government has made physical education an obligatory part of the school curriculum. In Prussia gymnastic instruction was formally recognized by a cabinet order of June 1842, and by a royal order of 1862 a guide-book of gymnastic instruction was introduced into the primary schools and into the training colleges for teachers. In Sweden this subject appears to have earlier attracted attention, for in 1813 the Government, under the direction of P. H. Ling, founded the Royal Central Gymnastic Institute at Stockholm, where teachers of both sexes are gratuitously trained for two years, and receive a diploma after undergoing a theoretical and practical examination. In Belgium, under the united efforts of MM. Delcour and Emile Greyson, considerable progress has been made, although much has still to be done, owing to the opposition raised by the municipality of Brussels to the views put forward by the Government. In the girls' schools the exercises are accompanied by music, after the example set by Colonel Ameros, who about the beginning of this century introduced into France a series of gymnastic exercises adapted to a jingling rhyme and to music. The chanting governed the movements, marked the intervals of repose, and helped to strengthen the organs of the voice and respiration. In France the necessity for the physical education of the people began to attract attention about the year 1845, owing probably to the energy displayed by Jahn in Prussia. M. de Salvandy proposed to introduce the teaching of gymnastics into the Lycées of Paris and Versailles, and a commission was appointed by him, which, however, never presented a report. In 1850, 1851, 1855, and 1856 several attempts were made to enforce compulsory gymnastic training, but the principle was not accepted till 1869, when M. V. Duruy took for his basis of action the labours of the commission presided over by Dr Hillairet. After the fall of the empire, M. Jules Simon addressed the head masters of the colleges and schools in France as follows:—

> "I beg you to assist me in introducing gymnastics into our habits in a profitable and earnest manner. This is not only in the interest of public health; a healthy child is better prepared for study, and especially for the battle of life. Morality gains by this education of the body; much money is not wanted for the purpose; and in case of need, exercises can be performed without a trapeze or dumb-bells. Our medical men will help us to do our task; if the children are once accustomed to, and take pleasure in, these healthy exercises, we may be sure of a prompt amelioration of the race."

In England we find that the first attempt to introduce scientific physical education among the people was made in parliament in 1862 by Lord Elcho. This attempt failed, as also did another made in 1875 by P. A. Taylor, M.P. for Leicester, although supported in an able speech by Mr Butler Johnstone. Lord Sandon, then vice-president of the committee of council on education, told Parliament that "the Government has done all that could be expected of them for physical education by taking steps to substitute military drill for ordinary drill." The substitution, it may be remarked, does not appear to have any advantage over the drill it displaced, as the military authorities declared the ordinary military drill to be insufficient for the requirements of the soldier, and have during the last sixteen years instituted gymnasiums at Aldershott, Gibraltar, Malta, and elsewhere, the teachers in which have, for the most part, passed under the care of Mr Maclaren of Oxford, one of the principal authorities on the subject in England. Without entering into details, it may be admitted that the physical condition of the people, if not actually deteriorating, is not improving, and it is a significant fact that within the last year or two it has been found necessary to lower the standard in the British army, and that Dr Ord, in his report for 1869, states that out of 5567 boys 4410 were rejected as under the standard of width of chest and height. We have already referred to the tendency to rely on the casual outdoor sports for maintaining the physique of the population, and to a great extent to depreciate systematic gymnastic exercises and physical education. That in some quarters, however, this opinion is not entertained is shown from the fact that the London School Board has appointed Miss Löfving of the Stockholm Training College to instruct certain of their teachers so as to fit them for teaching the girls in the schools. It is to be regretted that in the blind asylums so little is done for the physical education of the inmates. An institution in Milan provides for the training of ricketty children by carefully regulated gymnastic exercises; but this institution seems to be the only one of its kind in Europe.

To show that the importance of gymnastics has not been overstated, we may describe the effects produced on twelve non-commissioned officers sent by the military authorities to be trained as teachers for the British army by Mr Maclaren. The men ranged from nineteen to twenty-nine years of age, and in height from 5 feet 5 inches to 6 feet. In Mr Maclaren's own words, "the muscular additions to the arms and shoulders and the expansion of the chest were so great as to have absolutely a ludicrous and embarrassing result, for before the fourth month several of the men could not get into their jackets and tunics without assistance, and when they had got them on they could not get them to meet down the middle by a hand's breadth." In a month more they could not get into them at all, and new clothing had to be procured, pending the arrival of which the men had to go to and from the gymnasium in their greatcoats.

Though there is some diversity of opinion among teachers of [illegible] as to the relative value of the different exercises, some holding that "free exercises" are sufficient, others that [illegible] are necessary, yet all agree that, to ensure [illegible] development of the [illegible] of the body, a course [illegible] nding [illegible] Another form of [illegible] from 6 to 7 [illegible]

[illegible]

[illegible]

clear a barrier at the same time that it gives employment to both the upper and lower limbs. The *leaping pole* is usually made of ash, and varies from 8 to 10 feet in length. Its use may be left to the pleasure of the pupil after he has acquired some dexterity with the leaping rope.

The *horizontal beam* is a round wooden beam so mounted that it may be moved up and down. The exercises on this are chiefly balancing the body in the sitting and erect posture, and when moving along it.

The *vaulting bar* differs from the preceding in being somewhat thicker, so as to be easily grasped by the hand. The appropriate exercises on it have for their object the strengthening of the muscles of the upper extremity and loins. The *vaulting horse* allows of a wider range of exercises, and requires a greater amount of strength and dexterity. The muscles of the upper and lower limbs and trunk are all benefited by its use. The *parallel bars* are used to develop the muscles of the trunk and upper limbs, but chiefly the former. The *vaulting parallel bars* may be used for the same exercises as the preceding. The *trapeze* consists of a horizontal bar suspended by ropes at a height of 4 or 5 feet from the floor. Considerable practice is required to perform the exercises on this machine with dexterity and neatness. The *horizontal bar*, the *bridge ladder*, the plank, the *inclined plane*, the *pyramid wall*, and the [illegible], and several modifications of these that are used, permit of a great variety of exercises.

In "calisthenics" the exercises are more directed to ensure grace and ease in the several movements of the body than muscular development, and are, therefore, closely allied to the "movements and positions" or "free exercises" of the gymnast. Among these exercises dancing takes a prominent part, being at once healthful and graceful.

See Combe's *Education, its Principles and Practice*, edited by Jolly; Maclaren's *Physical Education*; the various works (in French) of Prof. N. Laisné, Capt. Docx, and Dr Le Blond; and numerous pamphlets by Dr Roth. (H. A. H.)

GYMNOTUS. See Eel and Electricity.

GYNÆCOLOGY (from the Greek γυνή, γυναικός, a woman, and λόγος), that branch of medicine which concerns the pathology and treatment of affections peculiar to the female sex. See Medicine.

GYOMA, an old market-town in the Trans-Tibiscan county of Békés, Hungary, is situated on the banks of the Körös main stream, 46° 57′ N. lat., 20° 50′ E. long. It has a fine town-hall, Roman Catholic, Calvinist, and Lutheran churches, a Jews' synagogue, tax, post, and telegraph offices, a brewery, several elegant private residences, and a large station on the Szolnok Arad Railway. The soil of the surrounding country, though in some places clayey, is in others of a rich and productive character, and the inhabitants succeed in raising plentiful crops of wheat, mangcorn, barley, millet, and maize, besides cultivating several kinds of orchard fruit and grapes. The more considerable landholders rear great numbers of sheep, pigs, and horned cattle. An abundant supply of fish and waterfowl is yielded by the Körös, which is here spanned over by a wooden bridge and by the railway. Enormous quantities of firewood are floated down the stream on rafts. The fields are protected from floods by a large dike, whilst a similar service is rendered by the Nagy [illegible], Csergetya, [illegible], and Nemet trenches, which usually become dry during summer. In 1870 the population of Gyoma was 9907, by nationality Magyars. Before 1682 three other communes, viz., [illegible], [illegible], and Nyárszeg, stood on the wide-spreading tract belonging to Gyoma. In that year they were, however, completely destroyed, and now only traces of their former existence remain.

GYÖNGYÖS, the second town in importance of Heves county, Hungary, is situated at the foot of the Mátra, [illegible] west of [illegible], and is connected by a branch line with the [illegible] railway, 47° 47′ N. lat., 19° 56′ E. long. Gyöngyös is the seat of a court of [illegible], and of a board of taxes, and contains three [illegible], a large [illegible] establishment belonging to the [illegible], a gymnasium, manufactures of leather, hats, [illegible], and distilleries. The town carries on a [illegible] in the [illegible] and [illegible]) [illegible] wines, which are produced in great quantities in the neighbourhood. In 1870 the population was 15,830, mostly Magyars by nationality. The Hungarians defeated the Austrians at Gyongyos on the 3d April 1849.

GYONGYOSI, ISTVAN or STEPHEN (1620-1704), one of the most talented Hungarian poets of the 17th century, was born of poor but noble parents in 1620. The county of his birth is variously given as Gomor or Bons, the date as August 5 or November 3. His abilities early attracted the notice of Count Ferencz Wesselényi, who in 1640 appointed him to a post of confidence in Fulek castle. Here he remained till 1653, when he married, and commenced his public career as an assessor of the judicial board. In 1681 he was elected as a representative of his county at the diet held at Soprony (Oedenburg). From 1686 to 1693, and again from 1700 to his death in 1704, he was deputy lord-lieutenant of the county of Gomor. Of his literary works the most famous is the epic poem *Murányi Vénus* (Caschau, 1664), which hymns the praises of his benefactor's wife Maria Széesi, the heroine of Murany. Among his later productions the best known are —*Rózsa Koszorú*, or Rose-Wreath (1690), *Kemény János* (1693), *Cupido* (1695), *Palinodia* (1695), and *Chariklia* (1700). His poems are chiefly remarkable for energy, feeling, and popular sentiment. The earliest edition of his collected poetical works is by Dugonics (Pressburg and Pesth, 1796); the best modern selection is that of Toldy, entitled *Gyöngyösi István válogatott poétai munkái* (Select poetical works of Stephen Gyongyosi), 2 vols., 1864-65.

GYPSUM, the hydrated sulphate of lime, $CaSO_4.2H_2O$, is a mineral substance occurring in various rock formations, especially in Tertiary deposits, in very considerable abundance and under varying conditions. In its transparent crystalline state it is known as selenite; when it presents a finely fibrous opalescent appearance, it is termed satin spar; and the name alabaster is reserved for the pure milky white massive varieties. Gypsum is very generally disseminated, the most famous locality for the finer qualities worked into alabaster vases and figures being Castelino, about 30 miles from Leghorn; while Montmartre, Argenteuil, and other places in the environs of Paris, and in the neighbourhood of Derby in England, furnish inexhaustible supplies chiefly for the preparation of plaster of Paris and for agricultural use, &c. It is also found in large quantities in Nova Scotia, New York, Virginia, and Michigan. The application of gypsum as a manure is referred to under AGRICULTURE, vol. i. p. 351, and its employment for ornamental purposes is described under ALABASTER, vol. i. p. 439. The preparation of plaster of Paris, so called from the fact that the industry chiefly centres in several Parisian suburbs, is the principal primary object of the quarrying or mining of gypsum. By the application of heat gypsum begins, at a temperature of about 175° Fahr., to part with its combined water. An increase of temperature causes the desiccation to proceed with great rapidity, and for manufacturing purposes the best results are obtained at from 230° to 250°. For making plaster of Paris, gypsum is burnt in kilns at about the latter temperatures, and subsequently it is powdered and ground to a fine uniform flour. So prepared it possesses the valuable property of recombining with water when mixed with it, and setting, from a thin paste, into a solid mass, the phenomenon being accompanied with some expansion and the evolution of heat. It is to this property of recombining with water that the value of plaster of Paris is principally due. When, however, gypsum is burnt at a temperature of 400° and upwards, the sulphate rehydrates only with great difficulty, and at still higher temperatures it loses all power of absorbing water, and in this respect it then resembles anhydrite, the natural water-free sulphate of lime. Plaster of Paris is largely used for obtaining copies of statuary figures, coins, medals, sculptures, and carvings, and also for taking casts from natural objects. It is also employed as the material for moulds for electro-deposits, and for the manufacture of embossed and pressed pottery ware. Still more extensively is it consumed in the finishing of internal plaster work in houses, and for making cornice mouldings and other architectural enrichments in positions sheltered from the weather. Plaster of Paris work is, like gypsum, soluble in water at a temperature of 32° to the extent of ·205 per cent., rising to a maximum solubility of ·254 at 95° Fahr. Plaster casts made simply with water are soft, porous, and easily injured, and various plans have been devised for producing a harder and more compact body with plaster. Keene's cement, which may be taken as a type of the hardened plasters, is made by treating the burnt gypsum with a solution of 1 part of alum to 12 of water at a temperature of about 95°. After about 3 hours the plaster is removed, dried, and rebaked in the furnace, and then thoroughly ground and powdered. Thus prepared, the plaster needs comparatively little water to slake it, and it sets much more slowly than the ordinary plaster, while the comparative tenacity of the two varieties is as 1·5 to 1. Parian cement is plaster hardened with water containing 10 per cent. of borax; and stucco is plaster rendered tenacious by being prepared with a strong solution of glue. When water containing lime or a solution of gum-arabic is used to slake burnt gypsum, a hard plaster is also obtained, which by smoothing, colouring, and subsequent polishing with oil assumes a marble-like surface. A fair imitation of meerschaum is also made in hardened plaster by polishing, tinting the surface with a solution of gamboge and dragon's-blood, and treating it with either melted paraffin or stearic acid. It is understood that the cheaper "meerschaum" pipes and cigar-holders are thus prepared.

GYROSCOPE, GYROSTAT, are names given to instruments which are used to demonstrate certain properties of rigid bodies, when made to rotate rapidly about the axis round which they are kinetically symmetrical.

In some of its forms the gyroscope has been known for a very long time, and is, in all probability, of French or German invention. Almost the first instrument of the kind that we hear of, and of which the present gyroscope is merely a modification, is that of Bohnenberger, which was constructed as early as 1810, and is described in Gilbert's *Annalen* for 1818 (lx. p. 60). It consisted of a heavy spheroid which could rotate inside a circular ring round its shorter axis,—the axis running on pivots situated at opposite ends of the ring's diameter. This ring, with its contained spheroid, was similarly made movable inside a second ring, and round an axis at right angles to the axis of the spheroid. In the same way this second ring, with its contents, could rotate inside a third ring, and round an axis at right angles to each of the others. From this it will be seen that the spheroid had all degrees of free rotation,—one point only within it being fixed, namely, the intersection of the three axes.

Under the title of precession instruments, various pieces of apparatus, involving the gyroscope principle, have been in use for a number of years for illustrating the precession of the equinoxes, and the parallelism of the earth's axis as it revolves round the sun. An instrument of this kind was given by Arago to Professor Playfair, which must have been in existence since 1816-17. Mention is made of a similar instrument as being brought from Italy to Mr Babbage in 1827. At the close of that year a notice of an instrument akin to the gyroscope made by Mr Henry Atkinson was read before the Astronomical Society. In 1836, in a paper read before the Royal Scottish Society of Arts, Mr Edward Sang, C.E., Edinburgh, suggested an experiment with an instrument exactly similar to the gyroscope, by which the rotation of the earth on its axis could be directly proved. He says: "While using Troughton's top an idea occurred to me that a similar principle might be applied to the exhibition of the rotation of the earth. Conceive a large flat wheel, poised on several axes all passing exactly through its centre of gravity, and whose axis of motion is coincident with its principal axis of permanent rotation, to be put in very rapid motion. The direction of its axis would then remain unchanged. But the directions of all surrounding objects varying, on account of the motion of the earth, it would result that the axis of the revolving wheel would appear to move slowly." This suggested experiment was actually carried out in 1852 by M. Leon Foucault, although, in all probability, without any knowledge on his part of Mr Sang's suggestion. Already, in 1851, Foucault, in his famous experiment with the pendulum at the Pantheon in Paris, had shown how the constancy of the plane of a pendulum's vibration could be used to show the rotation of the earth, and now, in 1852, he applied the property of the "constancy of the plane of rotation" of a gyroscope for the same purpose. The name gyroscope was given to the instrument by Foucault at this time, and in order to perform the experiment successfully the instrument had to be constructed with the utmost exactness. The experiment was repeated at the Liverpool meeting of the British Association, and by causing a considerable sensation in the scientific world at the time was the means of bringing the gyroscope into public notoriety. In *Poggendorff's Annalen* for 1853 there is a description of a gyroscope made some time before by Fessel, and about the same time we hear of various modifications of the instrument introduced by Prof. Baden Powell, Wheatstone, and others. Quite recently, in 1878, there has appeared in the *Scientific American* an account of a new form of gyroscope made by Mr G. M. Hopkins. In this instrument the heavy fly-wheel is driven by an electric current after the manner of an electromagnetic engine, and so its rotation can be kept up for any length of time.

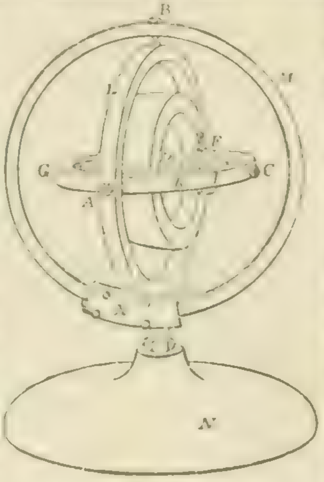


Fig. 1.

The construction of the gyroscope will be readily understood from fig. 1, which is engraved from a photograph of a large instrument made by Mr Sang.

[illegible]

1. [illegible]

tive direction. If the weight be put at C, the wheel rotating as before, the rotation round OB will be in the positive direction. Reversing the rotation of the wheel will in both cases produce a reversal of the rotation round OB.

2. The fly-wheel still rotating in the positive direction, let a gentle rotation be given to the ring L round OB, and immediately the axis of the wheel OC will tilt up, rotating in the positive direction round OA till it reach the vertical position, where it will remain, and then it will be observed that the fly-wheel is rotating in the positive direction round OB. Should the axis OC, in [illegible], be carried a little past the vertical, and the direction of rotation round OB be then suddenly reversed, the axis OC will continue to revolve in the positive direction round OA, till it reach the vertical position downwards, when it will again be stationary, and the wheel will now be rotating in the negative direction round OB. By gently oscillating the ring L as the [illegible] the axis of the fly-wheel is passing the vertical, a continuous rapid rotation round OA can be given to the ring K carrying the rotating fly-wheel with it.

3. Let the fly-wheel be now made stationary, and, while in this position, let simultaneous rotations in the positive direction be given round both OA and OB; the fly-wheel will then be observed to begin to move in the negative direction round OC.

The explanation of all these experiments follows readily from the theory of the composition of rotations round different axes. Let the angular velocities about OA, OB, OC, be ϖ, ρ, σ respectively. If simultaneous angular velocities σ and ϖ be given about OC and OA in the positive direction, these can be compounded into an angular velocity about a new axis OI, which divides the angle AOC into two parts such that

$$\frac{\varpi}{\sigma} = \frac{\sin COI}{\sin AOI} = \frac{\sin COI}{\cos COI} = \tan COI = \tan\theta \text{ (suppose)}.$$

OI is, therefore, the position of the instantaneous axis, and as OC will always tend to coincide with it, OC will move round the axis OB in the positive direction. It will be noticed also that ϖ remaining the same, $\tan\theta$ will be less as σ is greater. This shows that the rotation round OB, or the motion in azimuth, will be slower as the speed of the fly-wheel is greater. This accords with experiment. In exactly the same way by compounding the angular velocities about OC and OB and OA and OB, the other experiments may be explained.

Perhaps the most common form of gyroscope is that which has been largely sold under the name of the gyroscope top. It is a modification of the gyroscope introduced by Fessel. In it the ring containing the rotating wheel is either supported on a vertical pivot at the end of the axis, or simply held suspended by a string attached to the same point, as represented in fig. 2. In this case, when the wheel is rapidly rotated, and its axis partially inclined at an angle with the vertical, a slow motion round the vertical axis is observed to take place. This rotation is accompanied by a feeble nutation of the axis, which is unobservable by the eye so long as the wheel rotates rapidly. The rotation in azimuth would continue uniform if the velocity of the wheel remained constant, but it gradually decreases in speed, the nutation at the same time becoming more apparent as the velocity dies away, till the gyroscope finally settles with the axis of the wheel in the direction of the

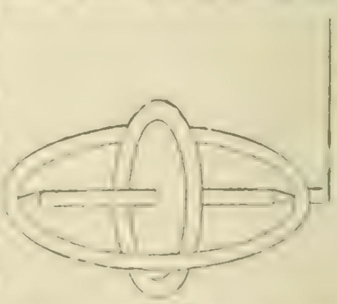


Fig. 2.

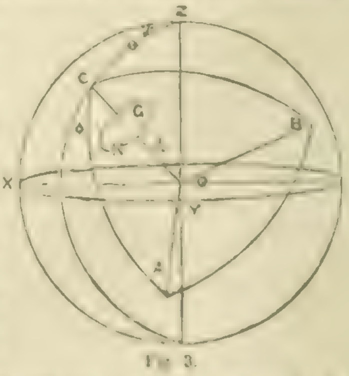


Fig. 3.

prolongation of the supporting string. A short analytical investigation of this particular case may serve to give some idea of how problems on the gyroscope generally may be attacked. For clearness in the woodcut (fig. 3) we suppose the ring containing the wheel removed.

Let K represent the wheel of mass M, h the distance of the centre of gravity G from O, OC the axis of the wheel, supposed of unit length, OB, OA two other axes through the fixed point O at right angles to OC and to each other; OX, OY, OZ, three rectangular axes fixed in space, with which OA, OB, OC (axes moving with the body) are connected by ψ, ϕ, θ, angles on the unit sphere which determine the point C.

If A, B, C be the moments of inertia, and ϖ, ρ, σ the angular velocities about OA, OB, OC respectively, the equation of kinetic energy T gives

$$T = \tfrac{1}{2}(A\varpi^2 + B\rho^2 + C\sigma^2)\,;$$

but

$$\varpi = \dot\theta \sin\phi - \dot\psi \sin\theta \cos\phi\,;$$
$$\rho = \dot\theta \cos\phi + \dot\psi \sin\theta \sin\phi\,;$$
$$\sigma = \dot\psi \cos\theta + \dot\phi.$$

Substituting and making A = B, as is clearly the case, we have

$$T = \tfrac{1}{2}A\dot\theta^2 + \tfrac{1}{2}A\dot\psi^2 \sin^2\theta + \tfrac{1}{2}C(\dot\psi \cos\theta + \dot\phi)^2.$$

Applying Lagrange's equations of motion, which are for this case

$$\frac{d}{dt}\cdot\frac{dT}{d\dot\psi} - \frac{dT}{d\psi} = 0,$$
$$\frac{d}{dt}\cdot\frac{dT}{d\dot\phi} - \frac{dT}{d\phi} = 0,$$
$$\frac{d}{dt}\cdot\frac{dT}{d\dot\theta} - \frac{dT}{d\theta} = Mgh\sin\theta,$$

we get

$$(1)\ \frac{d}{dt}\left\{A\dot\psi\sin^2\theta + C(\dot\psi\cos\theta + \dot\phi)\cos\theta\right\} = 0\,;$$
$$(2)\ \frac{d}{dt}\left\{C(\dot\psi\cos\theta + \dot\phi)\right\} = 0\,;$$
$$(3)\ A\ddot\theta - A\dot\psi^2\sin\theta\cos\theta + C\sin\theta\,\dot\psi(\dot\psi\cos\theta + \dot\phi) = Mgh\sin\theta.$$

Integrating (2), we get

$$\dot\psi\cos\theta + \dot\phi = \text{a constant} = n,$$

which represents the angular velocity about OC.

Now if the motion be steady we must have both θ and $\dot\psi$ constants. Let them be represented by α and μ respectively. Then equation (3) gives

$$-A\mu^2\sin\alpha\cos\alpha + C\mu n\sin\alpha = Mgh\sin\alpha\,.$$
$$\therefore\ \mu = \frac{Mgh + A\mu^2\cos\alpha}{Cn}.$$

By this formula we can calculate, for any particular instrument, the angular velocity in azimuth from having given the angular velocity of rotation of the fly-wheel and *vice versa*.

An important case of motion, and one also very interesting both mathematically and physically, is got by including a gyroscope in a pendulum bob and supporting the rod from a universal flexure joint. This constitutes the gyroscopic pendulum. The joint is usually got by attaching a short length of fine steel wire rigidly to the end of the rod, and suspending the whole by means of the other end of this wire firmly clamped into a fixed support. When the gyroscope is rapidly rotated, and the pendulum drawn a little aside from the vertical and then let go, its lower end is observed to describe a beautiful curve consisting of a series of equal closed loops, all equally near each other and radiating from a centre point. This curve, which is a species of hypotrochoid, is figured in Thomson and Tait's *Natural Philosophy*, where also the whole theory of the gyroscopic pendulum will be found.

As has been already mentioned, a remarkable apparent effect is produced by the earth's diurnal rotation upon a rapidly rotating gyroscope. This arises from what Foucault called the "fixity of the plane of rotation," and what Thomson and Tait have recently called "gyrostatic domination." In virtue of this principle, the axis of the rotating fly-wheel tends always to preserve a fixed direction in space, and, in consequence, will appear to move in a direction opposite to that in which the earth's rotation is at each instant actually carrying it.

If we suppose the gyroscope represented at fig. 1 to have all degrees of free rotation round the point O, and to be in every way exactly balanced about that point, and also to have all its pivots nearly void of friction, then, at whatever part of the earth's surface it may be placed, the fly-wheel while rotating rapidly will be observed to move gradually and finally take up such a position that its axis OC is parallel to the earth's axis, and also that its direction of rotation round OC is the same as that of the earth round its axis. Should the ring K be fixed so that the axis OC can only move in a horizontal plane, then the ring L will move in azimuth till it lies with OC in the direction north and south and such that the direction of rotation of the fly-wheel coincides with that of the earth. Further, should the ring L be fixed in the plane of the meridian, so that OC can only move in altitude, then OC will be observed to tilt up till it is parallel to the earth's axis, the direction of rotation of the wheel being, as before, the same as that of the earth. These effects may be explained as follows:—

Let λ be the latitude of the place, and ω the angular velocity of the earth on its axis; also, at starting, let the ring K be in the horizontal plane, and let OC make an angle α, in azimuth, with a horizontal line ON drawn from O northwards; further, let the rotation of the wheel round OC be positive. Now ω can be resolved into three angular velocities at right angles to each other, viz.:—

$\omega\sin\lambda$ round the vertical line,
$\omega\cos\lambda\cos\alpha$ round a line parallel to OC, and
$\omega\cos\lambda\sin\alpha$ round a line parallel to ON.

Of these $\omega\sin\lambda$ gives the velocity in azimuth, $\omega\cos\lambda\cos\alpha$ can only affect the velocity of the wheel, while $\omega\cos\lambda\sin\alpha$ gives the velocity of OC in altitude. These being the actual component velocities communicated to the gyroscope by the earth, the apparent velocities will be equal and opposite to them.

The apparatus actually employed by Foucault to demonstrate the rotation of the earth differed somewhat from that represented in fig. 1. In it the corresponding ring to L was suspended from a fixed stand by a thread without torsion, and rested at its lowest point by a pivot in an agate cup. Also the ring corresponding to K, which carried the fly-wheel, rested on knife edges within L, and could be removed at pleasure, in order that the rotation might be given to the fly-wheel. Great care was also taken to have every part thoroughly well balanced. It is stated that the experiment was several times successfully performed, and Foucault by means of his apparatus was thus able, without astronomical observation, to find out the latitude of the place, the east and west points, and the rate of the earth's motion. The same experiment has lately, it is said, been successfully performed by Mr G. M. Hopkins. His fly-wheel, being driven by electricity, has the advantage of rotating at a uniform rate for any length of time. By attaching a small mirror to the frame which carries the revolving wheel, and using a spot of light reflected from it as an index, he has been able to make manifest the earth's rotation in a very short time.

An ingenious practical application of the gyroscope principle was suggested and carried into effect about the year 1856 by Professor Piazzi Smyth. His aim was to devise a telescope-stand which would always remain level on board ship, notwithstanding the pitching and rolling, and so facilitate the taking of astronomical observations at sea. For this purpose the stand was supported on gimbals, and underneath it were placed on fine pivots several heavy fly-wheels which could be put in rapid rotation, some on vertical and some on horizontal axes. The complete apparatus, involving many ingenious details as to driving the fly-wheels, &c., was tested by Professor Smyth on board the yacht "Titania" during a voyage to Teneriffe, and found to work with perfect satisfaction. A full account of the method will be found in *Trans. Royal Scottish Society of Arts*, vol. iv.

GYROSTAT.—This is a modification of the gyroscope, devised by Sir William Thomson, which has been used by him as well as by Professor Tait for a number of years to illustrate the dynamics of rotating rigid bodies. It consists essentially of a fly-wheel, with a massive rim, fixed on the middle of an axis which can rotate on fine steel pivots inside a rigid case. The rigid case exactly resembles a similarly-shaped, but hollow, fly-wheel and axis closely surrounding the other but still leaving it freedom to move. Slits are made in the containing case whereby a cord can be coiled several times round the axis for the purpose of setting the fly-wheel in motion. There is also attached to the rigid case, in the plane passing through the centre of gravity of the wheel at right angles to its axis, a thin flange of metal, which is called the bearing edge. The circumference of this flange is not a circle but a curvilinear polygon of sixteen or more equal sides. The object of making it so is to prevent the instrument from rolling like a wheel on the bearing edge when the fly-wheel is rotating rapidly. A drawing of the gyrostat, with a portion of the case removed to show the inside, is given in fig. 4. A represents the bearing edge upon which the whole balances. To suit certain experiments, a sharp conical steel point can be fixed on to the end B by means of a bayonet joint.

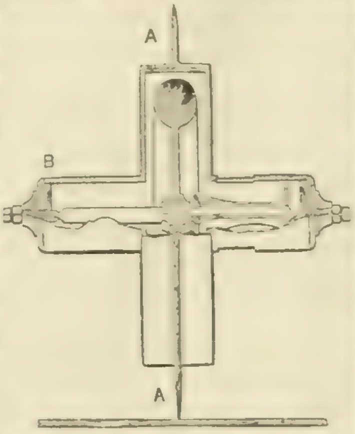


Fig. 4.

The gyrostat is a most instructive instrument, and with it many interesting experiments can be performed. We can only mention a few taken from Thomson and Tait's *Natural Philosophy*, vol. i. Part I., where the mathematics of the whole subject will be found fully given.

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

[illegible]

[illegible]

Memoirs, new ser., part 3, p. 210; *Ast. Notices*, vol. xiii. pp. 221-248; *Theory of Foucault's Gyroscope Experiments*, by the Rev. Baden Powell, F.R.S.; *Ast. Notices*, vol. xv.; articles by Major J. G. Barnard in *Silliman's Journal*, 2d ser., vols. xxiv. and xxv.; L. Hunt on "Rotatory Motion," *Proc. Phil. Soc. Glasgow*, vol. iv.; J. Clerk Maxwell, "On a Dynamical Top," *Trans. R.S.E.*, vol. xxi.; *Phil. Mag.*, 4th ser., vols. 7, 10, 14; *Proc. Royal Irish Academy*, vol. viii.; Sir William Thomson on "Gyrostat," *Nature*, vol. xv. p. 297; Price's *Infinitesimal Calculus*, vol. iv. (J. BL.)

GYTHIUM was an ancient Achæan town on the Laconian Gulf, south-west of the mouth of the Eurotas, near the site of the modern port Marathonisi. It lay opposite the island Cranæ, at the foot of the fertile valley of the Gythius. On its coins the common types are Apollo and Heracles, the founders of the city. Heracles, the Phœnician god Melkart, points to an early connexion with Tyre. The Phœnicians maintained a great trade with the shores of the Laconian Gulf, and Aphrodite Migonitis, the Phœnician Astarte, had a temple at Migonium, the modern Marathonisi. Aphrodite and Asclepius also occur on its coins, and the latter had a temple in the city. A great port in the period of Phœnician intercourse, Gythium became a secondary town after the Dorian conquest, as is proved by the absence of early coins; and it was only after the decay of Sparta that it again became an important city. It was the ordinary station of the Spartan fleet, and was considered the port of Sparta, from which it was distant about 30 miles. In the wars against Athens it was therefore exposed to frequent attacks. Tolmidas, the Athenian commander, burned it (455 B.C.). Later it was besieged unsuccessfully by Epaminondas (370 B.C.). It was strongly fortified by the tyrant Nabis; but he was compelled by Flamininus to give up Gythium and other coast towns to the Achæan league (195 B.C.). When, soon afterwards, the whole country became a Roman province, Gythium had its own magistrates, στρατηγοί and ἔφοροι (see inscr. in Lebas, *Voyage Archéol.* ii. 242*a*, and *Gött. Gel. Anz.*, 1865, p. 461). Augustus made it one of the twenty-four Eleuthero-Laconian towns. The existing ruins, called Palæopoli, are all of the Roman period. According to Strabo (p. 363), it had an artificial harbour, of which Col. Leake could see no trace. In the town was a well sacred to Asclepius, and at three stades distance was the stone Argos, where Orestes was relieved from his madness.

GYULA, chief town of the Trans-Tibiscan county of Békés, Hungary, is favourably situated on the Fehér (White) Körös, and has a well-built station on the Nagy-Várad (Grosswardein) and Esseg line of the Alföld Fiume Railway, in 46° 38′ N. lat., 21° 17′ E. long. The outer ditch of the old ruined fortress, the tower of which serves as a prison, divides Gyula into two parts, named respectively Magyar-Város (Hungarian town) and Német-Város (German town). Stone bridges facilitate communication over the canals, which flow from the Körös, and intersect the streets. Among the principal buildings are Roman Catholic, Old United Greek, Lutheran, and Calvinist churches, and a Jews' synagogue, also a fine castle with gardens, a county hall, an ancient Turkish bath, many handsome private residences, and several schools. Gyula is, moreover, the seat of the county [illegible], of a royal court of [illegible], and of a board of taxes, and has post and telegraph offices and a savings bank. The inhabitants are employed partly in industrial and commercial pursuits, partly in farming and cattle breeding. The fairs are much resorted to for the purchase of corn, horned cattle, sheep, pigs, woollen wares, and [illegible]. The chief agricultural products of the surrounding country are wheat, barley, oats, and maize; there is also a good supply of garden fruit, grapes, and vegetables. In 1870 the population amounted to 18,495, consisting chiefly of Magyars, Wallachs, and Germans.

H

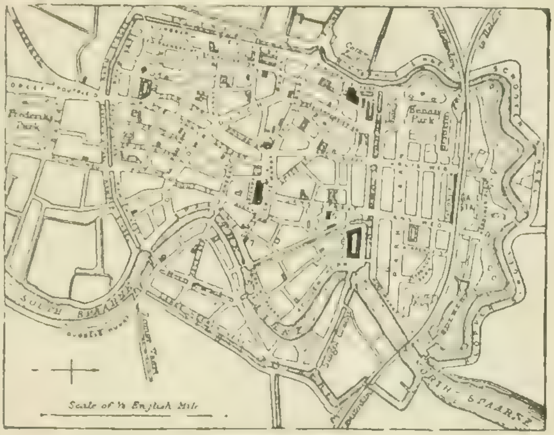
H has varied in form from the Phœnician and old Hebrew symbol ⊟, called Cheth, only by the removal of the upper and lower horizontal lines. (For the oldest forms of the letter see ALPHABET.) The closed form is sometimes found in old Greek inscriptions, and, though less frequently, in South Italy.

Its value in Phœnician was probably a continuous guttural sound—the sound which it had in Hebrew—resembling the German *ch*, and with no English counterpart. In Greece it represented nothing more than the spirant *h*, so long as a separate symbol to denote that sound was felt to be necessary. Afterwards it was generally employed to denote a second *e* sound, under the name of *Eta*; probably it had before been called *Heta*. The time of this change varied in different parts of Greece. In the alphabet of the island of Thera we find H representing *e* as early as the 40th Olympiad, though it still sometimes retained its old value. At Athens the date was 403 B.C., and here the practice did not vary. But in most of the alphabets of Greece proper, of Peloponnesus, and of the Italian colonies, H still remained as the rough breathing; and as such it consequently passed into the Latin alphabet. It is possible that *h* in a very few Latin words, when it occurs as a medial sound (*e.g.*, *traho*, *veho*), was a continuous guttural. But generally it occurs at the beginning of a word, and can hardly have been more than a breathing. Even as this it early became evanescent. During the classical period of Latin literature it was retained in the speech of educated men, doubtless in part by Greek influence. But in the popular speech it was rapidly disappearing as an initial sound; although it continued to be written, and indeed was often written wrongly, at the beginning of words where it had no place; *e.g.*, *umor* was written *humor*, and the *h* has held its own in English spelling down to our day. The sound is almost completely lost in modern Italian.

It is not settled beyond dispute by what mechanism the *h*-sound is produced. The old view (held by Lepsius and others) is that *h* has a distinct position of its own, further back in the throat than the gutturals, in fact, immediately above the larynx,—that it is a surd, to which the corresponding sonant is the slight gurgle heard between words of which the first ends and the second begins with the same sound (*e.g.*, "go over"), if we take care to close the glottis between the two words but not to alter the position of the other vocal organs. A quite different view is held by Whitney, M. Bell, and others, that *h* has no distinct position of its own, but is sounded in or through the position of the following sound; for example, that in saying *ha* we do not put the vocal organs into two positions, one for *h* and one for *a*, but we put them into the position for *a*, and then produce the breath and the vowel without any change of position, the *h* being a mere expiration of breath through the open glottis; similarly *hi*, *hu*, &c., are produced with the vocal organs in the position for *i*, *u*, &c., respectively; in each case the vocal chords vibrate for the vowel after the expiration of breath, but there is no change made within the orifice of the mouth between the *h* sound and the vowel. This view is at least a plausible one.

HAARLEM, a city of the Netherlands, the chief town of the province of North Holland. By rail it is 11 miles W. of Amsterdam, 19 S. of Alkmaar, and 20 N. of Leyden. Distant about 5 miles from the German Ocean, it communicates with the Zuyder-Zee by the Spaarne and the Ij. The railway to Amsterdam was opened in 1839, and that to Alkmaar in 1867.

Haarlem is a typical Dutch town. The branches of the Spaarne and an extensive system of canals bring the ship-traffic into the heart of it, and turn its streets into so many quays. The roadways are paved with bricks; the houses have gable-ends with old-fashioned crow-steps; and everything wears a decent and quiet aspect, which to one man is dulness and to another "aristocratic gravity and modest coquetry." What the city lacks in liveliness it makes up by the interest of its historical associations and the number of its scientific and artistic institutions. The great market place especially has much that is worth seeing: the town-house and the cathedral of St Bavo; the old meat market, a building of the end of the 16th century in the old Dutch style; the stadsdoelen, or place where in former times the burgesses used to assemble in arms; and the statue erected to Koster in 1856, when in Holland he was still generally considered the inventor of printing. St Bavo's is one of the most famous churches in the Netherlands. It is a cruciform structure completed in 1538, and makes a considerable impression on the spectator by the great length (about 426 feet) of its main axis and the height and steepness of the roof. The tower is about 255 feet high. Within the lofty vaulting is supported by twenty very light columns, and there is a good deal of beauty about the perspective of its aisles. The organ, built by Christian Muller of Amsterdam between 1735 and 1738, was for some time the largest in the world, and is still celebrated for the sweetness of its tone, especially in the vox humana stop. It possesses four key-boards, 64 stops, and 5000 pipes, the largest of which is 15 inches in diameter. Among the monuments in the church are those of Bilderdijk the poet and the hydraulic engineers Christiaan Brunings and Fredrik William Conrad, the latter the projector of the sluices at Katwijk. In the belfry are the *damiaatjes*, small bells presented to the town according to tradition by William I., the conqueror of Damietta. At the head of the scientific institutions of Haarlem may be placed the Dutch society of sciences (*Hollandsche Maatschappij van Wetenschappen*) founded in 1752, which possesses very valuable collections in botany, natural history, and geology. Teyler's foundation (Teyler's Stichting), instituted in accordance with the last will of Pietre Teyler van der Hulst for the study of theology, natural philosophy, poetry, history, drawing, and



Plan of Haarlem.

1. Gas Works.
2. Infirmary
3. Town-House
4. The Cathedral of St Bavo or Groote Kerk.
5. R.C. Ch. of St Joseph.
6. Barracks.
7. Teyler's Foundation.

numismatics, has various auxiliary collections in the founder's former residence. The Dutch society of industry, founded in 1777, is still active and flourishing, with branches established all over the country. In 1871 it instituted a colonial museum, which along with the royal museum of modern art is accommodated in the pavilion formerly the residence of an Amsterdam banker, Hope, and acquired for the crown by King Louis Napoleon. The colonial museum presents a complete survey of the manifold products of the Dutch possessions in the East Indian Archipelago, and the royal museum has a collection of 250 pictures. Among the benevolent institutions of the city it is enough to mention the hospital for old men founded in 1608, and the beautiful **Teyler's Hospital.**

The staple industries of Haarlem have been greatly modified in the course of time. Under the counts of Holland cloth-weaving and brewing were in a very thriving condition; but under Charles V. they lost enormously in importance. While 2000 pieces of cloth had been manufactured annually in the end of the 15th century, 800 or 900 was the number for 1515; and the breweries diminished from 120 in 1494 to 95 in 1503, and by 1518 were no more than 77. After the revocation of the edict of Nantes, silk, lace, and damask-weaving were introduced by French refugees, and in course of time these industries gave employment to 10,000 of the population. About the close of the 18th century this remarkable prosperity was a thing of the past; and it was not till after the Belgian revolution that Haarlem began to turn its attention to the various departments of manufacture in which it is now engaged. Cotton factories, carriage-works, bleach works, cotton and silk dye-works, a famous type foundry, oil works, soap-works, breweries, and a factory for preserved meats are among the more important establishments. The extensive workshops of the Dutch railway company are also of value to the town. One of the printing establishments has the reputation of being the oldest in the Netherlands, and publishes the oldest Dutch paper, *De Opregte Haarlemsche Courant*. As market gardening, especially in the flower department, is largely carried on in the immediate vicinity, Haarlem is the seat **of a flourishing trade in "Dutch roots," especially in hya**cinths, tulips, fritillaries, spiræas, and japonicas. A considerable business is also done in the butter, cheese, and other agricultural produce from the surrounding country.

Though the population of Haarlem has been steadily increasing since the beginning of the present century, it has not become so great as it was in the 17th. In 1570 the total was 20,772 souls, of whom 1836 were Dutchmen capable of bearing arms, 1215 Englishmen and Frenchmen, 1556 Germans, and 15,865 women and children. By 1622 it had increased to 39,455. A rapid decline took place in the 18th century: from 26,281 in 1748 the number sank to 21,227 in 1796, and by 1815 it was not more than 17,432. Seven years later we find 18,453 inhabitants, 21,667 in 1830, 24,012 in 1840, 25,852 in 1850, and 27,534 in 1860. The year 1874 showed 32,7[illegible], and three years later the number was no less than 35,09[illegible]. In 1869–1870 there were 14,471 members of the Dutch Reformed Communion, 11,574 Roman Catholics, and 5[illegible] Jews.

Haarlem is mentioned in a register of the 10th century as Haralem. From Count William II. it obtained a charter in 1245, and in the course of the following centuries it rapidly advanced in prosperity. In 1492 the insurgent [illegible] got possession of the town, but before the year was out it was recovered by the imperial general Duke Albert of Saxony. The year 1494 was witness of a great conflagration, and in 15[illegible] the plague claimed its many victims. In 15[illegible] Haarlem became a bishop's see. **The prominent part that its inhabitants took in the revolt of the Netherlands brought upon it an unparalleled disaster.** Don Frederick son of the duke of Alva invested the town with 30,000 men in December 1572, and after a siege, in which the burghers defended **themselves with admirable and pertinacious heroism, it was obliged** to capitulate in July 1573. The conquerors, in spite of their promises of mercy, took barbarous vengeance, and it was not till [illegible] 1577 that the town was recovered from their grasp by the prince of Orange. In its subsequent history the main events are the insurrections of 1775 and 1791, the arrival of the Prussians in 1787, and the quatercentenary celebration of the invention of **printing in 1823.**

See P. Allan, *Geschiedenis en beschrijving van Haarlem van de vroegste tijden tot op onze dagen, onder medewerking van Ekama, Enschedé, en Gonnet.*

HAARLEM LAKE, or HAARLEMMER MEER, a commune of the province of North Holland, constituted by the law of 16th July 1855. It has an area of about 46,[illegible] acres, and its population has increased from [illegible] in 18[illegible] to 11,[illegible] in 1878. As its name indicates, the commune was formerly a lake, and, according to Amersfoordt, this lake was [illegible] which passed through the district in the time of the Romans. In 1531 the Haarlemmer Meer had an area of 6[illegible] acres, and in its vicinity were three other sheets of water—the Leydsche Meer or Leyden Lake, the Spiering Meer, and the Oude Meer or Old Lake—with a united area of about 7[illegible] acres. The four lakes were gradually amalgamated into one by successive inundations, and by 1647 the new Haarlem Lake had an area of [illegible] acres, which by 1848 was [illegible] to 4[illegible] acres. As early as 1641 Jan Adriaanszoon Leeghwater proposed to drain the lake; and other schemes, among which those of Nicholas Samuel Cruquius in 1742 and of Baron van Lynden van Hemmen in 1820 are worthy of special mention, were brought forward from time to time. But it was not till 1836, when a [illegible] hurricane on the 9th of November drove the waters as far as the gates of Amsterdam, and another on the 29th of December sent them in the opposite direction to submerge the streets of Leyden, that the mind of the nation was turned seriously to the matter. In August 1837 the king appointed a royal commission of inquiry; the scheme proposed by the commission received the sanction of the [illegible] in March 1839, and in the following May the necessary law was passed. The first business was to dig a canal round the lake for the reception of the water and the accommodation of the great traffic which had previously been carried on. The canal was [illegible] in length, with a depth of 9 feet, and a width of 1[illegible] feet on the west side of the lake and 115 feet on the east side. The preliminary works were not completed till 1845. The area enclosed by the canal was rather more than 70 square miles; and as the average depth of the lake was 13 feet 1¼ inches, and as the water had no natural outfall it was calculated that probably 1000 million tons would have to be raised by mechanical means. A gigantic steam-engine designed by Messrs J. Gibbs and A. Dean of London was erected and named in honour of Leeghwater. It could raise 112 tons of water [illegible], and [illegible] tons in 24 hours. The total weight of iron used for the engine, pumps, &c., was [illegible], and the cost of [illegible] to £36,000. Two other engines of equal size and power were afterwards constructed by Messrs Harvey of Hayle and Messrs Fox and [illegible] of Perran, in Cornwall, the makers of the "Leeghwater." They were named respectively the Cruquius and the Van Lynden. Pumping commenced in 1848 and the lake was dry by the 1st of July 1852. At the first sale of the reclaimed lands along the banks, on August 16, 1853, 7[illegible] hectares were bought for [illegible] florins, or 7[illegible] florins per hectare, [illegible]. The whole area of 42,0[illegible] [illegible] of about £7[illegible], so that the actual cost to the nation had only been 4,100,000 florins or £[illegible], though the expense of the enterprise amounted to 13,78[illegible] florins or [illegible]. The soil is of various kinds, peat, clay, sand, and [illegible]. [illegible] Corn, seed, cattle, butter, and cheese are the principal products. The roads which traverse the commune are [illegible] after the various [illegible] of Holland, Friesland, or Zealand. Hoofddorp, Venneperdorp [illegible] Nieuw Vennep, Abbenes, and the vicinity of the [illegible] are the spots where the population has clustered most [illegible]. The first church was built in 1855; in 1877 there were twenty. In 185[illegible] the city of Leyden laid claim to the possession of [illegible] the new territory, but the courts decided in favour of the nation.

A history of the drainage of the Haarlem Lake is given by Gevers van Endegeest, *Dessèchement du Lac de Harlem*, The Hague, 1843–1861, 4 parts, with plates. See also J. P. Amersfoordt, *Het Haarlemmermeer*, Haarlem, 1857, published by the Amsterdam *Maatschappij tot Nut van 't Algemeen*.

HABAKKUK (חֲבַקּוּק), one of the minor prophets of the Old Testament, the eighth in order in the Massoretic text. The name of the prophet is peculiar to him, and occurs only in his own writing (i. 1, iii. 1). As to its meaning there is some uncertainty, but it is probably a formation from a verb signifying *to entwine to embrace*

(חבק), and means "embraced" or simply "embrace" (Jerome, *Pr. ad Hab.*; Gesenius and Fürst on the word). In the Septuagint and with the Greek fathers it appears in the form of Ἀμβακούμ, which would seem to indicate that the Hebrew was read and pronounced Hambakuk ([illegible]), the double *b* being changed for the sake of euphony into *mb*. The change of the *k* into *m* at the end of the word [illegible] says is without analogy; but in the change of Baalzebub into Beelzebul we have an analogous instance of the substitution of a liquid for a mute,—probably because to the Greek ear it was not agreeable that a final syllable should begin and end with the same rough consonant. Of the prophet's personal history nothing is certainly known. In the inscription of his book he is simply called "the prophet"; nor can we with certainty determine at what time he lived and prophesied. From the use of the word "my" in the subscription to the psalm in chap. iii., "To the chief singer on my stringed instrument" (ver. 19), it has been inferred that he was of the tribe of Levi, inasmuch as it is supposed from this that he held a place among those by whom officially the musical service of the temple was conducted, a place which only a Levite, it is alleged, could occupy. But this seems rather too much to build on the mere use of the word "my," nor is it quite certain that only Levites took part with stringed instruments in the service of song in the temple. King Hezekiah, after his recovery from his sickness, composed a psalm of thanksgiving, and in reference to it he says, "We will sing my songs to the stringed instruments all the days of our life in the house of the Lord"; for he "had said, What is the sign that I shall go up to the house of the Lord?" (Isa. xxxviii. 20, 22), from which it may be inferred that others besides Levites might take part in the liturgical music of the temple. Were there any truth in the assertion in the additions to Daniel in the Apocrypha that Habakkuk was sent by the Lord from Judæa to Babylon with food for Daniel in the lions' den, this would give us the date of the prophet's activity; but on such a manifest fiction nothing can be built. According to one tradition the prophet was buried at Keilah in the tribe of Judah; according to another at Hukkok (now Yakuk) in the tribe of Naphtali.

The book of Habakkuk falls into two parts,—the former of which (chaps. i. and ii.) has the inscription, "The burden which Habakkuk the prophet saw," and the latter (chap. iii.) the inscription, "Prayer" (or hymn) "of Habakkuk on Shigyonoth." Both parts have reference to the same subject, the invasion of Judah by the Chaldeans, who are expressly named (i. 6). In both this is regarded as a chastisement from the Lord upon the people for their sins; but whilst in the earlier part the prophet appears as a reprover and denouncer of evil, in the latter he gives utterance to emotions of reverence, confidence, and joy in God as the Saviour of His people. In the former part the prophecy is in the form of a dialogue between Jehovah and the prophet. The prophet, deeply troubled because of the corruption of his people, cries to God and asks how long such a state of things is to continue (i. 2-4), to which God replies in effect that He is about to bring on the sinful nation a heavy calamity by raising against them the Chaldeans—"that bitter and impetuous nation"—whose fierce and terrible hosts should devastate the land,—at the same time intimating that this scourge should pass away, and that the invaders, though the instruments of God's vengeance, should not be held guiltless (5-11). The prophet then appeals to God, the Everlasting and Holy One, and asks how the employment of such instruments to inflict punishment on the people of His choice is reconcilable with the divine rectitude and unchangeableness (12-17), but declares that he will stand on his watch-tower that he may learn what God will say to him, hoping that some word of comfort may be vouchsafed to him which he may carry to his people. The word comes; the Lord will not suffer the ungodly, the transgressor, and the idolater to escape; a fivefold woe is denounced against the enemies of God's people; the just are encouraged to abide in faith, cheered with the assurance that as a result of God's judgments on the wicked the knowledge of the glory of the Lord shall fill the earth as the waters cover the sea; for God is in His holy temple, His purposes shall stand fast, therefore let all the earth be still and await His coming (ii. 1-20). The latter part of the book is a hymn of praise in which the prophet in his own name and that of the people celebrates the majesty and mighty deeds of the Lord, and gives exulting expression to the confidence and joy with which His true subjects rest in Him (iii. 1-19). This hymn is in form and style like one of the Psalms, and was doubtless intended for use in the temple service. To some it has appeared that this third chapter is wholly unconnected with the two preceding. But though different in character and style, it stands closely connected in substance with what goes before, and forms with this one whole. In the former part we have the burden which the prophet had to bear to the people; in the latter we have the utterance of the feelings produced by the contemplation of the facts and revelations therein set forth, viewed in the light of God's manifestations of Himself on behalf of His people in former times.

This book, which it is generally agreed was written by the prophet himself, forms one of the finest remains of ancient Hebrew literature. In conception and style it is not inferior to any production of the most flourishing age of prophecy. The language is pure, the thought is lofty, and in the construction artistic skill is displayed. With the mantle of the prophet the author bears also the chaplet of the poet.

At what time Habakkuk prophesied remains uncertain. From i. 5, 6, where the invasion of Israel by the Chaldeans is represented as a thing so strange as to be incredible when announced, it has been inferred that the prophecy was uttered whilst as yet the people of Israel were unacquainted with the Chaldeans as a warlike power,—long, therefore, before the battle of Carchemish (606 B.C.), in which Necho, king of Egypt, was defeated by Nebuchadnezzar. The date of the prophecy has accordingly by some been relegated to the reign of Manasseh; and this has been supposed to receive confirmation from the fact that during that reign there were prophets who foretold the coming on the nation of a calamity such as that the ears of all who heard of it should tingle (2 Kings xxi. 10 *ff.*); and of these prophets Habakkuk may have been one. The words of the prophet, however, do not necessarily imply that at the time he uttered his prophecy the people were so ignorant of the Chaldeans that they could not believe what he was commissioned to announce to them regarding an invasion of the country by that "bitter and hasty" nation; it is rather the immediateness and terribleness of the catastrophe which he represents as what would pass belief, even when announced by a prophet of the Lord. It is further to be observed that his words imply that the calamity he was sent to announce would happen in the days of those to whom he spoke, which could hardly be said of a generation that had reached adult age during the latter half of Manasseh's reign, that is, fully sixty years before the invasion of Judah by Nebuchadnezzar. It may be added that it is very improbable that during the reign of Manasseh, when idolatry had to such an extent superseded the worship of Jehovah, such a psalm as that of chap. iii would have been composed for the temple service by any one living in Judah. A later date, it would thus appear, must be assigned to the prophecy. Vitringa has suggested that it was uttered in the time of Josiah, and this is accepted by Delitzsch and others. To this it has been objected that the state of things described in the beginning of the book does not accord with what we know to have been the state of things in Josiah's reign, and moreover that the declaration that the calamity threatened should happen in the days of the existing generation does not tally with the assurance given by the prophetess Huldah to King Josiah, that the evil the Lord was about to bring upon Jerusalem should not happen in his day (2 Kings xxii. 15-20). Neither of these objections, however, has much weight. To the former it may be replied that, though in the later part of Josiah's reign a better state of things than that described by the prophet prevailed, in the early part of it things were probably exactly such as he represents; and to the latter it may be replied that the two declarations are not irreconcilable, for though the invasion of the Chaldeans might happen in the time of the existing generation to whom the prophet spoke, it might be not till after the death of Josiah that Jerusalem should be taken; which in point of fact was the case. A more serious objection is that the psalm in chap. iii. could not have been composed in the early part of Josiah's reign before the reforms which he introduced had been begun, and that the first and second chapters could not have been uttered after these had been inaugurated, because then the state of things there described did not exist. To meet this it has been suggested that the two parts of the book may have been composed at different times, the earlier part in the beginning and the later after the middle of Josiah's reign. This is possible; but the standpoint of the prophet is in both parts so much the same that it is not probable that any marked interval of time elapsed between the composition of the two. We are, however, so imperfectly acquainted with the minuter details of the history of the times that for aught we can tell there may have been seasons during the reign of Josiah when the good and the evil in the nation were so mixed that a prophet, whilst bemoaning the wickedness he saw around him, and threatening a woe on the nation because of it, might yet be inspired by the remembrance of God's dealings with his people in the past and the hope of better things for the future to give utterance to such a strain of adoration and exultant gladness as the hymn at the close of the book presents; nor is there any reason to doubt that the pious king and such men as Hilkiah the high priest, and those associated with him as "rulers of the house of God" (2 Chron. xxxv. 8), would be so in sympathy with the prophet in this that they would readily approve of his psalm being consigned to "the chief singer" to be used in the temple service. An argument in favour of assigning the date of this prophecy to the reign of Josiah has been drawn from the numerous coincidences in sentiment and phraseology between this book and those of Jeremiah and Zephaniah (cf. Hab. i. 8 with Jer. v. 6, iv. 13, and Zeph. iii. 3; Hab. i. 13 with Jer. xii. 1; Hab. ii. 9 with Jer. xlix. 16; Hab. ii. 13 with Jer. li. 58; Hab. ii. 16 with Jer. xxv. 27; Hab. ii. 20 with Zeph. i. 7, &c.); and if in these instances Jeremiah and Zephaniah have imitated Habakkuk or quoted from him, the argument must be held conclusive, for both these prophets began to prophesy in the later part of the reign of Josiah. De Wette, Hitzig, Ewald, Bleek, and others assign the prophecy to the reign of Jehoiakim; but for this there seems no good reason. (W. L. A.)

HABEAS CORPUS, in English law, is a writ issuing out of one of the superior courts, commanding the body of a prisoner to be brought before the court. There are various forms of this writ, according to the purposes for which it is intended. Thus *habeas corpus ad respondendum* is to bring up a prisoner confined by the process of an inferior court in order to charge him with a fresh action in the court above. Other forms are *ad satisfaciendum* (when judgment has been had against a prisoner in the court below), *ad faciendum et recipiendum*, or *cum causa* (to remove the proceedings into the superior court, the defendant being under arrest), *ad testificandum* (when the prisoner is wanted as a witness), &c. These forms are now of little or no importance. The most famous form of the writ is the *habeas corpus ad subjiciendum*,—the well known remedy for the violation of personal liberty. It is addressed to the person in whose custody another is detained, and commands him to bring his prisoner before the court, with a statement of the day and cause of his capture and detention,—"*ad faciendum, subjiciendum, et recipiendum*, to do, submit to, and receive whatsoever the judge or courts awarding the writ may consider on that behalf." It is described as a high prerogative writ, *i.e.*, it is one of a number of extraordinary remedies, such as *mandamus*, prohibition, and the like, which the courts may grant on proper cause being shown. The writ of *habeas corpus* issues only after motion before the court or application to a judge, made on a sworn statement of facts setting up at least a probable case of illegal confinement. It is a common law writ. "From the earliest records of the English law," says Hallam, "no freeman could be detained in prison except upon a criminal charge or conviction, or for a civil debt. In the former it was always in his power to demand of the Court of King's Bench a writ of *habeas corpus ad subjiciendum*, directed to the person detaining him in custody, by which he was enjoined to bring up the body of the prisoner with the warrant of commitment that the court might judge of its sufficiency and remand the party, admit him to bail, or discharge him, according to the nature of the charge. The writ issued of right, and could not be refused by the court."[1] *Habeas corpus* is, in fact, the appropriate instrument for enforcing the law of personal liberty, as declared in the Great Charter,—that no "freeman may be taken or imprisoned but by the lawful judgment of his peers or by the law of the land."

In Darnel's case (3 Car. I., 1627) the judges held that the command of the king was a sufficient answer to a writ of *habeas corpus*. The House of Commons thereupon passed resolutions to the contrary, and after a conference with the House of Lords the measure known as the Petition of Right was passed, which, *inter alia*, recited that, contrary to the Great Charter and other statutes, divers of the king's subjects had been imprisoned without any cause shown, and when they were brought up on *habeas corpus*, and no cause was shown other than the special command of the king signified by the privy council, were nevertheless remanded to prison, concluded "that no freeman in any such manner as is before mentioned be imprisoned or detained." In Jenkes's case, 1676, the lord chancellor (Lord Nottingham) refused to issue a *habeas corpus* in the vacation. Shortly afterwards was passed the famous Habeas Corpus Act (31 Car. II. c. 2), which is sometimes described as a consequence of the harsh if not illegal refusal of the writ in Jenkes's case, but which, as Hallam shows, was really due to the arbitrary proceedings of Lord Clarendon. The Act itself passed the Lords after many similar measures sent up by the Commons had been rejected.

The Habeas Corpus Act recites that great delays have been used by sheriffs and jailers in making returns of writs of *habeas corpus* directed to them; and for the prevention thereof, and the more speedy relief of all persons imprisoned for criminal or supposed criminal matters, it enacts in substance as follows. (1) When a writ of *habeas corpus* is directed to a sheriff or other person in charge of a prisoner, he must within 3, 10, or 20 days, according to the distance of the place of commitment, bring the body of his prisoner to the court, with the true cause of his detainer or imprisonment—unless the commitment was for treason or felony plainly expressed in the warrant of commitment. (2) If any person be committed for any crime—unless for treason or felony plainly expressed in the warrant—it shall be lawful for such person or persons (other than persons convicted or in execution by legal process) *in time of vacation*, to appeal to the lord chancellor as a judge, who shall issue a *habeas corpus* returnable immediately, and on the return thereof shall discharge the prisoner on giving security for his appearance before the proper court—unless the party so committed is detained upon a legal process or under a justice's warrant for a non-bailable offence. Persons neglecting for two terms to pray for a *habeas corpus* shall have none in vacation. (3) Persons set at large on *habeas corpus* shall not be recommitted for the same offence unless by the legal order and process of the court having cognizance of the case. (4) A person committed to prison for treason or felony shall, if he requires it, in the first week of the next term or the first day of the next session of oyer and terminer, be indicted in that term or session or else admitted to bail, unless it appears on affidavit that the witnesses for the crown are not ready; and if he is not indicted and tried in the second term or session after commitment, or if after trial he is acquitted, he shall be discharged from imprisonment. (5) No inhabitant of England (except persons contracting, or, after conviction for felony, electing to be transported) shall be sent prisoner to Scotland, Ireland, Jersey, &c., or any place beyond the seas. Stringent penalties are provided for offences against the Act. A judge delaying *habeas corpus* forfeits £500 to the party aggrieved. Illegal imprisonment beyond seas renders the offender liable in action by the injured party with treble costs and damages to the extent of not less than £500, besides subjecting him to the penalties of præmunire and to other disabilities. "The great number of those who were likely to offend against this part of the statute was," says Hallam, "the cause of this unusual severity."

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[1] *Constitutional History*, vol. iii. c. 13.

The Habeas Corpus Act, it will be seen, applies only to the case of persons imprisoned on *criminal* charges. In 1758 the question arose whether, in the case of an impressment for military service, a *habeas corpus* could be applied for under the Act, and other questions of some difficulty were raised as to its effect in particular cases. The judges who were consulted by the House of Lords differed in their opinions, and ultimately the Act 56 Geo. III. c. 100 was passed, "for more effectually securing the liberty of the subject." It enacts (1) that a writ of *habeas corpus* shall be issued in vacation time in favour of a person restrained of his liberty (except persons imprisoned for debt or by civil process)—a privilege granted by the Act of Charles II only in the case of commitments for criminal offences; (2) that though the return to the writ be good and sufficient in law, the judge shall examine into the truth of the facts set forth in such return, and if they appear doubtful the prisoner shall be bailed; (3) that the writ shall run to any harbour or road on the coast of England, although not within the body of any county. The last clause was intended to meet doubts on the applicability of *habeas corpus* in cases of illegal detention on board ship.

In Anderson's case, in 1861, the Court of Queen's Bench decided somewhat reluctantly that the writ runs to all the foreign dominions of the crown even when there are independent local judicatures. In consequence of this decision the Act 25 and 26 Viet. c. 20 was passed, enacting that "no writ of *habeas corpus* shall issue out of England, by authority of any judge or court of justice therein, into any colony or foreign dominion of the crown where her Majesty has a lawfully established court or courts of justice, having authority to grant and issue the said writ, and to ensure the due execution thereof throughout such colony or dominion."

In times of public danger it has been found necessary to suspend the Habeas Corpus Act by a special statute. This was done in 1817 by the Act empowering the king to secure and detain such persons as his Majesty shall suspect are conspiring against his person and government. More recently this extreme measure has been judged necessary in the case of Ireland (see 29 Vict. c. 1, continued for a short period by annual acts).

In the United States of America the law of *habeas corpus* has been inherited from England, and has been generally made to apply to commitments and detentions of all kinds. Difficult questions, unknown to English law, have arisen from the peculiar features of the American State-system. Thus the constitution provides that "the privilege of the writ of *habeas corpus* shall not be suspended unless when, in cases of rebellion or invasions, the public safety may require it;" and it has been the subject of much dispute whether the power of suspension under this provision is vested in the president or the congress. The weight of opinion seems to lean to the latter alternative. Again, conflicts have arisen between the courts of individual States and the courts of the Union. It seems that a State court has no right to issue a *habeas corpus* for the discharge of a person held under the authority of the Federal Government. On the other hand, the courts of the Union issue the writ only in those cases in which the power is expressly conferred on them by the constitution.

HABINGTON, WILLIAM (1605–1654), one of the most pleasing of English minor poets, was born at Hendlip in Worcestershire, on the 4th of November 1605. His father, Thomas Habington, was a prominent Catholic; to his mother, Lady Mary Habington, was attributed the revelation of the Gunpowder Plot. The poet was educated first at St Omer, and refusing to become a Jesuit was removed to Paris. On his return to England he met and fell in love with Lady Lucy Herbert, second daughter of Lord Powis, whom he celebrated under the poetical name of Castara. After some opposition he won her hand, and they were married about the year 1632. In 1634 he first published his famous volume of lyrical poems entitled *Castara*, which was reprinted in 1635 and 1640. In the latter year he also published a prose *History of King Edward IV.* and *The Queen of Arragon*, a tragi-comedy. This play was published at the request of his kinsman, the earl of Pembroke; it was afterwards revived by Samuel Butler. The last work printed by Habington was *Observations upon History*, 1641. In 1647 his father died; and during the Commonwealth, as we learn from Anthony Wood, the poet "did run with the times, and was not unknown to Oliver the usurper." He died November 30, 1654, and was buried in the family vault at Hendlip. Habington possesses all the faults of his age except its impurity; he is honourably known as the chastest of the Royalist lyrists. His genius was gently fantastic, mild in its play of fancy, delicately ingenious, and of an unruffled stately dignity. He never rises to sublimity or passion, but he is always gentleman-like and often extremely graceful. His best verses have a very modern tone, and remind the reader of the 18th rather than of the 17th century.

The works of Habington have not been collected. An excellent edition of *Castara* was published by Mr Arber in 1870, and *The Queen of Arragon* has been included in the Dodsley collection.

HACHETTE, JEAN NICOLAS PIERRE (1769-1834), an eminent French mathematician, was born at Mézières, where his father was a bookseller, on the 6th May 1769. For his early education he proceeded first to the college of Charleville, and afterwards to that of Rheims. In 1788 he returned to Mézières, where he was attached to the school of engineering as draughtsman to the professors of physics and chemistry. When twenty-three years of age he succeeded from among a number of candidates in gaining the professorship of hydrography at Colliure and Port-Vendre. While there he sent several able papers, in which some questions of navigation were treated geometrically, to Monge, at that time minister of marine, through whose influence he obtained an appointment in Paris. Thence he passed to a deputy-professorship at Mézières, and towards the close of 1794, when the École Polytechnique was established, he was chosen one of its staff, being appointed along with Monge over the department of descriptive geometry. There he instructed some of the ablest Frenchmen of the day, among them Poisson, Arago, and Fresnel. Accompanying Guyton de Morveau in his expedition, earlier in the year, he was present at the battle of Fleurus, and entered Brussels with the French army. In 1816, on the accession of Louis XVIII., he was expelled from his chair by Government, at the same time that his friend and fellow-worker Monge was removed from the Institute. He retained, however, till his death the office of professor in the faculty of sciences in the École Normale, to which he had been appointed in 1810—the same year in which he married the daughter of the physician Maugras. The necessary royal assent was in 1823 refused to the election of Hachette to the Academy of Sciences, and it was not till 1831, after the Revolution, that he obtained that well-merited honour. He died at Paris, January 16, 1834. Hachette was held in high esteem for his private worth, as well as for his scientific attainments and great public services. His labours were chiefly in the field of descriptive geometry, with its application to the arts and mechanical engineering. It was left to him to develop the geometry of Monge, and to him also is due in great measure the rapid advancement which France made soon after the establishment of the Ecole Polytechnique in the construction of machinery. His writings on descriptive geometry are still of value.

Hachette's principal works are his *Deux Suppléments à la Géométrie Descriptive de Monge*, 1811 and 1818; *Éléments de Géométrie à trois dimensions*, 1817; *Collection des Épures de Géométrie*, &c., 1795 and 1817; *Applications de Géométrie Descriptive*, 1817; *Traité de Géométrie Descriptive*, &c., 1822; *Traité Élémentaire des Machines*, 1811; *Correspondance sur l'École Polytechnique*, 1804-1815. He also contributed many valuable papers to the leading scientific journals of his time.

HACHETTE, Louis Christophe François (1800-1864), a French publisher, was born at Rethel in the Ardennes, May 5, 1800. After studying three years at a normal school with the view of becoming a teacher, he was in 1822 on political grounds expelled from the seminary. He then devoted several years to the study of jurisprudence; but in 1826 he resolved to establish in Paris a publishing business, the main object of which should be the issue of works adapted to improve the system of school instruction, or to promote the general culture of the community. The series of works which from that time were brought out by him included manuals in various departments of knowledge, dictionaries of modern and ancient languages, educational journals, and French, Latin, and Greek classics annotated with great care by the most eminent authorities. Subsequent to 1850 he, in conjunction with other partners, published a cheap railway library, scientific and miscellaneous libraries, an illustrated library for the young, libraries of ancient literature, of modern foreign literature, and of the French classics, a series of guide-books, and a series of dictionaries of universal reference. In 1856 he also founded *Le Journal pour tous*, a publication with a circulation of 100,000 weekly. There can be no question that by his efforts to circulate such a variety of wholesome and instructive literature, Hachette is entitled to rank among the greatest benefactors of his country. He also manifested great interest in the formation of mutual friendly societies among the working classes, in the establishment of benevolent institutions, and in other questions relating to the amelioration of the poor, on which subjects he wrote various pamphlets; and he lent the weight of his influence towards a just settlement of the question of international literary copyright. He died 31st July 1864.

HACKBERRY, a name given to the fruit of the *Celtis occidentalis*, L., belonging to the natural order *Ulmaceæ*. It is also known under the names of "sugar berry," "beaver-wood," and "nettle tree." The hackberry tree is of middle size, attaining from 60 to 80 feet in height, and with the aspect of an elm. The leaves are serrate, ovate, and ovate-lanceolate, with a very long tapering point, mostly glabrous above, and usually soft pubescent beneath. The small greenish flowers appear early in the spring before the expansion of the leaves. The fruit or berry, about the size of a bird-cherry, is of an obovate shape, of a reddish or yellowish colour when young, turning to a dark purple in autumn. The tree, together with other species of the same genus, is distributed through the deep shady forests bordering the river banks of New England to Wisconsin and even farther southward. The fruit has a sweetish and slightly astringent taste, and is largely eaten in the United States, and, although not officinal, has been highly recommended in cases of dysentery. The seeds contain an oil like that of almonds. The bark is tough and fibrous like hemp, the wood is hard and compact and heavy, and next to ebony and box has been spoken of as the best for durability, strength, and beauty; its tenacity and flexibility have led to its employment as shafts for carriages, hoops, &c. The root has been used as a dye for linens. The root, bark, and leaves of *C. orientalis* are employed in the East as a remedy in epilepsy.

HACO, or Hakon (*c.* 920-960), surnamed the Good, king of Norway, was the son of Harold Fairhair by a female slave, and was presented by Harold to King Athelstan of England, to mark his contempt for an insult he had received. The child was placed by a Norse warrior on Athelstan's knee, who was thus made to observe the symbol of adopting a child that was base born. Athelstan did not, however, take vengeance on the innocent cause of his anger, but brought him up as one of his own sons. On hearing of the death of Harold, he supplied Haco with men and ships, and sent him to Norway to wrest the throne from Eric, eldest son of Harold, whose violent and cruel reign had during the life of his father gained him the general hatred of his subjects. The news of Haco's arrival in Norway spread, says the saga, "like fire through dried grass." Eric at once took flight to Orkney and then to England, and Haco was chosen king at every "thing." Haco, though himself a Christian, found it impossible in his time to establish Christianity in Norway. He ruled his kingdom with great justice and prudence, and gained for it many victories over the Danes by land and sea. He was slain in a great fight against the Danes, led by the sons of Eric, about the year 960.

HACO V., surnamed the Old, king of Norway, son of Haco IV., was on the death of his father in 1204 excluded from the throne on the ground of supposed illegitimacy, and only became king in [illegible], after his mother, to establish his rights, had undergone the ordeal of fire. He greatly increased the prosperity of Norway, and he also added to his kingdom Iceland and Greenland. As he had a dispute with Alexander III. of Scotland in regard to the sovereignty of the Hebrides, he set out about 1263 on a great expedition against the west of Scotland, where he took possession of Arran and Bute, but suffered such a severe defeat at Largs that he was compelled again to put to sea. After losing many ships by storm, he sailed to Orkney, where he died in the following winter. It is supposed by some that his fleet in his voyage north passed between Skye and the mainland, and that it is from this fact that the narrow sound of Kyle Akin received its name.

For the longer account, see the *Heimskringla* of Snorro Sturleson, which, however, does not include the reign of Haco V., translated into English by Samuel Laing, London, 1844. The saga of [illegible] was published by Unger under the title *Konunga Sögur*, Christiania, 1873. The saga of [illegible] from the [illegible] of the *Fornmanna Sögur*, published at Copenhagen, 12 vols., [illegible], and translated into Danish and Latin, [illegible]. See also *Sturlunga Saga*, 2 vols., Oxford, 1878, and Carlyle's *Early Kings of Norway*, London, 1875.

HADAD, the name of a Syrian deity, is met with in Scripture as the name of several human persons; it also occurs in the compounds Benhadad, Hadadrimmon, and Hadadezer. The etymology of the word, of which Hadar, Adad, and Arad appear to be merely variants, is obscure; the divinity primarily denoted by it, however, according to Philo of Byblus (Müller, *Fr. Hist. Gr.*, iii. 569; cf. Macrob., *Saturn.*, i. 23), is the king of the gods, the greatest and highest, the sun; and these interpretations seem to point to some such radical meaning as *unus*. The Syrian kings of Damascus seem to have habitually assumed the title of Benhadad, or son of Hadad (three of this name are mentioned in Scripture), just as a series of Egyptian monarchs are known to have been accustomed to call themselves sons of Ra. The word Hadadrimmon for which the inferior reading Hadarimmon is found in some MSS., in the phrase "the mourning of (or at) Hadadrimmon" (Zech. xii. 11), has been a subject of much discussion. According to Jerome and all the older Christian interpreters, the mourning for which was held at a place called Hadadrimmon (Maximianopolis) in the valley of Megiddo is meant, the event alluded to being generally held to be the death of Josiah; but since Hitzig and Movers the opinion has been gaining ground that Hadadrimmon is merely another name for Adonis or Thammuz the autumn sun-god, the allusion being to the mournings by which the Adonis festivals were usually accompanied (Hitzig on Zech. xii. 11, Isa. xvii. 8; Movers, *Phönizier*, i. 196).

F[illegible] will be found in Baudissin, [illegible] (1876), Abh. v. Thammuz, however, [illegible] views in Herzog and Plitt's [illegible] in important [illegible] *A. T.*, pp. 161 seq., which have since been found to require correction (see [illegible], p. 47 seq.; Wellhausen's criticism of [illegible] (1877), S. 306; Schrader, *Keilin. und Geschichtsf.* (1878), pp. 371 seq., 528 seq.

HADDINGTON, or East Lothian, a maritime county of Scotland, lies between 55° 46′ 10″ and 56° 4′ N. lat. and between 2° 8′ and 2° 49′ W. long. It is bounded on the N. by the Firth of Forth, on the E. by the North Sea, on the S. by Berwickshire, on the W. by Edinburghshire. Its seaboard is 31¾ miles. Its greatest length from east to west is 25 miles, its breadth from north to south about 16 miles. Its area covers 179,142 acres (280 square miles), of which 189½ are under water, 5505 foreshore, and 142½ in "links." The general outline of the county is that of an irregular quadrilateral figure with its northern angle projecting into the sea. Along a south and-north line through the county town, the land slopes gradually up from the coast to the Garleton Hills, thence down to the Tyne valley, and then up again to the Lammermuir Hills, which occupy the southern district of the county. On the east and west the ground slopes from the Lammermuirs to the sea, but near the sea the fall is so gentle that the land has the appearance of a plain. Two almost isolated hills break the level,—North Berwick Law (612 feet) on the coast, and Traprain Law (724) in the eastern part of the Tyne valley. The chief summits of the Lammermuir Hills are Spartleton (1531), Lammerlaw (1500), and Soutra Hill (1230). The only stream of any importance is the Tyne, which, after a course of 7 miles in Midlothian, flows through the county with a gentle current north-east past the town of Haddington, and falls into the sea at Tynemouth. A very fine variety of trout is found in it; and below the rocks of the linn at East Linton salmon are occasionally caught. The Whiteadder rises in the county, and flows south-east into Berwick.

Geology and Mineralogy.—The Lammermuirs are composed chiefly of Lower Silurian strata, overlaid in part by Old Red Sandstone and conglomerate—one great mass of the latter extending south-east from Spott, with a breadth of 3 or 4 miles, across the hills into Berwickshire. Another belt of Old Red Sandstone rather more than 1 mile in breadth begins at the sea a little to the south of Dunbar, and stretches along the base of the Lammermuirs. Patches of Old Red Conglomerate occur also here and there in the Lammermuirs farther to the west, and are seen in the upper tributaries of Gifford and Humbie waters. The ground to the north of the Lammermuirs is occupied chiefly by rocks belonging to the Calciferous Sandstone and Carboniferous Limestone series of the Carboniferous formation. The Calciferous Sandstones cover a wide area west and east of Haddington, extending south to the Lammermuirs, along the base of which they trend south-west beyond the county boundary. They also appear in the lower reaches of the Tyne valley, covering a considerable area between Tynninghame Links and Bell Water. Again they are seen on the shore between Torness Point and Dunglass Burn, whence they strike inland. The hilly tract between Haddington and North Berwick is made up of various volcanic rocks of Lower Carboniferous age, such as porphyrite, dolerite, and tuff. In the western part of the county the Carboniferous Limestone series occupies an extensive area and is rich in limestones and coal-seams. This area forms the eastern margin of the Midlothian coal-field. A patch of the Limestone series also appears upon the coast about a mile south of Dunbar. Besides these bedded aqueous and volcanic rocks, there are numerous intruded masses, dykes, and veins of felstone and basalt, and some pipes of tuff and agglomerate which mark the sites of ancient volcanoes of Lower Carboniferous age. Granite is found at Priestlaw. Deposits of glacial origin are met with more or less abundantly, especially in the low-lying tracts. These consist of till or boulder-clay and mounds and sheets of sand and gravel, underneath which the older rocks are often concealed over wide areas. Alluvial deposits occur along the course of many streams, but the only considerable alluvial flats are those of the Tyne.[1]

Coal of a very fair quality is extensively worked in the west. So long ago as 1200 the monks of Newbattle obtained this mineral from Prestongrange. Limestone is found throughout the greater part of the shire. A vein of hematite of a peculiarly fine character was discovered in 1866 at the Garleton Hills, and wrought for some years; but from a variety of causes the works have been meanwhile suspended.

Climate.—The climate is on the whole mild and equable. East winds, however, prevail in the months of March, April, and May, and from the lie of the county it is exposed to their full sweep. The amount of rainfall is far below the average of Great Britain. During the period 1835-64 the average annual rainfall was 24·85 inches,—the greatest fall being 32·7 in 1836, the least 17·3 in 1842. The average monthly fall is lowest in April (1·16) and highest in August (2·57). In 1872 the rainfall reached the exceptional amount of 41·51 inches.

Agriculture, &c.—The soils are various. The Lammermuirs are of course unproductive, but the slopes to a considerable height are cultivated; and for a considerable way down the land is very good. In the centre of the county there is "a tenacious yellow clay resting upon a tilly subsoil," and this land is not well suited for agricultural purposes. Along the margin of the Firth the soil is naturally of a sandy nature, but farther inland it is composed of rich loam and is very fertile. The most productive region is the land about Dunbar. The potatoes there are very good, and under the name of "Dunbar reds" are highly esteemed in the London market, selling at times for as much as £45 an acre. From the beginning of the present century till within the past few years East Lothian agriculture has on the whole been held to be the best in Scotland. This is not so much due to the natural fertility of the soil as to the enlightened enterprise of its cultivators. Andrew Meikle here first introduced the threshing mill (1787). Tile draining was first extensively used here, and the reaping machine (now universally employed) and the steam plough were introduced at a comparatively early period of their history. The high price of grain at the time of the Crimean War gave a great impetus to farming, and in consequence rents rose as much as from 15s. to £1 per acre; this, with the increased cost of labour, which has risen 35 or 40 per cent. (about 10s. per acre) within the last seven or eight years, has sadly diminished the profits of the farmer. The size of the farms is above the average of Great Britain. The majority are from 200 to 500 acres,—a very few from 600 to 1200 acres. They are usually let on leases of nineteen years' duration. The rotation of crops is generally the six-course shift, viz., (1) grass (pasture or hay), (2) oats, (3) potatoes, turnips, or beans, (4) wheat, (5) turnips, (6) barley.

According to the agricultural returns of 1879, of the total area of 179,142 acres 115,264 acres were under cultivation, distributed as follows:—corn crops, 44,719 (wheat, 7910; barley, 19,526; oats, 15,760); green crops, 25,656 (potatoes, 9835; turnips and swedes, 14,796); clover and grass, 27,194; permanent pasture, 16,000; bare fallow, 1075. Of live stock the numbers were—

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[1] See the *Geology of East Lothian*, by Howell, Geikie, and Young, with Appendix on Fossils, by G. W. Salter. Other works are enumerated on p. 69 of this treatise.

[illegible] 2818, or 3·3 for every 100 imperial acres as against a [illegible] for Scotland of 4·2; cattle, [illegible], or 7·1 as against [illegible]; sheep, [illegible], or 34 as against 145·1; pigs, 2456, or 2·2 as against 2·7.[1] These comparatively small averages are of course explained by the fact that the county is not a pastoral one. It [illegible], however, that its flocks of Leicester sheep have for years been justly celebrated, and shorthorns of a very high [illegible].

[illegible] agriculture. A source of greater an- [illegible] persons which, in [illegible] yearly.

The [illegible] about 1s. weekly, the "grieve" or [illegible] a little more, but of this [illegible] £20 to £24 per annum is given in money. The rest is paid in kind, and [illegible], potatoes, a cow's keep, a cottage, and piece of garden. [illegible] greatly improved of late years, and are now very fair dwellings indeed. The "bothy system" is practically a thing of the past. Extra field labour is supplied by [illegible] Highland workers, who dwell in the towns, but go out during the day to work in the country. The regular [illegible] for the most part at "hiring markets," though [illegible] employed.

According to the return for 1872–73, there were [illegible] proprietors in the county owning a total 171,739 of acres, of the annual value of [illegible]. The average rental was £2, 0s. [illegible] per acre,—that of all Scotland being £1. [illegible] per cent. of the whole [illegible] owned less than 1 acre; from 1 to [illegible] acres, [illegible] and 21,000, the largest proprietors being—Marquis of Tweeddale, Yester House, [illegible] acres; Lady Mary Hamilton, Biel, 14,345; Balfour of Whittinghame, 10,564; Earl of Wemyss, Gosford, 10,136; Sir G. Grant Suttie, Balgone, 8788; Earl of Haddington, Tynninghame, [illegible]; Earl of Hopetoun, [illegible]; Hunter of Thurston, 6492; and [illegible].

[illegible]—The county is well supplied with roads. The [illegible], however, [illegible] the coast, and this, [illegible] places considerable distant [illegible].

Population, &c.—The population of the county, which is divided into [illegible] parishes, was [illegible] in 1871, [illegible] 1861. [illegible] appears that the growth [illegible] North Berwick, [illegible] watering-place, [illegible] than [illegible] which [illegible] per cent. The chief towns and villages are Haddington, the county town, [illegible]; Dunbar, [illegible]; North Berwick, [illegible]; Tranent, [illegible]; East Linton, Prestonpans, [illegible], and [illegible]. The county returns one member to parliament, and the burghs of Haddington, Dunbar, and North Berwick unite with Lauder (Berwickshire) and Jedburgh [illegible].

[illegible] Saltoun and [illegible] Tranent [illegible] Salisbury. According to the [illegible] 1875, the [illegible], [illegible] School and [illegible].

[illegible] more [illegible].

[illegible]

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[1] [illegible]

[2] [illegible]

[3] [illegible] Scott [illegible]

taken in 1298 by Edward I. and again in 1650 by Cromwell's forces; Innerwick Castle, near Dunbar; the collegiate church of Seton in the parish of Tranent, built before 1390; North Berwick Abbey, founded about the middle of the 12th century; and Tantallon Castle, opposite the Bass Rock, formerly the chief seat in the east of the Douglas family. The genius of Scott has given to Tantallon a name in English literature greater even than its fame in Scottish history, and readers of *Marmion* will also remember the name of Hobgoblin Hall, romantically situated near the village of Gifford about six miles south of the county town[3], a place connected by name and legend with all manner of popular superstitions. Of modern mansions the chief are Broxmouth Park (Duke of Roxburghe), Yester House (Marquis of Tweeddale), Tynninghame House (Earl of Haddington), Gosford and Amisfield House (Earl of Wemyss,—Gosford containing a fine collection of pictures), Lennoxlove House (Lord Blantyre), Biel and Archerfield (Lady M. Hamilton), Winton House (Lady Ruthven), and Saltoun Hall (Fletcher). A lofty column on one of the Garleton hills, erected to the memory of the fourth earl of Hopetoun, is seen from nearly every part of the county.

Of the eminent men born in or connected with the county the following may be mentioned:—Sir David Lyndsay of the Mount was born 1490 at Garleton Castle, an old keep now utterly ruinous; William Dunbar was born at Biel about 1460; [illegible], author of the *Grave*, and Home, author of *Douglas*, [illegible] Athelstaneford; David Calderwood, the historian of the Kirk of Scotland, was minister at Pencaitland, [illegible] at Gladsmuir; George Heriot, the [illegible] of James VI., is said to have been born in Gladsmuir. [illegible] Fletcher of Saltoun, Dalrymple of [illegible], Maitland of Lethington, and Hamilton of Preston belong to the county.

HADDINGTON, a royal and parliamentary burgh, and the chief town of the above county, is situated on the banks of the Tyne, about 17 miles east of Edinburgh. It occupies almost the centre of the shire to which it has given the name. It consists of two main streets, which are wide and well built,—High Street to the south and Market Street to the north; both run towards the Tyne, here crossed by three bridges, two of which connect the town with its suburb of Nungate. This suburb consists of old and ruinous houses, and is inhabited for the most part by Irish agricultural labourers. The systems of drainage and water supply are excellent, but the want of manufactures and the inconvenience of its railway branch line have prevented the growth of the burgh.

The chief edifices are the county buildings, the corn exchange, which next to that of Edinburgh is the largest in Scotland, the town house adorned with a very elegant spire 150 feet high, and the district asylum for the insane. There is a monument of some pretensions to Robert Ferguson of Raith, and a somewhat [illegible] one to the memory of Home the author of *Douglas*. The chief structure, however, is the church, an edifice probably dating from the 13th century. It is 210 feet long, and is surmounted by a square tower 90 feet high. One part is used as the parish church; the remainder, though ruinous, is now preserved with a care that makes some amends for centuries of neglect. To this church the name of *Lucerna Laudoniæ* has long been applied, but it seems probable that the edifice to which Fordun and Major applied that name was the church of the Franciscan Friars close to the Tyne, of which not a fragment now remains. The Nungate possesses the ruin of an old chapel of St Martin. The grammar school of Haddington was established at a very early period, and [illegible] by the burghal authorities. At one time it attained considerable eminence, but latterly fell into complete decay. Under the name of the Knox Memorial Institute, a very handsome school building has been erected (1879), and [illegible] incorporated. The population of the burgh in 1861 was 3874 and in 1871 4004.

Haddington is said to have been [illegible] by David I. It [illegible] a place of [illegible], for when [illegible] was an appeal [illegible] the Chamberlain [illegible] Haddington. There [illegible] III. [illegible] the English [illegible]. In 1548 it was [illegible]

[illegible] of Wilton, the English commander, but was besieged [illegible] by the Scots and French [illegible] the town. As [illegible] to [illegible] means. [illegible] At the Reformation [illegible] the most [illegible] to which the [illegible] of [illegible] was [illegible]

[illegible] Wad

HADDOCK (*Gadus æglefinus*, the *Schellfisch* of the Germans, *Égrefin* of the French), a kind of cod-fish, distinguished by a black lateral line and a blackish spot above the pectoral fin. It is common round the British and Irish coasts, and generally distributed along the shores of the North Sea, extending across the Atlantic to the coast of North America. The haddock is prone, however, to abandon for a longer or shorter period a locality frequented by it. It attains to a weight of 15 lb, and is one of the most valuable food fishes of Europe.

HADERSLEBEN (Danish, *Haderslev*), a town of Prussia, capital of a circle in the province of Schleswig-Holstein, is situated 48 miles north of the town of that name, in a pleasant valley on the Hadersleben fiord, which is about 8 miles in length and communicates with the Little Belt. The principal buildings are the beautiful church of St Mary dating from the 13th century, the theological seminary established in 1870, the gymnasium, and the hospital. The industries include iron-founding, tanning, and the manufacture of machines, tobacco, and gloves. The harbour, owing to the accumulation of mud, is only accessible to small vessels. The population in 1875, including the garrison, was 8296.

[illegible] first mentioned in 1228, and received town rights [illegible] Waldemar II. in 1292. It suffered considerably during the wars between Schleswig and Holstein in the 15th century. In [illegible] was included along with Schleswig to Prussia. Two Danish kings, Frederick II. and Frederick III., were born at Hadersleben.

HADES. See Pluto and Eschatology.

HADJI KHALFA. See Hajji Khalfa.

HADRAMAUT. See Arabia.

HADRIAN, Roman emperor (117–138 A.D.), distinguished for the peace and beneficent energy of his government, was born at Rome 76 A.D. His full name was Publius Ælius Hadrianus; his ancestors, originally from Picenum, had been settled at Italica in Spain since the time of the Scipios. He lost his father at the age of ten, and was placed under the guardianship of Trajan, a cousin of his father and also a native of Italica, who was already a conspicuous man in the Roman army. We know little of Hadrian's youth; but he gave early promise of the readiness and versatility which distinguished him in later life, for he was so ardent a student of Greek that men nicknamed him Græculus. At fifteen he entered on the practical career of war and government which befitted a Roman, and grew fond of the chase even to excess. Patronized by Trajan and assisted by powerful friends he rose rapidly, filling successively all the civil and military offices, which now, as under the republic, were open to young men of good birth. On Trajan's elevation to the empire Hadrian was the first to congratulate him. He served with distinction in both the Dacian campaigns; in the latter Trajan presented him with the ring he had received from Nerva, a proof of his regard which justified him in aspiring to be his successor. If Trajan was not always favourably disposed towards Hadrian, the good will of the empress Plotina never failed him, and was particularly helpful in some of the most critical turning points of his career. She it was who secured his alliance with Sabina, granddaughter of the emperor's sister, a marriage, however, which proved anything but happy. She, it was thought, did him still more effectual service at Trajan's death, even determining the question of the succession in his favour. When that emperor returned from his victorious war in Parthia, the succession was still undecided; and we are assured on the express testimony of Dion Cassius that Plotina and her friends concealed his death for several days in order to facilitate the elevation of Hadrian. Whatever may have been the truth of such stories, Hadrian's claim to the empire rested on the unquestionable fact that he was the fittest man. His position as prefect of Syria, and commander of the legions with which Trajan had prostrated the Parthian empire, made him supreme in the army, while his peaceful disposition and civil demeanour must have made him acceptable to the senate. Yet he was not unconscious of the insecurity of his position; for he hastened to propitiate the army by a donation of twice the usual amount, and to excuse his abrupt elevation to the senate by alleging the impatient zeal of the soldiers and the welfare of the state, which could not exist without an "imperator." The first important act of Hadrian was to abandon the late conquests of Trajan, and again to make the Euphrates the eastern boundary of the empire. At his elevation the provinces were unsettled, and the barbarians on the frontier restless and menacing. He was convinced that the old limits of Augustus offered the most defensible frontier, and that the energy of the emperor was sufficiently occupied in governing the provinces already won. This policy of renunciation was ascribed to jealousy of Trajan; but history has recognized its wisdom. While arranging the affairs of the East, Hadrian had an opportunity of pardoning some eminent citizens who were accused of hostility to him, and after his return to Rome he confirmed his popularity by many gracious acts. Modestly declining the honours heaped upon himself, he carefully rendered the last offices to the deceased emperor, and considerably lightened the burdens of the citizens. During an absence in Mœsia, where he had gone to compose some troubles with the Sarmatæ and Roxelani, a formidable conspiracy was formed against him. The details are obscure; but four consular men, among the most eminent of Rome, were accused of being concerned in it, and were put to death. Some, however, went so far as to say that the conspiracy was a scheme devised by Hadrian for getting rid of dreaded rivals. It was a dark transaction which threw a suspicion on his character. On his return to Rome he exerted himself to undo the evil effects of it by a generous and popular policy. Towards the senate he expressed the utmost deference and consideration; he admitted the most eminent of its members to familiar intercourse, raised them to the highest honours, and supplied the indigent with means to maintain their position. He was equally liberal to the body of the people, granting them a large donation of money, remitting the arrears of taxes for the last fifteen years, and increasing the funds which Trajan had devoted to the alimentation of poor children. These measures of Hadrian might be criticized as the calculating policy of one who felt his position to be insecure, and who could afford to be generous to the city out of the revenues of the empire. But such a theory could not apply to what is most characteristic in his rule,—his unwearying care for the provinces and for the empire as a whole. He understood the true task of a Roman emperor better perhaps than any of his predecessors. More clearly than any of them he saw that the period of conquest was past, that an extension of the frontiers would only weaken the defensive power of the empire, that the time for consolidation and for softening the distinction between Rome and the provinces was come. While Trajan had been guilty of the anachronism of rivalling Alexander the Great, Hadrian made it the work of his life to become acquainted with the provinces, to learn their needs and resources, to improve and benefit them; he sought to be the effective ruler of the empire as a whole, and so was the first to realize the cosmopolitan task which his position imposed. For this end he sought to obtain a personal knowledge of the people he had undertaken to govern. Leaving Rome in 119, he visited probably every province of the empire. After traversing Gaul he inspected the legions on the Rhine, and then crossed to Britain, where he built (121) the great rampart from the Tyne to the Solway which bears his name. He returned through Gaul into Spain, and then proceeded to Mauritania, where he suppressed an insurrection. We next find him in the East averting a war with Parthia by a timely interview with the king. From the Parthian frontier he travelled through Asia Minor and the islands to Athens, where he sojourned a considerable time, and so returned by Sicily to Rome, having made the circuit of the empire. After some stay at Rome he resumed his travels. It is impossible to fix the details of this second progress with any exactness. It was chiefly in the East; and he did not finally return to Rome till 134. Everywhere he left lasting traces of his restless and beneficent energy: he built aqueducts and temples, and raised fortifications in suitable places; he inspected the details of the administration, learned to know the officials, and made himself at home in the military encampments. He was accompanied by a body of architects and artizans organized like a legion, whom he employed to gratify his passion for building in a truly imperial manner. Athens was the favoured scene of his architectural labours; he added a new quarter to the city, and finished the temple of the Olympian Zeus. While Hadrian spent his life in inspecting the provinces, and was not disinclined to purchase peace by a subsidy to the restless tribes on the frontiers, he did not neglect the army. All along the frontier his legions stood in constant preparation for battle. He maintained a rigorous discipline; the rules he drew up for the army long served as a kind of military code. He trained them to the severest exercises, and anticipated all complaint by sharing in their fatigues, walking bareheaded on a march of 20 miles a day, and partaking of their coarse fare of cheese, lard, and sour wine. The only important war in which this army was tested was the great rebellion of the Jews, which broke out in 131, and lasted for several years. The founding of a Roman colony on the site of Jerusalem, and an order of Hadrian forbidding the rite of circumcision, were the causes of the war. The Jews fought with the most resolute despair, and they were crushed only by a powerful army commanded by the best general of the empire. According to Dion, 580,000 Jews fell in battle. The whole country was reduced to a wilderness. But the loss of the Roman legions was so severe that in writing to the senate Hadrian omitted the customary formula:—"If you and your children are well, it is well; I and the army are well." In the later years of his life Hadrian discontinued his travels, and lived at Rome or near it. His health, which had been impaired by long exposure to the extremes of heat and cold, began to fail; and, what was worse, the dark and suspicious moods which had broken out occasionally in his earlier years became more frequent and fatal. His aged brother-in-law Servianus fell a victim to his jealousy; his wife Sabina died, not without a rumour of poisoning. Most of those who had been his familiar friends, and had been raised by him to the highest offices, were superseded, or banished, or put to death. But his passion for architecture did not abate. He built for his residence the great villa of Tibur, which was eight miles in circuit, and was a kind of epitome of the world, with miniatures of the most celebrated places in the provinces, and even of Hades. He built a splendid mausoleum, which has been the nucleus of the castle of St Angelo, and rebuilt several edifices at Rome. In these years he had to choose a successor. His first choice was Ælius Verus, who did nothing to justify such a distinction. The next was Antoninus Pius, so called from the filial assiduity with which he cherished the last days and the memory of his adopted father. Antoninus saved him from suicide, to which his physical sufferings impelled him, and from imbruing his hands in the blood of many noble Romans, who had provoked his moody and fickle temper. Hadrian died at Baiæ, 138 A.D. The cruelty of his latter life had so eclipsed the lustre of his early rule that the senate at first refused him divine honours, and were prevailed upon to grant them only at the urgent solicitation of Antoninus. In the travels and administrative energy of Hadrian we see only one side of his character. He had a versatile and many-sided mind, in which the faculty for command, speculative curiosity, and literary ambition were strangely blended. Not satisfied with the toils imposed on the laborious autocrat of the world, he sought to excel the Greek professors and artists each in his own special work. In painting, sculpture, and music, in rhetoric and philosophy, he considered himself the competent rival and critic of men who had made these pursuits the work of a lifetime. The architect Apollodorus atoned for his frankness with his life. The more politic Favorinus, when reproached for yielding too readily to the emperor in some grammatical discussion, replied that it was unwise to dispute with the master of thirty legions. The product of Hadrian's pen which has been most celebrated is the dying address to his soul:—

"Animula vagula, blandula,
Hospes comesque corporis,
Quae nunc abibis in loca
Pallidula, rigida, nudula;
Nec, ut soles, dabis jocos?"

Under Hadrian Salvius Julianus composed a "perpetual edict," which is supposed to have been a fixed code of some kind, but the exact significance of the edict is disputed. Still there can be no doubt that Roman law owes much to Hadrian.

The sources for Hadrian's life are unsatisfactory; the chief are Spartianus in the *Scriptores Historiæ Augustæ* and Dion Cassius as abridged by Xiphilinus, lib. lxix. See also Aurelius Victor, *De Cæsaribus*, and Eutropius. For modern works consult Merivale's *History of the Romans under the Empire*; Gregorovius, *Kaiser Hadrian*; and W. W. Capes's *Age of the Antonines*, in the series *Epochs of Ancient History*. (J. R.)

HADRIAN, WALL OF. It is under this heading that it seems most convenient to give a short account of the stone wall and other works erected by the Romans in the north of England between the Solway and the Tyne, and commonly known as the Roman Wall. As will be afterwards seen, those who have written on the subject are by no means agreed that the name of Hadrian ought to be exclusively associated with this great fortification. But before touching on the question, it is necessary to describe the works themselves.

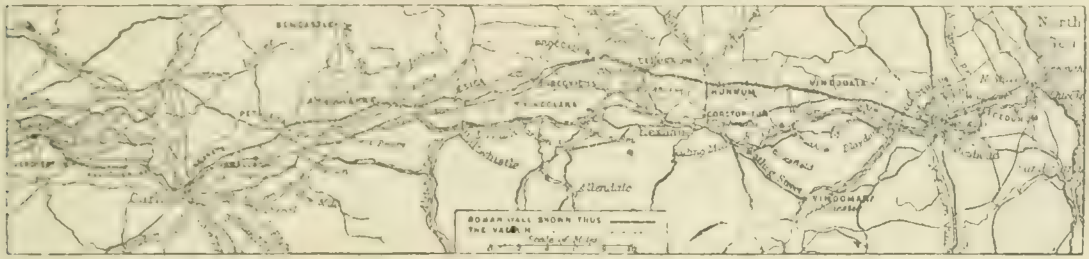
Viewed as a whole the Roman Wall, when entire, consisted of three parts:—(1) a stone wall, strengthened by a ditch or fosse, at a short distance from its northern base; (2) three parallel earthen walls, with a ditch sloping down from the northern side of the second of these lines; (3) stations, castles, and turrets, placed at various intervals for the accommodation of troops, and communicating with one another by a military way.

The Murus or stone wall extended from Wallsend on the Tyne to Bowness on the Solway Firth, a distance of [illegible] 73½ English miles. No portion of it now remains as when erected, so that its original height cannot be accurately determined. Bede gives 12 feet, an estimate that one of the best modern authorities on the Wall, Dr J. Collingwood Bruce, deems too low, for some parts of its course at least. Its thickness varies, being 6 feet in some places and 9½ in others.

The northern face of the Wall was continuous, but the southern had numerous offsets and insets, as if portions of the work had been carried on at the same time but without definite instructions as to a uniform breadth. In this way when sections met differences in width often showed themselves, though the junction was so managed that the irregularity was confined to one face. It is not improbable that a similar discretion was allowed as regards height. Both sides consisted of blocks of freestone 8 or 9 inches thick, 10 or 11 broad, and from 15 to 20 long. These had been sometimes quarried near the spot, sometimes brought from considerable distances. The interior was filled with rubble firmly cemented with mortar of a peculiar tenacity. In pursuing its course from sea to sea, the Wall seldom deviated from the shortest and straightest course it could take, and then only with the evident design of seizing neighbouring elevations that would otherwise have commanded its position. Along the whole length of its northern base, and adding greatly to its strength as a defensive work, was drawn a ditch or fosse of varying breadth and depth, 36 and 15 feet respectively being probably its average dimensions. In some places the difficulties to be overcome by its excavators, owing to the rocky nature of the soil, must have been enormous in an age when blasting with gunpowder was unknown. But none of them have been shunned.

South of the Murus ran the earth wall or Vallum, consisting, as has been already stated, of three ramparts and a ditch. Of these ramparts the most northerly was raised at a distance from the base of the stone wall varying, according to the nature of the country, from 30 yards to half a mile. Time and the spoiler have dealt so hardly with it that its original dimensions cannot now be accurately stated. It seems, however, to have been about 20 feet broad at the base and at least 10 feet high. The materials of which it was made up consisted of earth largely intermixed with fragments of stone of all sizes and shapes. 24 feet or so farther south was a ditch apparently somewhat inferior in breadth and depth to the ditch of the Murus, though otherwise of the same character. On its southern edge was a rampart much smaller in size than the one just noticed, while the series was completed by a third mound, approaching in its dimensions the larger of the other two, and raised at nearly the same distance as it from the centre of the included ditch.

Along the wall, at intervals averaging 4 miles, were stationary camps strongly fortified. According to the *Notitia Utriusque Imperii*, which contains a brief record of the civil and military arrangement of the empires of the East and West, and is supposed to have been compiled in the beginning of the 5th century of our era, there were 23 such stations. The names given are as follows:—Segedunum (Wallsend), Pons Ælii (Newcastle). Condercum (Benwell Hill), Vindobala (Rutchester), Hunnum (Halton Chester), Cilurnum (Chesters), Procolitia (Carrawburgh). Borcovicus (Housesteads), Vindolana (Chesterholm), Æsica (Great Chesters), Magna (Carvoran), Amboglanna (Birdoswald), Petriana, Aballaba, Congavata, Axelodunum, Gabrosentum, Tunnocelum, Glannibanta, Alione, Bremetenracum, Olenacum, and Virosidum. It is somewhat strange that not a trace of one of these names survives in the local vocabulary of the present day, though the exact positions of a number of the stations have been identified beyond all doubt by other means. The sites had been chosen with great care, and much labour must have been expended in their construction. They were in fact military cities, "suited," to use the words of Dr Bruce, "to be the residence of the chief who commanded the district, and providing secure lodgment for the powerful body of soldiery he had under him." It is not clear, however, that more than 18 of the 23 were situated *per lineam valli*, the others being probably supporting stations. The Wall was further strengthened by quadrangular buildings called mile-castles as well as by smaller watch towers or sentry-boxes of stone; while connecting the whole was a military way made in Roman fashion and protected by the other parts of the fortification. By means of this road the garrisons of the different stations could be quickly and safely concentrated on any point along the line that was threatened by an enemy. "It is sometimes asked," remarks the authority just quoted, "How long would the Wall be in building? From calculations that have been made, founded upon the experience gained by the construction of the vast works connected with modern railways, it is considered that, in the existing circumstances of the country at the time, the *Vallum* and the *Murus* could not be reared in a shorter period than 10 years. The cost of it in our present currency would be about £1,000,000. Above 10,000 men would be required to garrison its stations" (*Wallet Book of the Roman Wall*, p. 37).



Plan of Hadrian's Wall.

Several of the ancient writers allude to ramparts and lines of forts raised by the Romans across the island during the time they had a footing in it. Of these notices some refer to the barrier on the isthmus of the Forth and Clyde (see ANTONINUS, WALL OF, vol. ii. p. 139); the others probably apply to the more important works now described. In his *Agricola* Tacitus states that the Roman general during his operations in the north of England (79 A.D.) compelled many states hitherto hostile to lay down their arms and surrounded them with garrisons and castles A hundred years later two contemporary historians, Dion Cassius (as abridged by Xiphiline) and Herodian, writing of events in Britain that occurred in their own day, both notice—the former in two places—the existence of a wall in Britain separating the Roman territory from the unconquered tribes that dwelt beyond; but neither of them mentions when or by whom it was built. Another century onwards and Spartian, one of the *Scriptores Historiæ Augustæ*, states that the emperor Hadrian was the first to rear a wall across Britain (*circa* 120 A.D.) as a defence against the northern barbarians. It was, he adds, 80 miles in length. The same author in his life of Severus tells us that emperor also raised a wall from sea to sea (*circa* 208 A.D.). Aurelius Victor, who flourished about the year 360 A.D., ascribes to Severus the building of a wall in Britain, employing almost the words of Spartian; while his contemporary, Eutropius, makes a similar statement, adding, however, that this rampart was 32 (according to another reading, 132) miles long, and erected for the defence of certain portions of the country, which Severus had reconquered for Rome. Another possible wall-builder is introduced to us in the early years of the 5th century by the poet Claudian, who represents Britain as indebted to Stilicho, the successful general of the emperors Theodosius I. and Honorius, for some protection of this nature against the attacks of the Scots, Picts, and Saxons. Lastly, Gildas, our earliest native historian, asserts that the Britons themselves built a wall to aid them in warding off the assaults of the Picts and Scots, and that another was constructed by the Romans with native assistance, just before their final abandonment of the island. Both statements are repeated by Bede, who identifies the former of these structures with Antonine's wall and the latter with the more famous fortification near his own monastery of Jarrow.

Founding on such unsatisfactory if not conflicting data, modern writers have been led to give various answers to the questions—When and by whom was the Roman Wall built? The limits of the present article do not admit of any discussion of the subject, and those who wish to see these questions fully examined, as well as to read an account of the inscriptions and other antiquities discovered from time to time along the line of the Wall, are referred to the list of works given below, more especially to Dr J. C. Bruce's exhaustive treatise. For others the following summary may be sufficient.

Gordon, to whom we owe one of the earliest surveys of the Wall, is of opinion that the Vallum was the work of Hadrian, and the Murus of Severus. Horsley believed that the stations and the northern rampart of the Vallum were raised by Agricola, the ditch of the Vallum and its remaining mounds by Hadrian, and the stone wall with its castles, towers, and its great military way by Severus. Dean Merivale, while admitting that camps and mounds may have been erected at these times by Hadrian and Severus, supposes that the stations were lined with masonry and the work planned as we now see it by Theodosius, his designs being afterwards fully carried out about 400 A.D. by Stilicho, or under his command from Gaul. But others, and foremost among them Dr Bruce, see in the fortification a unity of design that points it out as the product of one period and one mind, and have come to the conclusion that Hadrian was the builder of the whole. This view, while it does not exclude the probability that he may have worked to some extent on lines already laid down by Agricola, and that Severus, when entering on his northern campaign, against the Caledonians, or after its close, repaired and strengthened the works of his predecessor, seems most consistent with the statements of ancient writers, with the testimony of inscriptions, and with the appearances presented by the relative position of the component parts of the fortification itself.

Gordon, *Itinerarium Septentrionale*, London, 1727; Horsley, *Britannia Romana*, London, 1732; Hutton, *History of the Roman Wall*, London, 1802; Hodgson, *History of Northumberland*, Newcastle, 1840; Maclauchlan, *Memoir written during a Survey of the Roman Wall*, made in the years 1852-54; Bruce, *The Roman Wall*, 3d ed., London, 1867. (J. M'D.)

HADRUMETUM, or ADRUMETUM (the name appears in the Greek writers in a great variety of forms—Ἀδρύμη, Ἀδρύμης, Ἀδρύμητος, Ἀδραμύττος, Ἀδράμητος), a city on the African coast of the Mediterranean on the Sinus Neapolitanus or Gulf of Hamamet. A Phœnician colony of earlier date than Carthage, in course of time it became subservient to the imperial city, and fell along with it under the power of the Romans. On the subdivision of the Roman province of Africa Propria, it became the capital of Byzacium. By Trajan it was made a colony, as is evidenced by the grandiloquent inscriptions preserved by Gruter—*Col. Concordia Ulpia Trajana Augusta Frugifera Hadrumetina*. From the devastation inflicted by the Vandals it was restored by Justinian, and in consequence it bore for some time the name of Justinianopolis.

The identification of Hadrumetum is a matter of some difficulty. Most modern authorities agree in fixing it at Susa, but others contend that Hamamet is the true site. Hitherto no inscription has been discovered which satisfactorily settles the point in favour of either; for the fragments that are appealed to for the identification of Hamamet with Siagitis may possibly have been brought to the place of their discovery. The arguments in favour of each may be thus summarized. Susa agrees remarkably well, as Mannert elaborately maintains, with the position assigned to Hadrumetum by the *Notitia* and other ancient works in which the distances from place to place are given. The remains of ancient buildings, though few, prove undoubtedly that Susa is the site of some city of considerable importance, and the ruins now known as [illegible] or the Fallen may be those of a great temple. We know that in the time of El-Bekri Susa still possessed a cothon or inner harbour, one of the chief features of Hadrumetum as described by the author of the *African War*, which may be recognized in the existing sandy plain 1700 feet wide between the two ancient moles, now distinguished as the Quarantine Mole and Pointe du Mole. The figures found by M. Daux (*Journ. Asiat.*, 1869) would of themselves have suggested that Susa was a Phœnician colony. Barth suggests that the name Susa is probably a corruption of Σώζουσα. In favour of Hamamet Mr J. F. Davis argues that the scenery near Susa agrees with that of Ruspina described by the author of the *African War*; that the absence of ruins at Hamamet is accounted for by the clouds of sand swept down upon the site; that there are clear traces of a cothon at Hamamet; and that the modern name Hamamet or Tent of Death corresponds exactly with the hypothetical Hahamuth or Chamber of Death of the Phœnicians. On the whole the argument appears to be on the side of Susa.

For further details see Barth, *Wanderungen durch die Küstenländer des Mittelmeeres*, 1849; Guérin, *Voyage archéologique dans la Régence de Tunis*, 1862; Nathan Davis, *Ruined Cities*, 1862; Maltzan, *Reise in den Regentschaften Tunis und Tripolis*, 1870.

HÆMORRHOIDS (from αἷμα, blood, and ῥέω, to flow), commonly called piles, a frequent and distressing malady. Two varieties are described. They are named from their situation external and internal, as they are without or within the opening of the anus. The external pile is an overgrowth of the thin dark-coloured skin round the opening; there is most frequently more than one present; they are, when not inflamed, lax and in folds. The internal pile arises from within the opening, although it may appear externally protruding through the anus when any pressure from above is applied, as when the patient strains at stool. It is covered by, and composed of an overgrowth of, the mucous membrane lining the bowel. There may be several internal piles. The internal pile is sessile or pedunculated. The external pile is of a pale colour. The internal pile is moist, vascular, and of a deep-red colour; it is apt to inflame, and then it swells and becomes tense, with heat, pain, and general uneasiness. Ulceration and bleeding are common symptoms of the internal pile, hence the term "bleeding" as opposed to "blind" piles. Both varieties are primarily due to the same primary cause, an enlargement of the veins in this region. Any cause which, by pressure on the large abdominal veins, retards the upward flow of blood to the heart will give rise to piles; such are constipation, disease of the liver, pregnancy. General weakness, involving a want of tone in the blood vessels may act as a predisposing cause. The exciting cause is frequently exposure to damp, as from sitting on the wet ground. Piles are only a symptom, and in their treatment this should be kept in view; remove the cause and the piles will disappear. The local treatment is palliative or radical. The palliative treatment consists in attention to the state of bowels, cold bathing, astringent injections, lotions, and ointments. The radical treatment consists in their removal; the external pile is cut off, the internal pile is tied or clamped and cauterized. Both methods have their advocates; the radical treatment should not be undertaken until palliative treatment has failed. When in a state of inflammation the treatment consists in hip baths, hot fomentations, and poultices. The introduction of a morphia suppository often relieves the uneasiness. Both varieties are often met with in the same individual; when this is the case both should be removed by operation at one time. The internal piles are apt to return if the predisposing cause is still in existence. Piles are apt to be confounded with other surgical diseases in this region, as fissure or ulcer, prolapse, polypus, or cancer. This is not the place to point out the distinguishing features of these different maladies; the patient should consult a surgeon. There is a form of pile situated just at the verge of the anus, where the skin joins the mucous membrane: its onset is sudden, and due to the rupture of a blood-vessel; the blood is extravasated and clots; a small, tense, painful swelling of a bluish colour is seen at the edge of the anus. This may be relieved by hot fomentations, or the pile may be laid open and the clot turned out by gentle pressure.

HÁFIZ. Muhammed Shamsuddin, better known by his *takhallus* or "nom de plume" of Háfiz, was one of the most celebrated writers of Persian lyrical poetry. He was born at Shiraz, the capital of Fars, in the early part of the 8th century of the Mahometan era, that is to say, in the 14th of our own. The exact date of his birth is uncertain, but he is known to have attained a ripe old age and to have died in 791 A.H. (1388 A.D.). This is the date given in the chronogram which is engraved on his tomb, although several Persian biographers give a different year. Very little is actually known about his life, which appears to have been passed in quiet retirement and literary ease in his native city of Shiraz, of which he always speaks in terms of affectionate admiration. He was a subject of the Muzaffar princes, who ruled in Shiraz, Yazd, Kirman, and Ispahan, until the dynasty was overthrown by Timur-lang (Tamerlane). Of these princes his especial patrons were Shah Shujá' and Shah Mansúr. He early devoted himself to the study of poetry and theology, and also became learned in mystic philosophy, which he studied under Shaikh Mahmúd 'Attár, chief of an order of dervishes. Háfiz afterwards enrolled himself in the same order and became a professor of Kuranic exegesis in a college which his friend and patron Haji Kiwám uddín, the vizier, specially founded for him. This was probably the reason of his adopting the *sobriquet* of Háfiz, which means "one who remembers," and is technically applied to any person who has learned the Koran by heart. The restraints of an ascetic life seem to have been very little to Háfiz's taste, and his loose conduct and wine-bibbing propensities drew upon him the severe censure of his monastic colleagues. In revenge he satirizes them unmercifully in his verses, and seldom loses an opportunity of alluding to their hypocrisy and religious pretensions. Háfiz's fame as a poet was soon rapidly spread throughout the Mahometan world, and several powerful monarchs sent him presents and pressing invitations to visit them. Amongst others he was invited by Mahmúd Shah Bahmani, who reigned in the south of India, and set off with the intention of sojourning at the court of that sovereign. After crossing the Indus and passing through Lahore he reached Hurmuz, and embarked on board a vessel sent for him by the Indian prince. He seems, however, to have been a bad sailor, and, having invented an excuse for being put ashore, made the best of his way back to Shiraz. Some biographers narrate a story of an interview between Háfiz and the invader Timur. The latter sent for him and asked angrily, "Art thou he who was so bold as to offer my two great cities Samarcand and Bokhara for the black mole on thy mistress's cheek," alluding to a well-known verse in one of his odes. "Yes, sire," replied Háfiz, "and it is by such acts of generosity that I have brought myself to such a state of destitution that I have now to solicit your bounty." Timur was so pleased at the ready wit displayed in this answer that he dismissed the poet with a handsome present. Unfortunately for the truth of this story Timur did not capture Shiraz till 1393 A.D., while the latest date that can be assigned to Háfiz's death is 1391. Of his private life little or nothing is known. One of his poems is said to record the death of his wife, another that of a favourite unmarried son, and several others speak of his love for a girl called *Shákh i Nabát*, "Sugar-cane branch," and this is almost all of his personal history that can be gathered from his writings. He was, like most Persians, a Shiah by religion, believing in the transmission of the office of Imam, or head of the Muslim Church in the family of Ali, cousin of the prophet, and rejecting the *Hadith*, or traditional sayings of Mahomet, which form the Sunneh or supplementary code of Mahometan ceremonial law. One of his odes which contains a verse in praise of Ali is engraved on the poet's tomb, but is omitted by Sudi, the Turkish editor and commentator, who was himself a rigid Sunni. The same sectarian bigotry has influenced many other editors, and it is no unusual thing to find an Indian edition of the *Díván* emasculated by the excision of all the passages which can be construed as having the slightest allusion to the objects of Shiah veneration. That his tendencies were towards a rather extravagant and heretical form of theosophy may be deduced from his writings, and in one verse he even goes so far as to speak in terms of admiration of one Mansúr of Halláj who was hanged, after being put to the most horrible tortures, on a charge of blasphemy, 309 A.H. This person professed a creed nearly approaching pure pantheism, and went about asserting that he was himself an incarnation of the omnipresent divinity, saying, *Ana 'l Hakk*, "I am the Truth!" Háfiz in allusion to this says that his only fault was that he revealed the mystery. These heretical opinions and the dissipated life of the poet caused difficulties to be raised by the ecclesiastical authorities on his death as to his interment in consecrated ground. The question was at length settled by Háfiz's own works, which had then already begun to be used as they are now throughout the East for the purposes of divination, in the same manner as Virgil was employed in the Middle Ages for the divination called *Sortes Virgilianæ*. Opening the book at random after pronouncing the customary formula asking for inspiration, the objectors hit upon the following verse—"Turn not away thy foot from the bier of Háfiz, for though immersed in sin, he will be admitted into Paradise." He was accordingly buried in the centre of a small cemetery at Shiraz, now included in an enclosure called the Háfiziyeh.

His principal work is the *Díván*, that is, a collection of short odes or sonnets called *ghazals*, and consisting of from five to sixteen *baits* or couplets each, all the couplets in each ode having the same rhyme in the last hemistich, and the last couplet always introducing the poet's own *nom de plume*. The whole of these are arranged in alphabetical order, an arrangement which certainly facilitates reference but makes it absolutely impossible to ascertain their chronological order, and therefore deteriorates from their value as a means of throwing light upon the growth and development of his genius or the tendency of his career. These "orient pearls at random strung," as a version of a passage from Hafiz in Sir William Jones's grammar calls them, are often held together by a very slender thread of continuous thought, and very few editions agree exactly in the order of the couplets which form the individual ghazals. Still, although they often appear at first sight extremely disconnected, a careful study of them, especially from the point of view indicated by the Sufiistic system of philosophy, will always show that a single idea does run throughout the whole. The nature of these poems has been the subject of much discussion in the West, some scholars seeing in their anacreontic utterances nothing but sensuality and materialism, while others, following the Oriental school, maintain that they are wholly and entirely mystic and philosophic. Something between the two would probably be nearer the truth. It must be remembered that Hafiz was a professed dervish and Sufi, and that his ghazals were in all probability published from a *tekkeh*, and arranged with at least a view to Sufiistic interpretation. At the same time it is ridiculous to suppose that the glowing imagery, the gorgeous and often tender descriptions of natural beauties, the fervent love passages, and the roystering drinking songs were composed in cool blood or with deliberate ascetic purpose. The beauty of Hafiz's poetry is that it is natural. It is the outcome of a fervent soul and a lofty genius delighting in nature and enjoying life; and it is the poet's misfortune that he lived in an age and amongst a people where rigid conventionality demanded that his free and spontaneous thoughts should be recast into an artificial mould.

The system of philosophy professed by Persian poets and dervishes, and in accordance with which the poems of Hafiz are allegorically interpreted, is called Sufiism (*Tasawwuf*). It is derived usually from the word *suf*, which in Arabic means wool, and is supposed to refer to the woollen robes worn by the dervishes, although it is in all probability connected with the Greek *σοφός*. It is the ultimate outcome of the protest of the conquered Aryan nations against the laws, ceremonials, and ideas of their Semitic conquerors, which first found expression in the schism of the Shiahs, that is, of the Persian party who sided with the family of Ali ibn Abi Talib, cousin and son-in-law of Mahomet, against the claims of Moawiyeh, who at the head of the Arab party claimed and held the caliphate. Forced by events to accept el Islam, and compelled to forsake the Magian and Zoroastrian faiths, the Persian Shiahs rapidly developed a system which, while teaching openly the unity of God according to Moslem doctrine, secretly theorized and refined upon it, until Pantheism became the esoteric religion of the sect. It teaches that God is the only real existence and that all other existences are hypothetical, that God created and ordered the universe merely by His Will and by the utterance of the word "Be." The "Will" or "Order" and the "Be" are closely allied to the "Spirit" and "Word" of Christian theology. Man, the highest product of the creation, is therefore part and parcel of the Deity, and when sufficiently purified from the lower and grosser elements returns to his source again. The circle of existence thus traversed is looked upon as a road which all must travel, and that image is kept up throughout the terminology of the sect. Thus the doctrine is spoken of as *tarik*, the student or disciple is the *salik* (wayfarer), and the different stages of perfection are [illegible] stations, or inns. And since all differences in sect and religion are immaterial to the illuminated philosopher who is initiated into this mystery, and as the contemplation of the divinity of his own existence and of his ultimate reabsorption into and part and parcel of the Deity produces ecstasy and mental exaltation, and inasmuch as everything that is beautiful, lovable, and pure is a purer and clearer manifestation of the Deity that runs through all,—therefore the Sufis speak of their real worship as paganism, their real devotion as love and drunkenness, and see a divine mystery in every phase of beauty in humanity or inanimate nature.

Besides the *Divan*, Hafiz wrote a number of other poems; the largest edition of his works contains 573 ghazals forming the *Divan*, 42 kit'ahs or fragments, 69 rubá'is or tetrastichs, 6 masnavis or poems in rhymed couplets, 2 kasidas, or panegyrics, and one [illegible] poem in [illegible] stanzas. [illegible] contains several [illegible] poems [illegible]. His works have never been completely translated into English; a few rhyming versions of single poems by Sir William Jones, Nott, Hindley, Falconer, &c., are to be found scattered through the pages of the *Oriental Miscellany* and other periodicals, and a small volume containing a verse rendering of the principal poems by the late H. Bicknell was published by Trübner and Co. (London, 1875). A prose version of a hundred selected odes was also published anonymously by Williams & Norgate (London, 1875). In the German the principal versions are by Von Hammer Purgstall; a charming and rhythmical translation of a large portion of Hafiz's works by Von Rosenzweig (Vienna, 3 vols. 8vo, Vienna, 1858), which contains also the Persian text and notes; *Die Lieder des Schems-eddin Mohammed Hafis*, by Nesselmann (Berlin, 1865), in which the rhyming system of the original is preserved. For further information the reader may consult D'Herbelot, *Bibliothèque Orientale*, article "Hafez;" Sir William Ouseley's *Oriental Collections* (3 vols. 4to, London, 1797-98); *Specimens of Persian Poetry, or Odes of Hafez*, by John Richardson (London, 1802); *Biographical Notices of Persian Poets*, by Sir Gore Ouseley (Oriental Translation Fund, 1846); and an excellent article by Professor E. B. Cowell in *Macmillan's Magazine* (No. 177, July 1874). The best edition of the text is perhaps that edited by Hermann Brockhaus of Leipsic, 1854, which is based on the recension of the Turkish editor Sudi, and contains his commentary in Turkish on a considerable portion of the *Divan*. (E. H. P.)

HAGEDORN, FRIEDRICH VON (1708-1755), one of the most distinguished German poets in the earlier half of last century, was born April 23, 1708, at Hamburg, where his father was Danish minister at the court of Lower Saxony. The father, a man of scientific and literary tastes, possessed a valuable library of French literature, and dabbled also in the science of alchemy. Having by this and other means lost a great part of his fortune, he died in 1722, leaving in poor circumstances a widow and two sons, of whom the poet was the elder. He was educated at the gymnasium of Hamburg, and went later (1726) to study jurisprudence at Jena. Shortly after his return to Hamburg in 1729, he obtained the appointment of private secretary without salary to the Danish ambassador in London, where he lived till 1731, and published two small works in English. His return to Hamburg was followed by a period of great poverty and hardship, a scanty income being derived from the posts which he held in the Hamburg cathedral and among the mining population in Klausthal. In 1733 Hagedorn became secretary to the so-called "English court" in Hamburg, a trading company founded in the 13th century, and formerly known as "Die Societät der Aventurier Kaufleute." He shortly afterwards married, and from this time, with a settled income and sufficient leisure to pursue his literary occupations, led a pleasant and congenial existence, surrounded by friends and admirers, till his death, at the early age of forty-seven, October 28, 1755.

Hagedorn is known as the author of satirical, didactic, and moral verses, epigrams, odes, fables, and songs. His popularity during his lifetime was great. Although he held himself aloof from any poetical school, he nevertheless exercised an important influence on the German poetry of his time, for, besides being a learned man and well-read in the ancient and modern classics, he was a profound admirer of French literature, the study of which gained for him an ease and melody before unknown in German versification. He has been called the originator in Germany of the modern song, and some of his *Lieder* were set to music by the favourite composers of his day. His popularity, however, is now long past. His learning and his style have been eclipsed by later and greater poets, and he who was at one time the "allgemeine Bewunderung von Deutschland" now ranks only among the secondary German classics.

The first collection of Hagedorn's poems was published at Hamburg, shortly after his return from London in 1729, under the title *Versuch einiger Gedichte, oder erlesene Proben poetischer Nebenstunden*. In 1738 appeared *Versuch in poetischen Fabeln und Erzählungen*; in 1747 a collection of his lyric poems, under the title *Sammlung neuer Oden und Lieder*; and his *Moralische Gedichte* in 1750. A collection of his entire works was published at Hamburg after his death in 1754, and a second edition in 1757. The best is Eschenburg's edition, 5 vols., 1800, republished, with Hagedorn's correspondence, in 1825. See C. H. Schmid, *Biographie der Dichter*.

HAGEN, a town of Prussia, at the head of a circle in the Arnsberg government of Westphalia, is situated at the confluence of the Ennepe with the Volme, and at the junction of several railways, 26 miles W.S.W. from Arnsberg. It is the seat of a provincial office, a circle court, a chamber of commerce, a state railway commission, and an agricultural union. It has two Evangelical churches, a Catholic church, an Old Catholic church, a synagogue, a real school of the first order, a royal provincial trade school, a higher female school, and two infirmaries. Hagen is one of the most flourishing commercial towns in Westphalia, and possesses puddling works for iron and steel, iron foundries, cast-steel works, a large cotton print work, woollen and cotton factories, manufactures of leather, paper, tobacco, and iron and steel wares, breweries, and distilleries. There are large limestone quarries in the vicinity, and also an alabaster quarry. The population in 1875 was 24,335, or including Althagen 26,570.

HAGEN, Friedrich Heinrich von der (1780–1856), distinguished for his researches in Old German literature, was born at Schmiedeberg in Brandenburg, 19th February 1780. After studying law at the university of Halle, he obtained a legal appointment in the state service at Berlin, but in 1806 he resigned this office in order to devote himself exclusively to the study of his choice. In 1810 he was appointed professor extraordinarius of German language and literature in the university of Berlin, in the following year was transferred to a similar professorship in Breslau, and in 1821 returned to Berlin as professor ordinarius. He died at Berlin, 11th June 1856. To Hagen belongs the chief merit of awakening an interest in Old German poetry, of which he published several collections.

His principal publications are the *Nibelungenlied*, of which he issued four editions, the first in 1810 and the last in 1842; the *Minnesinger*, Leipsic, 1838-52, 5 vols.; *Lieder der alten Edda*, Berlin, 1812; *Altnordische Lieder und Sagen*, Breslau, 1814; a collection of Old German tales under the title *Gesammtabenteuer*, Stuttgart, 1850, 3 vols. He also published *Ueber die ältesten Darstellungen der Faustsage*, Berlin, 1844; and from 1835 he edited the *Jahrbuch der Berlinischen Gesellschaft für deutsche Sprache und Alterthumskunde*.

HAGENAU, the chief town of a circle and canton in Alsace-Lorraine, Germany, district of Lower Alsace, is situated in the middle of the Hagenau Forest, on the Moder, and on the railway from Strasburg to Weissenburg, 10 miles N.N.E. of the former town. It has two ancient Catholic churches, one dating from the 12th the other from the 13th century, a gymnasium, a reformatory for boys, a female penitentiary, a public library, a hospital, and a theatre. The principal industries are wool and cotton spinning, and the manufacture of porcelain, earthenware, soap, leather, oil, and beer. There is also considerable trade in hops, vegetables, and wine. Population (1875), 11,786.

Hagenau dates from the beginning of the 12th century, and owes its origin to the erection of a hunting lodge by the dukes of Swabia. Frederick Barbarossa surrounded it with walls and gave it a constitution. On the site of the hunting lodge he founded an imperial palace, in which were preserved the jewelled imperial crown, sceptre, imperial globe, and sword of Charlemagne. Subsequently the town obtained imperial rights, and after the extinction of the Hohenstaufens it was made the capital of the bailiwick of Lower Alsace. In 1648 it came into the possession of France, and in 1673 Louis XIV. caused the fortifications to be razed. In 1675 it was captured by imperial troops, but in 1677 it was retaken by the French and nearly all destroyed by fire. In 1871 it came, along with the rest of Alsace-Lorraine, into the possession of Prussia.

HAGENBACH, Karl Rudolf (1801–1874), distinguished as a church historian and as an expounder of the so called "Vermittelungstheologie," or mediation theology of Germany, was born March 4, 1801, at Basel, where his father, a man of considerable talent and scientific repute, was a practising physician. His preliminary education was received at a Pestalozzian school, and afterwards at the gymnasium, whence in due course he passed to the newly reorganized local university. Carefully brought up within a church in which the strictest orthodoxy still continued to hold undisputed sway, familiar at the same time from boyhood with his father's expressions of approval of the principles of the French Revolution, himself of an ardent, sympathetic, inquiring, and devout temperament, he early devoted himself to theological studies and to the service of the church, while at the same time cherishing and developing broad "humanistic" tendencies which found expression in many ways and especially in an enthusiastic admiration for the writings of Herder. The years 1820–23 were spent first at Bonn, where Lücke exerted a powerful influence on the formation of his opinions, and afterwards at Berlin, where Schleiermacher, and still more Neander, became permanently his masters. Returning in 1823 to Basel, where De Wette had recently been appointed to a theological chair, he distinguished himself greatly by his "habilitationsschrift" or trial-dissertation, entitled *Observationes historico-hermeneuticæ circa Origenis methodum interpretandæ sacræ Scripturæ*; in the following year he became professor extraordinarius, and in 1829 professor ordinarius of theology. Apart from his special academic labours during many years in connexion with the history of dogma and of the church (which first owed to him their recognition as distinct branches of study at Basel), he lived a life of great and varied usefulness as a theologian, a preacher, and a citizen; and at his "jubilee" in 1873, not only the university and town of Basel but also the various churches of Switzerland united to do him honour. He died at Basel, June 7, 1874.

Hagenbach was a voluminous author in many departments (as will be seen from the list of his works which is given below), but it is as a writer on church history that he is specially distinguished, and is likely to be longest and most widely known. Though neither so learned and condensed as the contributions of Gieseler, nor so original and profound as those of Neander, his lectures are written with remarkable clearness and attractiveness, and are deservedly appreciated at once for their warm glow of sympathy with his subject and for their entire freedom from narrow sectarian prejudice. In dogmatics, while avowedly a champion of the "mediation theology" based upon the fundamental conceptions of Herder and Schleiermacher, he was much less revolutionary in his aims and in his results than were many others of his school. To the last he sought to maintain the old confessional documents, and to make the objective and churchly prevail over the purely subjective manner of viewing theological questions. But he himself was aware that in the endeavour to do so he was not always successful, and that his delineations of Christian dogma often betrayed a vacillating and uncertain hand. His works include a remarkably clear *Tabellarische Uebersicht der Dogmengeschichte* (1828); *Encyclopädie u. Methodologie der theol. Wissenschaften* (1833); *Vorlesungen über Wesen u. Geschichte der Reformation u. des Protestantismus* (1834-43); *Lehrbuch der Dogmengeschichte* (1840-41, 5th ed., 1867; English transl., 1850); *Vorlesungen über die Geschichte der alten Kirche* (1853-55); *Vorlesungen über die Kirchengeschichte des Mittelalters* (1860-61); *Grundlinien der Homiletik u. Liturgik* (1863); also biographies of Œcolampadius and Myconius and a *Geschichte der theol. Schule Basels* (1860). His *Predigten* have been published in nine volumes (1858-75), and he is also author of two volumes of poems entitled *Luther u. seine Zeit* (1838), and *Gedichte* (1846). The lectures on church history under the general title *Vorlesungen über die Kirchengeschichte von der ältesten Zeit bis zum 19ten Jahrhundert* have been recently reissued in seven volumes (1868-72).

HAGERSTOWN, a city and township of Maryland, United States, capital of Washington county, is situated near the west bank of Antietam creek, 20 miles from its confluence with the Potomac river, and at the junction point of three railways, 86 miles W.N.W. by rail from Baltimore. It is a well-built town with very few wooden houses, and possesses a fine new court-house, a male and a female academy, and a national and a state bank. It depends for its prosperity chiefly on agriculture, and has flour-mills, bone-mills, machine shops, and a tannery, and considerable trade in agricultural produce. The population in 1850 was 3884; in 1860, 4132; and in 1870, 5779, of whom 869 were coloured.

HAG-FISH, GLUTINOUS HAG, or BORER (*Myxine*), a marine fish which forms with the lampreys one of the lowest orders of vertebrates (*Cyclostomata*). Similar in form to a lamprey, it is usually found within the body of dead cod or haddock, on the flesh of which it feeds after having buried itself in the abdomen. When caught, it secretes a thick glutinous slime in such quantity that it is commonly believed to have the power of converting water into glue. It is occasionally found in the North Atlantic and other temperate seas of the globe.

HAGGAI, the tenth in order of the minor prophets. The name Haggai (חגי, Greek Ἀγγαῖος, whence Aggeus in the English version of the Apocrypha) is usually held to be an adjective meaning *festive*. But Wellhausen[1] is probably right in taking the word as a contraction for Hagariah (*Jehovah hath girded*), just as Zaccai (Zacchæus) is known to be a contraction of Zechariah (*cf.* Derenbourg, *Histoire de la Palestine*, pp. 95, 150).

The book of Haggai contains four short prophecies delivered between the first day of the sixth month and the twenty-fourth day of the ninth month—that is, between September and December—of the second year of Darius the king. The king in question must be Darius Hystaspis, who came to the throne 521 B.C. Scaliger, Drusius, and other older writers think of Darius Nothus (*acc.* 424 B.C.); but this is impossible, since in chap. ii. 3 Haggai speaks of old men as still alive who had seen the first temple in its splendour before 587 B.C.[2] The language of the prophet suggests the probability that he was himself one of those whose memories reached across the seventy years of the captivity, and that his prophetic work began in extreme old age. This supposition agrees well with the shortness of the period covered by his book, and with the fact that Zechariah, who began to prophecy in the same autumn and was associated with Haggai's labours (Ezra v. 1), afterwards appears as the leading prophet in Jerusalem (Zech. vii. 1–4). We know nothing further of the personal history of Haggai from the Bible. Later traditions may be read in Carpzov's *Introductio*, pars 3, cap. xvi. On the mention of Haggai in the titles of several psalms in the Septuagint (Psalms cxxxvii., cxlv. cxlviii.) and other versions, see Kœhler's *Weissagungen Haggai's*, p. 32. These titles are without value, and moreover vary in MSS. Eusebius did not find them in the Hexaplar Septuagint.[3]

In his first prophecy (i. 1–11) Haggai addresses Zerubbabel and Joshua, rebuking the people for leaving the temple unbuilt while they are busy in providing panelled houses for themselves. The prevalent famine and distress are due to God's indignation at such remissness. Let them build the house, and God will take pleasure in it and acknowledge the honour paid to Him. The rebuke took effect, and the people began to work at the temple, strengthened by the prophet's assurance that the Lord was with them (i. 12–15). In a second prophecy (ii. 1–9) delivered in the following month, Haggai forbids the people to be disheartened by the apparent meanness of the new temple. The silver and gold are the Lord's. He will soon shake all nations and bring their choicest gifts to adorn His house. Its glory shall be greater than that of the former temple, and in this place He will give peace. A third prophecy (ii. 10–19) contains a promise, enforced by a figure drawn from the priestly ritual, that God will remove famine and bless the land from the day of the foundation of the temple onwards. Finally, in ii. 20–23, Zerubbabel is assured of God's special love and protection in the impending catastrophe of kingdoms and nations to which the prophet had formerly pointed as preceding the glorification of God's house on Zion. In thus looking forward to a shaking of all nations Haggai agrees with earlier prophecies, especially Isa. xxiv.–xxvii., while his picture of the glory and peace of the new Zion and its temple is drawn from the great anonymous prophet who penned Isa. lx. and lxvi. The characteristic features of the book are the importance assigned to the personality of Zerubbabel and the almost sacramental significance attached to the temple. The hopes fixed on Zerubbabel, the chosen of the Lord, dear to Him as His signet ring (*cf.* Jer. xxii. 24), are a last echo in Old Testament prophecy of the theocratic importance of the house of David. In the book of Zechariah Zerubbabel has already fallen into the background and the high priest is the leading figure of the Judean community.[4] The stem of David is superseded by the house of Zadok, the kingship has yielded to the priesthood, and the extinction of national hopes gives new importance to that strict organization of the hierarchy for which Ezekiel had prepared the way by his sentence of disfranchisement against the non-Zadokite priests.

If his attitude to Zerubbabel forms a link of connexion between Haggai and the prophets before the captivity, his post-exile standpoint is characteristically marked in the central importance which he attaches to the temple. The prophets who spoke under the shadow of the first temple held quite another language.[5] To Isaiah and Jeremiah the religion of Israel and the holiness of Jerusalem have little to do with the edifice of the temple. The city is holy because it is the seat of Jehovah's sovereignty on earth, exerted in His dealings with and for the state of Judah and the kingdom of David. The proof that Jehovah's throne is in Jerusalem lies in the history of what He has done for His people, or, if a visible pledge is needed, it must be sought not in the temple but, in accordance with antique ideas, in the ark (Jer. iii. 16) or in the altar with its sacred flame (Isa. xxix. 1, xxxi. 9).[6] But, in the desolation of Jerusalem, the extinction of the political life with which all religion had till then been inseparably bound up gave a new meaning to the old prophetic doctrine that the service of Jehovah is the true vocation of Israel, a new significance to the ruined temple and all its ordinances of worship. "The holy and beautiful house where our fathers praised Thee" (Isa. lxiv. 11) was a chief thought of the sorrowing exiles (Lamentations, *passim*), and to one anonymous writer the Lord's vengeance on Babylon appears eminently as vengeance for His temple (Jer. l. 28). The great prophet of the captivity—the author of Isa. xl.–

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[1] In Bleek's *Einleitung*, 4th ed., p. 434.

[2] Darius Nothus [illegible] Ezra iv. 6–23 [illegible] The Rabbinical [illegible] of history make Darius [illegible]

[3] [illegible]

[4] After the foundation of the temple Zerubbabel disappears from history, and lives only in legend, which continued to busy itself with his story, as we see from the apocryphal book of Esdras (*cf.* Derenbourg, *Histoire de la Palestine*, chap. ii.).

[5] Compare for example Jer. vii.

[6] Haggai (ii. 14) attaches no value to altar and sacrifice so long as the temple is unbuilt.

xvi.—pictures the Israel of the restoration no longer as an earthly state but as a world-priesthood, a mediatorial people gathered round the sanctuary and holding forth amidst the nations the true pattern of the knowledge and service of the living God till all the ends of the earth shall look to Him and be saved. Under the limitations of the old dispensation neither seer nor people could separate the realization of this great conception from the restoration of the visible centre of Israel's worship in the temple at Jerusalem. The prophet had pointed to Cyrus by name as the rebuilder of Jerusalem and the founder of the temple (Isa. xliv. 28; lii. 11); and the captives whose hearts were touched by his burning words, and who availed themselves of the decree of that monarch (536 B.C.) to repeople the desolate places of Judah, looked for the speedy advent of the time when the glory of Jehovah displayed in His house on Zion should draw to Jerusalem the willing homage of all nations (Isa. lvi.; lx. 7; lxvi. 1-6). The actual experiences of the returning exiles fell as far short of these bright hopes as the Israel of Zerubbabel and Joshua fell short of the ideal regenerate nation to which the prophet had promised the heritage of Jehovah's glory. Scarcely was a settlement effected when difficulties and misfortunes began to thicken about the little colony. The anger of the Lord seemed still to rest on Jerusalem and the cities of Judah (Zech. i. 12), whose inhabitants soon ceased to find favour from the Persian court, and had to struggle with penury and famine as well as with the hostility of their neighbours. Amidst such discouragements the first zeal soon grew cool, and the work of rebuilding the sanctuary lay practically untouched till Haggai arose sixteen years later.

What had actually been effected during these years for the restoration of the temple is a question of some difficulty. It seems safest to start from the explicit contemporary evidence of Hag. ii. 18 (*cf.* ii. 15 and Zech. viii. 9) which gives the ninth month of the second year of Darius—after Haggai had begun to preach—as the date when the temple was founded by Zerubbabel and Joshua. On the other hand, the book of Ezra, in its present shape as edited and partly composed by the much later author who wrote Chronicles, conveys the impression that large gifts for the temple were offered by the leading Jews on their first return (Ezra ii. 68, 69), that the foundation of the house was laid by Joshua and Zerubbabel in the second year of the return (ch. iii.), and that the work was thereafter interrupted by the opposition of the Jews' enemies till the reign of Darius. It appears probable, however, that the Chronicler has somewhat dislocated the order of events, especially by taking the official correspondence in ch. iv. to refer to the temple, whereas it really refers to the building of the city-walls. This oversight might readily involve the antedating of the foundation ceremony described in iii. 8-13, which seems to be identical with that which Haggai speaks of, since the actors are the same, and the chief feature in the description which does not belong to the usual liturgical scenery of the Chronicler recalls Hag. ii. 3, Zech. iv. 7-10. Again, the verses Ezra ii. 68, 69 seem really to refer to a collection made in the time of Nehemiah, having been transcribed from a history of that period (part of which is preserved in the canonical book of Nehemiah) along with the ancient list which occupies the first part of Ezra ii. But they are not part of the list, as appears from a comparison of Ezra ii. 62-iii. 1 with Neh. vii. 64-viii. 1. If this criticism is just, the Tirshatha of Ezra ii. is Nehemiah, not Zerubbabel, and the usual arguments for identifying the latter with Sheshbazzar—whom Cyrus, according to an Aramaic source preserved in Ezra v., appointed governor and charged with the restoration of the temple—fall to the ground.[1] Sheshbazzar was presumably a Persian official; and the first hope of the Jewish colony, in accordance with Isa. xliv. 28, lx. 10, was, no doubt, that the Persians would effect the restoration without effort of theirs. This hope was frustrated, Sheshbazzar presumably having taken up his task with the usual conscientiousness of an Oriental governor, that is, having done nothing, though the work was nominally in hand all along (Ezra v. 16). The advancement of Zerubbabel to the governorship may have given Haggai his opportunity.

In the confused state of the chronology of the book of Ezra it may also be a question when the Samaritans sought to join the Jews and were repulsed. That the relation of Ezra iv. 1-4 is historical seems to be established against objections which have been taken to it by the reference to Esarhaddon, which A. v. Gutschmidt has vindicated by an ingenious historical combination with the aid of the Assyrian monuments (*Neue Beiträge*, p. 145). Compare also Jer. xli. 5 for the antiquity of the Samaritan claim to worship with the Jews. But from Ezra v., and especially from Zech. iii., it may be questioned whether the opposition of the Samaritans arose before the time of Haggai and Zechariah. See on the whole question Schrader, "Die Dauer des zweiten Tempelbaues," in the *Studien und Kritiken*, 1867.

Such indifference to the undertaking which held a chief place in the first ardour of the returning exiles had a deeper significance than at once occurs to our modern habits of thought. The restoration of the temple and its worship was connected in every mind with the doctrine that the service of Jehovah was the true national vocation of Israel, and the apathy that Haggai rebukes showed the people to have forgotten in the struggle for material welfare their ideal calling as the nation of the true God. His reproofs touched the conscience of the Jews, and the book of Zechariah enables us in some measure to follow the course of a religious revival which, starting with the restoration of the temple, did not confine itself to matters of ceremony and ritual worship. On the other hand, Haggai's treatment of his theme, practical and effective as it was for the purpose in hand, moves on a far lower level than the aspirations of the great evangelical prophet who inspired the people at their first return. To the latter the material temple is no more than a detail in the picture of a work of restoration eminently ideal and spiritual, and he expressly warns his hearers against attaching intrinsic importance to it (Isa. lxvi. 1). To Haggai the temple appears so essential that he teaches that while it lay waste the people and all their works and offerings were unclean (Hag. ii. 14). In this he betrays his affinity with Ezekiel, who taught that it is by the possession of the sanctuary that Israel is sanctified (Ezek. xxxvii. 28). In truth the new movement of religious thought and feeling which started from the fall of the Hebrew state took two distinct lines, of which Ezekiel and the anonymous prophet of Isa. xl.-lxvi. are the respective representatives. While the latter developed his great picture of Israel the mediatorial nation, the systematic and priestly mind of Ezekiel had shaped a more material conception of the religious vocation of Israel in that picture of the new theocracy where the temple and its ritual occupy the largest place, with a sanctity which is set in express contrast to the older conception of the holiness of the city of Jerusalem (*cf.* Ezek. xliii. 7 *seq.* with Jer. xxxi. 40, Isa. iv. 5), and with a supreme significance for the religious life of the people which is expressed in the figure of the living waters issuing from under the threshold of the house (Ezek. xlvii.). It was the conception of Ezekiel which permanently influenced the citizens of the new Jerusalem, and took final shape in the institutions of Ezra. To this consummation, with its necessary accompaniment in the extinction of prophecy, the book of Haggai already points.

Exegetical Helps.—The elaborate and valuable German commentary of A. Kohler (Erlangen, 1860) forms the first part of his work on the *Nachexilische Propheten*. Reinke's *Commentary* (Munster, 1868) is the work of a Roman Catholic. Haggai has generally been treated in works on all the prophets, as by Ewald (2d ed., 1868; Eng. trans., vol. iii., 1878); or along with the other minor prophets, as by Hitzig (3d ed., Leipsic, 1863), Keil (1866; Eng. trans., Edinburgh, 1868), and Pusey (1875); or with the other post-exile prophets as by Koehler, Pressel (Gotha, 1870), Dods (1879), and others. The older literature will be found in books of introduction or in Rosenmüller's still useful *Scholia*. The learned commentary of Marckius may be specially mentioned. On the place of Haggai in the history of Old Testament prophecy, see Duhm's *Theologie der Propheten* (Bonn, 1875). (W. R. S.)

HAGUE, The (in Dutch, *'s Gravenhage* or *den Haag*, in French, *La Haye*; and in Modern Latin, *Haga Comitis*), a town of the Netherlands, in the province of South Holland, 13 miles N.W. of Rotterdam, 10 miles S.W. of Leyden, and 2 miles inland from the German Ocean. It is connected with both Rotterdam and Leyden by the "Holland Railway," and with Utrecht by the railway of the Rhine. Besides being the chief town of the province, the Hague is the usual residence of the court, and the seat of the Government, the states-general, the high council of the Netherlands, the council of state, the chamber of accounts, and various other administrative bodies. The characteristics of the town are quite in keeping with its political position. It is "the handsomest, the most fashionable, and the most modern looking" town in the Netherlands. D'Amicis rightly describes it in his *Olanda* as half Dutch half French. Broad and regular streets, extensive avenues and drives, and spacious squares well planted with trees, are the main features of its general plan; large and beautiful buildings are numerous; and the population consists for the most part of Government officials and members of the nobility, the army, and the navy. A good idea of the place is obtained by passing along the Vijverberg or Fishpond Hill, which takes its name from the large basin of water which it skirts, the Voorhout, and the Willemspark, next through Java Street and Sumatra Street, and then the Buitenhof or Outer Court, the Binnenhof or Inner Court, the Plein, the Kneuterdijk, and the Groote Markt. Willemspark was laid out by King William II., and in 1863 it was chosen as the site of the national monument in memory of the recovery of independence in 1813, executed by Wayen, Pieterszen, and Koelman. The Plein, a square bordered with the offices of the various ministers and the high council, is adorned with a statue of William I., the "father of our people," by Louis Royer; an equestrian statue of the same prince, by the count of Nieuwerkerke, is placed in front of the royal palace; and there is a statue of William II. by Georges in the Buitenhof.

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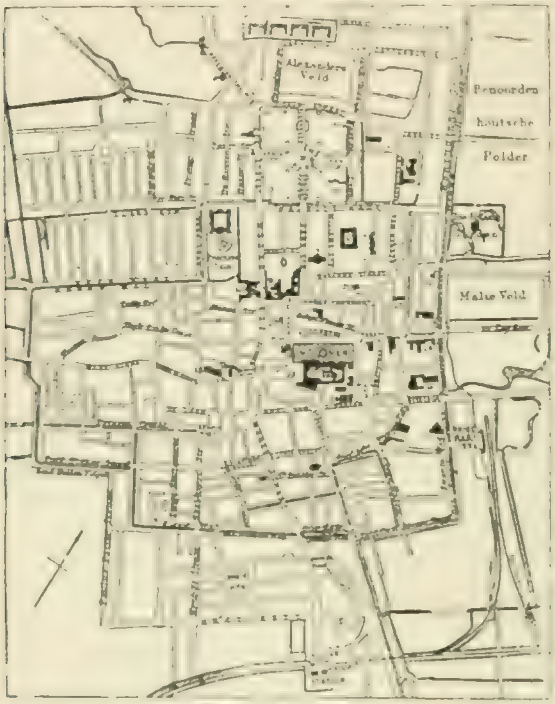
[1] Ezra ii. 2 seems to show that at the return Zerubbabel was merely one of the Jewish elders. The opposite impression is due solely to the punctuation.



Plan of the Hague.

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The centre of the Hague, both historically and topographically, is the buildings of the court. The oldest portion was founded by Count William II., "king of the Romans," in 1249. A handsome Gothic building, with towers at each corner of the façade, contains the great or knights' hall, a noble chamber 130 feet in length, 62 feet in breadth, and 69 in height, in which the states of the Netherlands abjured their allegiance to Philip II. of Spain, and in front of which the grey-headed Olden-Barneveldt lost his life in 1619. To the south-east of the hall is the troonzaal, or throne room, in which the second chamber of the states-general holds its sittings; and to the west is the meeting-place of the first chamber. The archives of the kingdom and several Government offices are in the same range of buildings. The royal palace proper was purchased by the states of the Netherlands in 1595, rebuilt by Prince William III., and extended by King William I. The palace of the prince of Orange was founded about 1720 by Count Unico William of Wassenaar Twickels; the palace of Prince Frederick of the Netherlands dates from 1825 to 1826; the palace of Prince Henry was erected in 1743 for the deputies of Rotterdam; and the palace of Prince Alexander was in the 17th century the house of John de Witt, pensionary of the council. Among the public institutions of the Hague, the following are the most important:—the royal library, with upwards of 100,000 volumes, and a collection of manuscripts, coins, and gems, erected between 1734 and 1738; the Museum Meermanno-Westreenianum, comprising books, manuscripts, maps, plates, pictures, antiquities, and curiosities; the royal picture gallery in the Prins-Mauritz-Huis, which was founded in 1633 by Prince John Maurice of Nassau-Siegen, governor of Brazil; the Vijverberg hôtel, with a collection of curiosities; the town museum of antiquities and modern art; the zoological gardens, founded in 1862; the royal school of design and music; and the new buildings for the arts and sciences, erected in 1874. Of the fourteen churches of the Hague five belong to the Dutch Reformed communion, six to the Roman Catholics, and one to the Old Catholics; one is Episcopalian, one German Evangelical, and two Apostolical. There are also two synagogues and one Greek chapel. Architecturally the Groote Kerk, under the patronage of St James, is the most noteworthy; it is 300 feet long by 154 broad, and has a lofty tower and spire; in the interior are the sepulchral monuments of James Baron of Wassenaar Obdam, a Dutch naval hero, of Gerrit of Assendelft, and of Philip, landgrave of Hessen-Philipsthal. The Willemskerk was a present of William III. to the Reformed community of the Hague.

The principal industries of the town are iron-casting, copper and lead smelting, cannon founding, the manufacture of furniture and carriages, silk-dyeing, liqueur-distilling, lithographing, and printing. In 1622 the population of the Hague was only 17,430; in 1732 it was estimated at 34,000; in 1796, inclusive of the inhabitants of Scheveningen,—a watering place now connected with the town by a tramway line,—it was 41,266; in 1811, 42,150; in 1830, 56,105; in 1840, 58,521; and in 1850, 66,329. In 1860 it was 78,405, and in 1870, 91,328. At the last date 52,600 belonged to the Dutch Reformed Church, 27,486 were Roman Catholics, 3471 Dutch Jews, and 148 Portuguese Jews. In 1874 the total was stated at 94,895.

The Hague is mentioned as early as 1097 in a document by Count Floris II., and seems originally to have been a hunting lodge of the counts of Holland. Under William II. it became a residence of the court, and by the 15th century it began to be called a town, though, till the time of Louis Napoleon, it was [illegible] designated as a village. In 14[illegible] the princess Mary of Burgundy [illegible] the place [illegible] in 15[illegible] it was the scene of the [illegible] of Johannes Pistorius, [illegible] of Woerden; in 1528 it was [illegible] by the [illegible]; and in 1572, 1573, and 1574 it was laid waste by the Spaniards. Restored by William l in 1576, it was in 1584 the seat of the sessions of the States of Holland. Fosses were constructed round the town in 1620. In 1672 it was the scene of the famous assassination of the brothers De Witt. It was at the Hague that the convention was arranged in 1710 between the German emperor, the king of Prussia, the emperor of Russia, and the maritime powers, for the maintenance of the neutrality of North Germany; it was at the Hague that the Triple Alliance of 1717 was concluded, and that the peace of the same year was signed between Spain, Savoy, and Austria. From 1782 to 1787 the town had its full share in the civil disturbances of the country. In 1808 it was made the seat of the Government administrative offices.

See *Guide ou Nouvelle Description de la Haye*, The Hague, 1785; *Description sommaire de la ville de la Haye*, The Hague, 1823; *[illegible] door en in den omtrek van 's Gravenhage*, The Hague, 1832; *Gezigten van 's Gravenhage*, Amsterdam, 1845; *Petit Guide de la Haye*, The Hague, 1860; *La Haye et Scheveningue photographiés*, The Hague, 1860.

HAHN, August (1792-1863), German Protestant theologian, was born March 27, 1792, at Grossosterhausen near Eisleben, and after attending the Eisleben gymnasium, entered the university of Leipsic as a student of theology in 1810. After holding an educational appointment in Wittenberg for some time, he in 1819 was nominated professor extraordinarius of theology at Königsberg, and in the following year received a pastoral charge and a superintendency in that city. These posts, however, he soon resigned on his promotion in 1821 to be professor ordinarius. In 1826 he removed as professor of theology to Leipsic, where, hitherto distinguished only as editor of Bardesanes, Marcion, and Ephraem Syrus, he came into extraordinary prominence as the author of a treatise, *De rationalismi qui dicitur vera indole et qua cum naturalismo contineatur ratione* (1827), and also of an *Offene Erklärung an die Evangelische Kirche zunächst in Sachsen u. Preussen* (1827), in which he endeavoured to convince the rationalists that it was their duty voluntarily and at once to withdraw from the national church. In 1833 Hahn was called to Breslau as theological professor and consistorial councillor, and in 1844 he became "general superintendent" of the province of Silesia. He died at Breslau on May 13, 1863. Though uncompromising in his "supranaturalism," he did not altogether satisfy the men of his own school by his own doctrinal system. The first edition of his *Lehrbuch des christlichen Glaubens* (1828) was freely characterized as lacking in consistency and as detracting from the strength of the old positions in many important points. Many of these defects, however, he is considered to have remedied in his second edition (1857). Among the other literary labours by which Hahn is best known are his edition of the Hebrew Bible (1833) and his *Bibliothek der Symbole und Glaubensregeln der apostolisch-katholischen Kirche* (1842; 2d ed. 1877). A volume of *Predigten* was published in 1852.

HAHN, Johann Georg von (1810-1869), an Austrian traveller, to whom we are indebted for most of our knowledge about the Albanians, was born at Jena in 1810. After travelling for some time under the auspices of the Vienna academy, he entered the Austrian consular service, in which he rose to be consul-general in Greece. He died at Jena 23d September 1869. In his great work *Albanesische Studien* (Jena, 1854), he treats at once of the geography, the history, the archæology, the linguistic affinities, and the folk-lore of this remarkable country and people; and the book at once took rank as a scholarly and authoritative production. He had previously (1851) published *Bemerkungen über das Albanesische Alphabet* (Vienna, 1851). In 1858 he undertook a journey along with Major F. Zach from Belgrade to Saloniki (Thessalonica), for the purpose mainly of ascertaining the feasibility of constructing a railway from the Danube to the Ægean; and an account of their experiences was published in the *Denkschriften der Kaiserl. Akademie der Wissenschaften zu Wien, Phil. Hist. Klasse*, Bd. xi., Vienna, 1861. This paper, reprinted in 1871, contained valuable matter in regard to the Albanians, and especially in regard to their geographical distribution. Another journey undertaken in 1863 furnished material for a second contribution to the *Denkschriften* (*Phil. Hist. Klasse*, 1867)—"Reise durch die Gebiete des Drin und Wardar." Since the author's death a large work has appeared under the title of *Sagwissenschaftliche Studien* (Jena, 1872-73), in which he deals learnedly with numerous questions in comparative mythology.

HAHNEMANN, Samuel Christian Friedrich (1755-1843), the founder of the homœopathic system of medicine, was born at Meissen in Saxony, 10th April 1755. He studied first at the "elector's school" of Meissen, and thereafter as a student of medicine at Leipsic and Vienna. He took the degree of M.D. at Erlangen in 1779, and after acting as physician at various places he returned in 1789 to Leipsic, where he largely occupied himself in the translation of medical works. While working at Cullen's *Materia Medica*, he was struck by the contradictory account given of the properties of Peruvian bark. He had previously meditated much on the unsatisfactory nature of the science of medicine; and, after much reflexion and many experiments, he became convinced of the truth of the principle *similia similibus curantur* (see Homœopathy), *i.e.*, the cure for a disease is the very drug that would in a healthy person produce the symptoms of such disease. Further experiments convinced him that the conventional doses produced symptoms of unnecessary and dangerous violence, and this led to another principle, that of minimum doses, according to which the benefit to be derived from a medicine can be fully obtained by the administration of a very small quantity. Firmly convinced of the truth of these principles, Hahnemann spent the rest of his life in making them known to the world. He encountered much opposition, and in 1821 was forced to leave Leipsic, as he was not allowed to dispense his own prescriptions. The grand duke of Anhalt-Köthen, however, appointed him his physician, and at Köthen he resided till 1835 when he removed to Paris. He died 2d July 1843. Hahnemann was a man of remarkable courage and perseverance. He not only sacrificed his immediate interests for the sake of his convictions, but made many painful experiments upon his own person.

Hahnemann's chief work, in which he expounds his system, is his *Organon der rationellen Heilkunde* (Dresden, 1810; 6th ed., Kothen, 1865; English translation by Dudgeon, London, 1849). His other important writings are *Fragmenta de viribus medicamentorum positivis* (2 vols., Leipsic, 1805): *Reine Arzneimittellehre* (6 vols., Dresden, 1811); *Die chronischen Krankheiten* (4 vols., Dresden, 1828-30). His smaller writings have been edited by Stapf (2 vols., Dresden and Leipsic, 1829-34). See also Albrecht's *Hahnemann's Leben und Werken* (2d ed., Leipsic, 1875).

HAIDARÁBÁD. See Hyderabad.

HAIDINGER, Wilhelm von (1795-1871), a mineralogist, geologist, and physicist of considerable note, was born at Vienna, February 5, 1795. His father, Karl Haidinger, contributed largely to the development of mineralogical science in the latter half of the last century. Having studied at the normal school of St Anne, and attended classes at the university, Wilhelm, at the age of seventeen, joined Professor Mohs at Gratz, and five years later accompanied the professor to Freiberg on the transfer of his labours to the mining academy of that Saxon El-Dorado. In 1822 Haidinger visited France and England with Count Breunner, and, journeying northward, took up his abode in Edinburgh. He translated into English, with additions of his own, Mohs's *Grundriss der Mineralogie*, published at Edinburgh in three volumes under the title *Treatise on Mineralogy*, 1825. After a tour in northern

Europe, including the Scandinavian mining districts, he undertook the scientific direction of the porcelain works at Elnbogen, belonging to his brothers. In 1840 he was appointed counsellor of mines (Bergrath) at Vienna in the place of Professor Mohs, a post which included the charge of the imperial cabinet of minerals, &c. He devoted himself to the rearrangement and enrichment of the collections, and the cabinet became the first in Europe. Shortly after (1843) Haidinger commenced a series of lectures on mineralogy, which was given to the world under the title *Handbuch der bestimmenden Mineralogie* (Vienna, 1845; tables, 1846). On the establishment of the imperial geological institution, he was chosen director (1849); and this important position he occupied for seventeen years. On the completion of the geological survey of the Austrian dominions in 1862, he superintended the preparation of the maps which were issued. He was elected a member of the imperial board of agriculture and mines, and a member of the imperial academy of sciences of Vienna. He organized the society of the friends of natural sciences. As a physicist Haidinger ranked high, and he was one of the most active promoters of scientific progress in Austria. He was the discoverer of the interesting optical appearances which have been called after him "Haidinger's brushes." Knighted in 1865, the following year he retired to his estate at Dornbach near Vienna, where he died March 19, 1871.

In addition to the works already named, Haidinger published *Anfangsgründe der Mineralogie*, Leipsic, 1829; *Bericht über die Mineralien-Sammlung der K.K. Hofkammer im Münz- und Bergwesen*, Vienna, 1843; *Geognostische Uebersichtskarte der Oesterreichischen Monarchie*, Vienna, 1847; *Ueber den Zusammenhang der Körperfarben und des Oberflächenschillers*, Vienna, 1852; *Bemerkungen über die Anordnung der kleinsten Theilchen in Christallen*, Vienna 1853; *[illegible]*, Vienna, 1853; *[illegible]*, Vienna, 1855; *[illegible]*, Vienna, 1855; *[illegible]*, Vienna, 185[illegible]. He also edited the *Naturwissenschaftliche Abhandlungen*, Vienna, 1847; the *Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien*, Vienna, 1847-51; and the *Jahrbuch* of the Vienna *K.K. Geologische Reichsanstalt*, 1850, &c. Some of his papers will be found in the *Transactions* of the Royal Society of Edinburgh (vol. x.) and of the Wernerian Society 1822-24, *Edinburgh Phil. Journal*, *Brewster's Journal of Science*, and *Poggendorff's Annalen*.

HAIL. See METEOROLOGY.

HAILES, SIR DAVID DALRYMPLE, BART., LORD (1726-1792), an eminent Scottish lawyer and historian, was born at Edinburgh, October 28, 1726. His father, Sir James Dalrymple of Hailes, in the county of Haddington, Bart., auditor-general of the exchequer in Scotland, was a grandson of James, first Viscount Stair; and his mother, Lady Christian Hamilton, was a daughter of Thomas, sixth earl of Haddington. He received his school education at Eton, and thence proceeded to Utrecht for the study of law, being intended for the Scottish bar, to which he was admitted, shortly after his return to his native country, on the 24th of February 1748. As a pleader he attained neither high distinction nor very extensive practice, but he rapidly established a well deserved reputation for sound knowledge, unwearied application, and strict probity; and in 1766 he was elevated to the bench, when he assumed the title of Lord Hailes. Ten years later he was appointed a lord of justiciary. His death took place on the 29th of November 1792.

His most important contribution to literature is the *Annals of Scotland*, of which the first volume, "From the accession of Malcolm III., surnamed Canmore, to the accession of Robert I.," appeared in 1776, and the second, "From the accession of Robert I., surnamed Bruce, to the accession of the House of Stewart," in 1779. [illegible], as Dr Johnson [illegible] at the time of its [illegible], a "[illegible]" of carefully sifted facts, in our history a new [illegible] wanted and all [illegible] splendour of language or [illegible]. The other works of Lord Hailes include *Historical Memoirs concerning the Provincial Councils of the Scottish Clergy* (1769); *An Examination of some of the arguments for the High Antiquity of Regiam Majestatem* (1769); three volumes entitled *Remains of Christian Antiquity* ("Account of the Martyrs of Smyrna and Lyons in the second century," 1776, "The Trials of Justin Martyr, Cyprian, &c.," 1778; "The History of the Martyrs of Palestine, translated from Eusebius," 1780); *Disquisitions concerning the Antiquities of the Christian Church*, 1783; and editions or translations of portions of Lactantius, Tertullian, and Minucius Felix. In 1786 he published *An Inquiry into the Secondary Causes which Mr Gibbon has assigned for the Rapid Growth of Christianity*, a Dutch translation of which was published at Utrecht in 1793. Both by its acuteness in detailed argument and by its freedom from theological rancour this controversial work is entitled to rank as one of the most respectable of the very many replies which were made to the famous 15th and 16th chapters of the *Decline and Fall of the Roman Empire*; but it has too much the character of a collection of detached critical remarks. A "Memoir" of Lord Hailes is prefixed to the 1808 reprint of his *Inquiry into the Secondary Causes*.

HAINAN, or, as it is usually called in Chinese, *Kiung-chow-foo*, an island belonging to the Chinese province of Kwang-tung, and situated between the Chinese Sea and the Gulf of Tong-king from 20° 8′ to 17° 52′ N. lat., and from 108° 32′ to 111° 15′ E. long. It measures 160 miles from N.E. to S.W., and the average breadth is about 90 miles. The area is estimated at from 1200 to 1400 square miles, or two-thirds the size of Sicily. From the peninsula of Lei chow on the north it is separated by the straits of Hainan, which have a breadth of 15 or 20 miles.

With the exception of a considerable area in the north, and broad tracts on the north-east and north-west sides, the whole island is occupied by jungle-covered mountains, with rich valleys between. The central range bears the name of Li-mou Shan or Wu Tchi Shan (the Five-Finger Mountain), and attains a height of 6000 or 7000 feet. Its praises are celebrated in a glowing ode by Chiu, a native poet. The island appears to be well watered, and some of its rivers are not without importance as possible highways of commerce; but the details of its hydrography are very partially ascertained. A navigable channel extends in an irregular curve from the bay of Hai-Kow in the north to Tan-chow on the west coast. Being exposed to the winter monsoon the northern parts of the island enjoy much the same sort of temperate climate as the neighbouring provinces of the mainland, but in the southern parts, protected from the monsoon by the mountain ranges, the climate is almost or entirely tropical. Snow falls so rarely that its appearance in 1684 is reported in the native chronicles as a remarkable event. Earthquakes are a much more familiar phenomenon, having occurred, according to the same authority, in 1523, 1526, 1605, 1652, 1677, 1681, 1684, 1702, 1704, 1725, 1742, 1816, 1817, and 1822. Excellent timber of various kinds—eagle-wood, rose-wood, liquidambar, &c.—is one of the principal products of the island, and has even been specially transported to Peking for imperial purposes. The cocoa palm flourishes freely even in the north, and is to be found growing in clumps with the *Pinus sinensis*. Rice, cotton, sugar, indigo, cinnamon, betel nuts, sweet potatoes, ground-nuts, and tobacco are all cultivated in varying quantities. The aboriginal inhabitants collect a kind of tea called tein cha, or celestial tea, which looks like the leaves of a wild camellia, and has an earthy taste when infused. Lead, silver, copper, and iron occur in the Shih luh Shan or "stone-green hill"; the silver at least was worked till 1850, and the copper would probably pay for its exploitation. Gold and lapis lazuli are found in other parts of the island.

The ordinary cattle of Hainan are apparently a cross between the little yellow cow of South China and the zebu of India. Buffaloes are common; and in the neighbourhood of Nodoa at least they are frequently albinos. Horses are numerous but small. Hogs and deer are both common wild animals, and of the latter there are three species.

Cervus Eldi, *Cervus hippelaphus*, and *Cervus vaginalis*. Among the birds, of which 172 species are described by Mr Swinhoe in his paper in *The Ibis*, 1870, there are eagles, notably a new species *Spilornis Rutherfordi*, buzzards, harriers, kites, owls, goatsuckers, and woodpeckers. The [illegible] is familiar to the natives as the "bird of the Li matrons," and the *Palaeornis javanicus* as the "sugar-cane bird."

Hainan, as already indicated, forms a foo or department of the province of Kwang-tung, though strictly it is only a portion of the island that is under Chinese administration, the remainder being still occupied by unsubjugated aborigines. The department contains three *chow* and ten *hsien* districts,—Kiung-chow hsien, in which the capital is situated; Ting-an hsien, the only inland district; Wen-ch'ang-hsien, in the north-east of the island; Hwei-tung hsien, Lo-hui-hsien, Ling-shui hsien, Wan-chow, Ai-chow (the southmost of all), Kan-en hsien, Chang-hua hsien, Tan-chow, Lin-kao-hsien, and Chang-mai-hsien. The capital Kiung-chow-foo is situated in the north about 10 li (or 3 miles) from the coast on the river. It is a well-built compact city, and its temples and examination halls are in good preservation. The population is frequently stated at 200,000, but, according to C. C. Stuhlmann in the *Globus* for 1876, it is only [illegible]. Carved articles in cocoa nuts and scented woods are its principal industrial product. In 1630 it was made the seat of a Roman Catholic mission by Benoit de Mathos a Portuguese Jesuit, and the old cemetery still contains about 113 Christian graves. The port of Kiung-chow-foo at the mouth of the river, which is nearly dry at low water, is called simply Hoi-how, or in the court dialect Hai Kow, *i.e.*, sea-port. The two towns are united by a good road, along which a large traffic is maintained partly by coolie porters but more frequently by means of wheelbarrows, which serve the purpose of cabs and carts. The net value of the trade of the port, that is, the foreign and native imports minus the re-exports and the native imports of local origin, rose from 684,772 Hk. taels in 1876 to 1,215,056 in 1878. Out of 182 vessels engaged in the foreign trade in 1878 with a tonnage of 87,290 tons, 152 were British, with a tonnage of 70,078 tons. The exports comprised leather, hides, skins and tallow, sugar to the value of 204,427 taels, hemp, galangal, lung-ngan pulp, grass cloth, and silk, and sesamum to the value of 41,936 taels.

The inhabitants of Hainan may be divided into three classes, the Chinese immigrants, the civilized aborigines or Shu-li, and the wild aborigines or Sheng-li. The Chinese were for the most part originally from Keang-se and the neighbouring provinces, and they speak a peculiar dialect of which a detailed account by Mr Swinhoe is given in *The Phoenix, a Monthly Magazine for China, &c.*, 1870. The Shu-li as described by Mr Taintor are almost of the same stature as the Chinese, but have a more decided copper colour, higher cheek-bones, and more angular features, while their eyes are not oblique. Their hair is long, straight, and black, and their beards, if they have any, are very scanty. They till the soil and bring rice, fuel, timber, grass-cloth, &c., to the Chinese markets. The Sheng-li or Li proper, called also La, Le, or Lauy, are probably connected with the Laos of Siam, and the Lolos of China. Though not gratuitously aggressive, they are highly intractable, and have given great trouble to the Chinese authorities. Among themselves they carry on deadly feuds, and revenge is a duty and an inheritance. Though they are mainly dependent on the chase for food, their weapons are still the spear and the bow, the latter being made of wood and strung with bamboo. In marriage no avoidance of similarity of name is required. The bride's face is tattooed according to a pattern furnished by the bridegroom. Their funeral mourning consists of abstaining from drink and eating raw beef, and they use a wooden log for a coffin. When sick they sacrifice oxen. In the spring-time there is a festival in which the men and women from neighbouring settlements move about in gay clothing hand in hand and singing songs. The whole population of the island is estimated at about 2½ millions. At its first conquest 23,000 families were introduced from the mainland. In 1300 the Chinese authorities assign 166,257 inhabitants; in 1370, 291,000; and in 1617, 250,524; and in 1835, 1,350,000.

It was in 111 B.C. that Lu-Po-Teh, general of the emperor Wu-ti, first made the island of Hainan subject to the Chinese, who divided it into the two prefectures, Tan-urh or Drooping Ear in the south, so-called from the long ears of the native "king," and Chu-yai or Pearl Shore in the north. During the decadence of the elder branch of the Han dynasty the Chinese supremacy was weakened, but in 43 A.D. the natives were led by the success of Ma-yuan in Tung-king to make a new tender of their allegiance. About this time the whole island took the name of Chu-yai. In 627 A.D. the name of Kiung-chow came into use. On its conquest by the generals of Kublai Khan in 1278 the island was incorporated with the western part of the province of Kwang-tung in a new satrapy Hai-peh Hai-nan Tao, *i.e.*, the circuit north of the sea and south of the sea. It was thus that Hai-nan-Tao, or district south of the sea or strait, came into use as the name of the island, which, however, has borne the official title of Kiung-chow-foo, probably derived from the Kiung-shan or Jade Mountains, ever since 1370, the date of its erection into a department of Kwang-tung. For a long time Hainan was the refuge of the turbulent classes of China and the place of deportation for delinquent officials. It was there, for example, that Su-She or Su-Tung-po was banished in 1097. From the 15th to the 19th century pirates made the intercourse with the mainland dangerous, and in the 17th they were considered so formidable that merchants were allowed to convey their goods across only by the narrow channel from Sen-wen. Since 1863 the presence of English men-of-war has put an end to this evil. According to the treaty of Tientsin, the capital Kiung-chow and the harbour Hai-Kow were opened to European commerce; but it was not till 1876 that advantage was taken of the permission.

See Taintor in *Notes and Queries on China and Japan*, 1868; Mayers, "Hist. and Stat. Sketch of the Island of Hainan," in *Journ. of N. China Branch of Roy. As. Soc.*, new ser., No. vii (1871-2); Dr F. Hirth, "Die Chinesische Provinz Kwang-tung" in Petermann's *Mittheilungen*, 1873; *The China Review*, Hong-Kong, 1876; *Report on the newly-opened ports of Kiung-chow (Hoihow) in Hainan, and of Haiphong in Tonquin*, by N. B. Dennys, Hong-Kong, 1876. (H. A. W.)

HAINAU (officially HAYNAU), a town in the Prussian province of Silesia, circle of Goldberg-Hainau and government district of Liegnitz, is situated on the Rapid Deichsel and on the railway from Breslau to Dresden, 12 miles N.W. of Liegnitz. It has an Evangelical and a Roman Catholic church, and manufactories of woollen and cotton cloth, gloves, leather, locks, and tin ware. Near Hainau the Prussian cavalry inflicted a defeat on the French rear-guard, 26th May 1813. The population of the town in 1875 was 5351.

HAINAULT, one of the nine provinces of the kingdom of Belgium, bounded E. and N. by Namur, Brabant, and Flanders, which are also Belgian provinces, and to the S. and W. by the French département du Nord. The name[1] is doubtless derived from the little river Haine, which runs nearly due east and west past the town of Mons, and falls into the Scheldt not far from Condé. Hainault is well-wooded and hilly in the east and south-east, where it is partly covered by the Ardennes; the rest of the province is a pleasantly diversified, fertile, and well-cultivated plain-land, which produces all kinds of cereal crops, flax, tobacco, chicory, and beetroot. The long and narrow coal-field which, with some breaks, stretches from Aix-la-Chapelle to the sea near Boulogne, passes through the middle of Hainault, underlying a district of about 190,000 acres; its centre is about Mons, whence it extends westward to Valenciennes, eastward to Charleroi. At this latter town, named after Charles II. of Spain, who built it in 1666, are iron and copper works; marble and building-stone are also largely quarried in Hainault; the manufactures of the province are vigorous and good; ironware and cutlery, woollen and linen goods, glass, porcelain, and a variety of other articles are made, and are exported largely into France. Hainault, with a population of 956,354 inhabitants in 1876 (the largest in this respect of all the provinces), has an area of near 1400 square miles, and is therefore somewhat thickly peopled; for administrative purposes it is divided into six arrondissements, of which that of Mons is the chief; the others are Tournai, Charleroi, Ath, Soignies, and Thuin; these again are subdivided into thirty-two cantons.

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[1] In German, *Hennegau*; Flemish, *Henegouwen*; French, *Hainaut*; the *Comitatus Hennegavensis* or *Hannonia* of Latin chronicles.

Formerly the county was nearly twice as large as the present province. In Cæsar's days it was inhabited by the Nervii, and did not get its present name till the 7th century, before which time it had become a county under its own lords. This dignity, at first more or less elective, became hereditary in the 9th century. Throughout the early Middle Ages Hainault was a purely agricultural district, owned by a numerous and very quarrelsome and disagreeable nobility; it possessed also no less than fifteen abbeys. It was famous in legend and history as the chosen land of chivalry, and Froissart, himself a native of Valenciennes, faithfully reflects the character of his fatherland. In the 11th century Baldwin V. of Flanders occupied it, and Baldwin VI., by marrying the heiress to the county, permanently added it to the territories of his house. It was his descendant Baldwin IX., count of Flanders and Hainault, who proclaimed himself first Latin emperor of Constantinople in 1204. In 1299 John of Avennes, count of Hainault, became also count of Holland by right of his mother Adelaide, sister of William II. of Holland; it was his granddaughter Philippa who in 1326 married the Prince of Wales, afterwards Edward III. Hainault went with Flanders, till it was occupied by Philip "the Good" of Burgundy in the war which lasted from 1424 to 1427. It finally fell to the house of Burgundy on the death of the unfortunate Jacobæa in 1436. With the other territories of Charles the Bold it passed with Mary of Burgundy in 1477 to the house of Austria, and remained there till the peace of the Pyrenees in 1659, when part of the southern portion of the county was ceded to Louis XIV.,—a cession confirmed and enlarged at Nimwegen in 1678. Thenceforth there are two Hainaults, the French and the Austrian, the latter answering to the present Belgian province. French Hainault (now a part of the department du Nord) had as its ancient capital Valenciennes; its other towns are Condé, Cambrai, Maubeuge, Le Quesnoy, Landrecies, Avesnes, Givet, Charlemont. Philippeville, which owes its name to Philip II. of Spain, having been transmuted out of a village called Corbigny into a town by Charles V. in 1555, was restored to the Netherlands in 1815. Austrian Hainault was overrun by the French in 1793, and annexed to France as the department of Jemmapes in 1794; in 1814 it was made part of the kingdom of the Netherlands; and in 1830, as a matter of course, in the division of that kingdom, it became one of the provinces of the Belgian half.

The chief authorities are the Baron de Reiffenberg's *Monuments pour servir à l'histoire des Provinces de Namur, de Hainaut, et de Luxembourg*, 1844-1848, and Jacques de Guise's *Annales du pays de Haynault.*

HAINBURG, or HAIMBURG, a town of Austria, in the circle of Bruck, situated on the Danube 27 miles E.S.E. of Vienna, is the seat of a district court of justice and of a tax-office. It occupies part of the site of the old Celtic town Carnuntum, destroyed 251 A.D. Since the fire of 1827 Hainburg has been much improved, and is now a handsomely built town. It is still surrounded by ancient walls, and has a gate guarded by two old towers. There are numerous Roman remains, among which may be mentioned the altar and tower at the town-house, on the latter of which is a statue said to be of Attila. A Roman aqueduct is still used to bring water to the town. Hainburg has a military school for engineers. The two important manufactures are tobacco, employing about 1700 hands, and needles, of which about 80 millions are annually turned out. On the neighbouring Hainberg is an old castle, built of Roman remains, which appears in German tradition under the name of Heimburc; it was wrested from the Hungarians in 1012 by the emperor Henry III. At the foot of the same hill is a castle of the 12th century, where Ottocar, of Bohemia, was married to Margaret of Austria in 1252; earlier it was the residence of the dukes of Babenberg. Outside the town, on a rock in the Danube, is the ruined castle of Rothelstein or Röthenstein, held by the Knights Templars. Hainburg was besieged by the Hungarians in 1477, was captured by Matthias Corvinus in 1482, and was sacked, and its inhabitants massacred, by the Turks in 1683. Population (1869), 4178.

HAINICHEN, a town of Saxony, in the circle of Leipsic and the prefecture of Döbeln, is situated on the Little Striegis, 15 miles N.E. of Chemnitz by railway. It is the seat of a royal court of justice, and has cigar and leather manufactories and a school of weaving. Its most important industry is the manufacture of flannels, baize, and similar fabrics; indeed it may be called the centre of this industry in Germany. The special whiteness and excellence of the flannel made in Hainichen is due to the peculiar nature of the water used in the manufacture. There are 22 spinning-mills in the town and environs, with about 2500 looms, of which between 300 and 400 are mechanical. There are also large dye works and bleaching establishments. Large quantities of both wool and cotton are spun and woven, and yarn spun elsewhere is brought to Hainichen to be woven. About 3,850,000 ℔ of raw wool, worth about £600,000, is annually worked into material, some of which is exported to South America and eastern Asia. Coal is found in the neighbourhood, but does not repay the expense of working. Hainichen is the birthplace of Gellert, to whose memory a bronze statue was erected in the market-place in 1865. The Gellert institution for the poor was erected in 1815. Population (1875), 8468.

HAIR is a substance which, from its various properties, and differences in stoutness, length, and strength, enters into a considerable variety of manufactures. Bristles are the stout elastic hairs obtained from the backs of certain breeds of pigs. The finest qualities, and the greatest quantities as well, are obtained from Russia, where a variety of pig is reared principally on account of its bristles. The best and most costly bristles are used by shoemakers, secondary qualities being employed for toilet and clothes-brushes, while inferior qualities are worked up into the commoner kinds of brushes used by painters and for many mechanical purposes. For artists' use and for decorative painting, brushes or pencils of hair from the sable, camel, badger, polecat, &c., are prepared. The hair of various animals which is too short for spinning into yarn is utilized for the manufacture of felt. For this use the hair of rabbits, hares, beavers, and of several other rodents is largely employed, especially in France, in making the finer qualities of felt hats. Cow hair, obtained from tanneries, is used in the preparation of roofing felts, and felt for covering boilers or steam-pipes, and for other similar purposes. It is also largely used by plasterers for binding the mortar of the walls and roofs of houses; and of late years it has to some extent been woven up into coarse friezes, horse cloths, railway rugs, and inferior blankets. The tail hair of oxen is also of value for stuffing cushions and other upholstery work, for which purpose, as well as for making the official wigs of law officers, barristers, &c., the tail and body hair of the yak or Thibet ox is also sometimes imported into Europe. The tail and mane hair of horses is in great demand for various purposes. The long tail hair is especially valuable for weaving into hair cloth, mane hair and the short tail hair being, on the other hand, principally prepared and curled for stuffing the chairs, sofas, and couches which are covered with the cloth manufactured from the long hair. The horse hair used in Great Britain is principally obtained from South America, Germany, and Russia, and its sorting, cleaning, and working up into the various manufactures dependent on the material are industries of some importance. In addition to the purposes already alluded to, horse hair is woven into crinoline for ladies' bonnets, plaited into fishing lines, woven into bags for oil and cider pressers, and into straining cloths for brewers, &c., and for numerous other minor uses. The manufactures which arise in connexion with human hair are more peculiar than important, although occasionally fashions arise which cause a large demand for human hair. The fluctuations of such fashions determine the value of hair; but at all times long tresses are of considerable value. Grey, light, pale, and auburn hair are distinguished as extra colours, and command much higher prices than the common shades. The value of hair also increases very rapidly with increase in length. Thus while 8 inch hair sells at about 1s. per oz., 36 inch hair will command a price as high as 30s. per oz. Lengths beyond 36 inches are exceptional and command fancy prices, the standard length in the hair trade being 18 inches. The light-coloured hair is chiefly obtained in Germany and Austria, and the south of France is the principal source of the darker shades. In the south of France the cultivation and sale of heads of hair by peasant girls is a common practice; and hawkers attend fairs for the special purpose of engaging in this traffic. Hair 5 and even 6 feet long is sometimes obtained. Scarcely any of the "raw material" is obtained in the United Kingdom except in the form of ladies' "combings." Bleaching of hair by means of peroxide of hydrogen is now extensively practised, with the view of obtaining a supply of golden locks, or of preparing white hair for mixing to match grey shades; but in neither case is the result very successful. Human hair is worked up into a great variety of wigs, scalps, artificial fronts, frizzets, and curls, all for supplementing the scanty or failing resources of nature. The plaiting of human hair into articles of jewellery, watch guards, &c., forms a distinct branch of trade. For structure, properties, &c., of the human hair see ANATOMY, vol i. p. 898.

HAIRBELL. See HAREBELL.

HAIR-TAIL (*Trichiurus lepturus*), a marine fish, with a long band-like body terminating in a thread-like tail, and with strong prominent teeth in both jaws. Several species are known, of which one, common in the tropical Atlantic, not rarely reaches the British Islands.

HAITI. See HAYTI.

HAJDÚK, sometimes corrupted into HEYDUKE, is the plural form of the Magyar word Hajdú, and was formerly used as the collective name of the undermentioned towns (along with Vámos-Pércs, population 3000) of the old privileged Hajdúk district of Hungary, now included in the county of Hajdú.

HAJDÚ BOSZÖRMÉNY, the second town in importance of Hajdú county, lies about 11 miles to the N.W. of Debreczin, 47° 41′ N. lat., 21° 31′ E. long. It is the seat of a royal court of law, and was formerly the capital of the Hajdúk district. Among the principal buildings are the old district court-house, a Greek Catholic and two Calvinist churches, a Protestant gymnasium, the post and telegraph offices, and the savings bank. The fairs periodically held in the town attract people from a considerable distance. Population (1870) 19,208.

HAJDÚ-DOROG is a market-town situated about 10 miles to the N. of Böszörmény, with a Greek Catholic and a Calvinist church. At Dorog the Magyar adherents of the Greek Catholic Church are met with in great numbers. Population 8216.

HAJDÚ-HADHÁZ is a corporate town lying about 10 miles N of Debreczin. It has a Calvinist church, post and telegraph offices, and a station on the railway from Nyiregyháza to Debreczin. Population 7024.

HAJDÚ-NÁNÁS is a market-town, about 24 miles N.N.W. of Debreczin, with a large Calvinist church, a high school for girls, and a Protestant gymnasium. The surrounding country, although on the whole productive, assumes in the west a generally swampy character. Population 13,198.

HAJDÚ-SZOBOSZLÓ is a corporate town, 12 miles to the S.W. of Debreczin, with which it is connected by railway. Among the principal buildings are a Calvinist church and school, and a royal law-court. Population 12,269.

The Hajduk district was made over to the Hajdúks in 1605, with special privileges and the rights of nobility, by the Transylvanian prince Stephen Bocskay, as a reward for military service rendered him in his revolutionary campaigns. The inhabitants were confirmed in their possessions by the diet of 1613. From 1849 to 1860 the district was united to the county of North Bihar, but it afterwards received a separate cantonal organization. It now forms the principal portion of the new county of Hajdú, constituted in 1876, and including, along with the old Hajduk district, portions of the neighbouring counties of Szabolcs and Bihar. Debreczin is the capital, and the population is computed at about 163,000, mostly Magyars.

HÁJÍPUR, a municipal town in Muzaffarpur district, Bengal, situated on the east bank of the Gandak, a short distance above its confluence with the Ganges opposite Patná, 25° 40′ 50″ N. lat., 85° 14′ 24″ E. long. It is said to have been founded about 500 years ago by one Hájí Ilyás, the supposed ramparts of whose fort, enclosing an area of 360 *bighás*, are still visible. Hájípur figures conspicuously in the history of the struggles between Akbar and his rebellious Afghán governors of Bengal, being twice besieged and captured by the imperial troops, in 1572 and again in 1574. Its command of water traffic in three directions makes the town a place of considerable commercial importance. Within the limits of the old fort is a small stone mosque, very plain, but of peculiar architecture, and attributed to Hájí Ilyás. Two other mosques and a small Hindu and Buddhist temple are in the town or its immediate vicinity. Besides the ordinary courts, the town contains a school, post-office, charitable dispensary, and distillery. The population in 1872 numbered 22,306, of whom 18,765 were Hindus and 3510 Mahometans.

HAJJI KHALFA. Mustafa 'bn Abdallah, Kátib Chelepí (*c.* 1600–1658), commonly known as Haji (or Hadji) Khalfa (more properly Hájjí Khalífah), was the author of an encyclopædia in Arabic of Oriental biography and bibliography. He was born at Constantinople about the beginning of the 17th century of the Christian era, and after passing the earlier part of his life in military service, studied under Cadhizádeh Effendi, a learned doctor at the Ottoman capital, and made great progress in Arabic literary and linguistic studies. In June 1633 he again accompanied the army to Syria, but while the troops were in winter quarters at Aleppo, he himself performed the pilgrimage to Mecca, whence he took the cognomen of Hajji, "Pilgrim." Returning in 1635 to Constantinople, he resumed his literary studies, and occupied himself with visiting all the libraries and book shops, and compiling an inventory of their contents, together with notices of the authors of the various works. In 1638 he attended the lectures of Sheikh A'raj Mustafazadah, whom he proposed to himself as an example to imitate in his future literary career. Besides his purely literary studies he also devoted himself assiduously to the sciences, and became well versed in logic, geometry, geography, astronomy, and the like. Nor were medicine and the occult sciences neglected by him, so that there were few of the subjects treated of in the works which he delighted to describe with which he was not more or less technically acquainted. About 1648 he was appointed assessor (khalífa) to the principal of the imperial college, whence he took the title of Khalfa, by which, with the prefix of Hajji (Pilgrim), he is commonly designated. He died in September 1658.

Besides his great *Bibliographical Lexicon*, he composed several other works, chiefly geographical and historical; of these the best known are *Takwímu 'ttawáríkh* or "Chronological Tables," *Tuhfat el Kubár fí asfári Bahár*, a work on the science of naval warfare, *Jehán Numá* or "Mirror of the World," and one or two treatises on miscellaneous literary subjects. The language in which he wrote is Arabic, and the style is that which the nature of his studies would lead us to expect,—correct and grammatical, fairly classical, and abounding in technical terms and phraseology. Of the amount of his learning and of his indefatigable application to study his *Lexicon* is a lasting memorial. There is scarcely a work in the whole range of Arabic, Persian, and Turkish literature, no matter on what subject or science, but it will be found described in this vast encyclopædia, with every piece of collateral information which it was possible to procure or useful to mention. When we consider that it is the Oriental habit to give fancy titles to books that often in no way indicate the nature of their contents, and that one is often obliged to read through pages of irrelevant matter before arriving either at the author's name or the subject of the work, the labour expended on the production of Hagi Khalfa's book appears absolutely incredible. The work has always enjoyed a well-deserved reputation in the East, and has attracted the attention of many European scholars, but we need only mention here the magnificent edition in seven thick 8vo volumes by the eminent Arabic scholar Gustavus Fluegel published at Leipsic in 1835-1858 for the Oriental Translation Fund of Great Britain and Ireland. This edition is accompanied by a Latin page-for-page translation, indices, and notes, and is an indispensable adjunct to every library in which a collection of Oriental books is found. The Arabic title of the lexicon is *Kashf az-zunún 'an Asámí 'l Kutub wa 'l funún*, "The removal of doubts concerning the names of books and concerning sciences," and the Latin title adopted by Fluegel is *Lexicon Bibliographicum et Encyclopædicum Haji Khalfa*. After a short preface and an introduction of five chapters comes the encyclopædia proper, the articles in which are arranged in the alphabetical order of the names of the works described. The title of each work is given, a concise account of its contents, the name of the author, and the date, when this could be ascertained; and in many cases the initial phrase is also added to facilitate its identification. Besides the general bibliography, Fluegel's edition contains several appendices of great value to Oriental scholars and librarians. Copious notes and indices complete this splendid edition, one of the finest monuments of Oriental learning which Europe has produced.

HAKE (*Merluccius vulgaris*), a fish belonging to the family of cod-fishes (*Gadidæ*), differing from the common cod in having only two dorsal and one anal fin. It is very common on the coasts of Europe and eastern North America, but its flesh is much less esteemed than that of the true *Gadi*. Specimens 4 feet in length are not scarce. A closely allied fish inhabits the coasts of Chili and New Zealand.

HAKIM, or, as the full title runs, EL HÁKIM BI-AMRI-LLÁH ABOO 'ALEE MANSOOR (985-1020), the sixth of the Fatimite caliphs, and the third of that dynasty ruling in Egypt, founder of the sect of the Druses, was born in 985 A.D., was designated heir apparent in 993, succeeded in 996, and died in 1020. For the principal events of his life and the leading features of his character the reader is referred to the article EGYPT (vol. vii. p. 751) See also DRUSES (vol. vii. p. 484).

HAKLUYT, RICHARD (*c.* 1553–1616), geographer, was born of good family[1] in or near London about 1553. He was elected "one of her Majesties scholars at Westminster," and it was while there that the bent of his future studies was determined by a visit to his cousin and namesake, Richard Hakluyt of the Middle Temple. His cousin's discourse, illustrated by "certain bookes of cosmographie, an universall mappe, and the Bible," had such an effect upon Hakluyt's mind that he resolved, if opportunity offered, to "prosecute that knowledge and kind of literature." Entering Christ Church, Oxford, in 1570, "his exercises of duty first performed," he fell to his intended course of reading, and by degrees perused all the printed or written voyages and discoveries that he could find. He took his degree of B.A. in 1573-74, and we learn from the Towneley MSS. that two years later he was selected twice in the same year to receive gifts of money.[2] It is highly probable that, shortly after taking his degree of M.A. (1577), he commenced at Oxford the first public lectures in geography that "shewed both the old imperfectly composed and the new lately reformed mappes, globes, spheares, and other instruments of this art."[3]

Hakluyt's first published work was his *Divers Voyages touching the Discoverie of America* (London, 1582, 4to). By reason of his great knowledge of these matters and his acquaintance with "the chiefest captaines at sea, the greatest merchants, and the best mariners of our nation," he was selected in 1583, at the age of thirty, to accompany Sir Edward Stafford, the English ambassador, to Paris in the capacity of chaplain. In accordance with the instructions of Secretary Walsingham, he occupied himself chiefly in collecting information of the Spanish and French movements, and "making diligent inquirie of such things as might yield any light unto our westerne discoverie in America." The first fruits of Hakluyt's labours in Paris are embodied in the most important production of his that has seen the light in modern times; it is entitled *A particuler discourse concerning Westerne discoveries written in the yere* 1584, *by Richarde Hackluyt of Oxforde, at the requeste and direction of the righte worshipfull Mr Walter Raghly before the comynge home of his twoo barkes*.[4] This long-lost MS., after failing to find a resting-place in America, was finally acquired by Sir Thomas Phillipps, and is now the property of Rev. J. E. A. Fenwick of Thirlstane House, Cheltenham. The object of the *Discourse* was to recommend the enterprise of planting the English race in the unsettled parts of North America. Hakluyt's other works consist mainly of translations and compilations, relieved by his dedications and prefaces, which last, with a few letters, are the only material we possess out of which a biography of him can be framed.

Hakluyt returned to England in 1584, and during his short stay he had the honour of laying before Queen Elizabeth a copy of the *Discourse* "along with one in Latin upon Aristotle's *Politicks*," which won for him, two days before his departure again for Paris, the grant of the next vacant prebend at Bristol. In the spring of the following year, feeling anxious about the reversion of the prebend, he again visited England, and exhibited in person, on the 24th May 1585, before the chapter of Bristol cathedral, the queen's mandate for the coveted vacancy already signed and sealed. Before the close of the year the reversion of it fell to him, and in 1586 he was admitted to the prebend, which he held, with his other preferments, till the time of his death.

While in Paris Hakluyt caused to be published the MS. journal of Laudonnière or *Histoire notable de la Florida*, edited by M. Bassanier (Paris, 1586, 8vo). This was translated by Hakluyt and published in London under the title of *A notable historie containing foure voyages made by certayne French Captaynes into Florida* (London, 1587, 4to). The same year *De Orbe Novo Petri Martyris Anglerii Decades octo illustratæ, labore et industria Richardi Hakluyti*, saw the light at Paris. This work contains the exceedingly rare copperplate map dedicated to Hakluyt and signed F. G. (supposed to be Francis Gualle); it is the first on which the name of "Virginia" appears.

In 1588 Hakluyt finally returned to England with Lady Stafford, after a residence in France of nearly five years. In 1589 he published *The Principall Navigations, Voiages, and Discoveries of the English Nation* (fol., London, 1 vol.). In the preface to this we have the announcement of the intended publication of the first terrestrial globe made in

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[1] The Hakluyts were a family of Welsh extraction, [illegible]

[2] "To one Mr Hackluyt, [illegible] of Christ Church in Oxford, the 12 of May 1575 [illegible] Mr Hackluyt, [illegible] 61" (Hist. MSS. Comm. 4th Report, Appendix p. [illegible]).

[3] From [illegible] we know that the first lecture of the kind was delivered at the university on the 4th of November 1588 by Thomas Hood.

[4] Now first printed from a contemporary MS., with an introduction by Leonard Woods, LL.D., edited by Charles Deane, *Collections of Maine Hist. Soc.*, Camb. (Mass.), 1877, 8vo.

England by Molyneux (see Globe). On the 20th April 1590 he was instituted to the rectory of Wetheringsett-cum-Brockford, Suffolk. The magnum opus of Hakluyt is *The Principal Navigations, Voyages, Traffiques, and Discoveries of the English Nation* (fol., London, 1598-1600, 3 vols.). Some few copies contain an exceedingly rare map,[1] the first on the Mercator projection made in England according to the true principles laid down by Edward Wright. Hakluyt's great work, though but little read, has been truly called the "prose epic of the modern English nation." It is an invaluable treasure of material for the history of geographical discovery and colonization, which has secured for its author a lasting reputation for research and industry.[2] In 1601 Hakluyt edited a translation from the Portuguese of Antonio Galvano, *The Discoveries of the World* (4to, London). On the 4th May 1602 he was installed prebendary of Westminster, and in the following year elected archdeacon of Westminster. In the licence of his second marriage (30th March 1604) he is also described as one of the chaplains of the Savoy, and his will contains a reference to chambers occupied by him there up to the time of his death; in another official document he is styled D.D.[3] His last publication was a translation of Fernando de Soto's discoveries in Florida, entitled *Virginia richly valued* (London, 1609, 4to). This work was intended to encourage the young colony of Virginia, of which Hakluyt was so zealous a promoter, "to whom England is more indebted for its American possession than to any man of that age."[4]

A number of Hakluyt's MSS., sufficient to form a fourth volume of his collections of 1599–1600, fell into the hands of Samuel Purchas, who inserted them in an abridged form in his *Pilgrimes* (1625-26, fol.). Others are preserved at Oxford (Bib. Bod. MS., Seld. B. 8), which consist chiefly of notes gathered from contemporary authors. Hakluyt died in 1616, and was buried in Westminster Abbey (November 26); by an error in the abbey register it stands under the year 1626. His best monument is the society that flourishes under his name. Founded in 1846 for the purpose of printing rare and unpublished voyages and travels, "it aims at opening by this means an easier access to sources of a branch of knowledge which yields to none in importance, and is superior to most in agreeable variety." The fifty-seven volumes that have been published by the society since its formation have been edited with great discrimination and care, and have come to be regarded as the standard text-books upon their respective subjects. Some are out of print, and others have passed through two editions. The latest volume published is a reissue in a new form of *The Hawkins Voyages*, the first work published by the society. (C. H. C.)

HAKODADI, or **Hakodate**, a seaport town of Japan, in the old province of Hokukaido, on the southern coast of the island of Yezo or Yesso, in 41° 49′ N. lat. and 140° 47′ E. long. Its general position, as has been frequently remarked, is not unlike that of Gibraltar, as the town is built along the north-western base of a rocky promontory (1100 feet in height) which forms the eastern boundary of a spacious bay, and is united to the mainland by a narrow sandy isthmus. At the time of Captain Perry's visit in 1854 few of the buildings of Hakodadi, with the exception of its temples and fire-proof warehouses, were more than one story high, and the roofs were made of slight shingles protected against the effects of wind-storms by heavy stones. Since that date the town has increased considerably in extent, and many of the more modern buildings, such as the new custom house and the residences of the Government officials, have been erected in a more solid European style. In 1870 there were four European hotels. A new bund or embankment has been constructed along the shore, and several quarters of the town have been laid out in better fashion by the local authorities. Hakodadi is the residence of the governor of Yezo, and the seat of an arsenal. There are four Buddhist and three Shinto temples,—the most important of the former being the Zhioghen-zhi, or Country's Protector, built about 1830. A medical college is maintained in connexion with the Government hospital, and in the neighbourhood of the town an agricultural college has been erected since 1873. The Bay of Hakodadi, says Sir Rutherford Alcock, is completely land-locked, easy of access, and spacious enough for the largest navies to ride in it, with deep water almost up to the shore, and good holding-ground. The Russians have for a considerable time used it as a winter station for their ships, because their own harbours on the coast of Kamchatka are annually frozen up. Their establishment formerly comprised a handsome consular residence, a hospital, warehouses, and workshops, but the consulate was removed from the port in 1871. Hakodadi has a large local trade; but neither its exports nor its imports are very extensive, and as a commercial centre it will not improbably be superseded by Endermo. The exports comprise awabi, cuttlefish, sea-weed, bêche-de-mer (iriko), sea-otter skins, and deer horns; as many as 30,000 pairs of the last being sometimes shipped in a year. Lead and coal mines exist in the neighbourhood. There is telegraphic communication with Tokio (Yedo); and a new road has been made to Sapporu (Satsuporu). The population of the town is estimated at 30,000; in 1872 the foreign settlement had 22 residents. Hakodadi, originally a fishing village belonging to a local daimio, was purchased by the Government and incorporated in the imperial fief of Matsmai. It was opened to American commerce in 1854; and there are now also Danish, German, and English consuls. In 1868 the town was taken by the rebel fleet, but it was recovered by the mikado in 1869.

HAL, a town of Belgium, province of South Brabant, is situated on the Senne and the Charleroi canal, 9 miles S.S.W. of Brussels. It has a beautiful Gothic church of the 14th century, very much resorted to by pilgrims on account of a famous miracle-working image of the Virgin. The church has been enriched by a large number of votive gifts, and contains a beautifully carved high altar of white marble. The principal industries are tanning, soap-boiling, the manufacture of paper, and salt-refining. The population in 1869 was 6406.

HALA, or **Halla** (formerly known as Murtizábád), a town in Hyderabad district, Sind, India, situated on the Alíganj canal and immediately connected with the Trunk Road at two points, 25° 48′ 30″ N. lat., 68° 27′ 30″ E. long. It was long famous for its glazed pottery and tiles, made from a fine clay obtained from the Indus, mixed with flints. The *súsis*, or trouser-cloths, for which the town is also celebrated, are manufactured to the value of £750 yearly. Hála was built about 1800 in consequence of old Hala, 2 miles distant, being threatened with encroachment by the Indus. Among the antiquities round which the new town has grown up are the tomb and mosque of a pír or saint, who died in the 16th century, and in whose honour a fair, largely attended by Mahometans from all parts of the province, is held twice a year. The local trade, chiefly of grain, piece goods, *ghí*, cotton, and sugar, is valued approximately at £3000; the transit trade (in the same articles) at about £700. Population (1872), 4096, including 2646 Mahometans and 1234 Hindus.

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[1] Supposed to be the "new map" of the *Twelfth Night*, act iii., scene 2. See *Trans. of New Shakspere Soc.*, 1877-79, pt. 1, 8vo.

[2] In 1809-12 was published a new edition of it by Woodfall & Evans in 5 vols. The last two contain pieces not comprised in the collection of 1598-1600.

[3] *Westminster Abbey Registers*, edited by J. L. Chester, 1876, pp. 113.

[4] Robertson, *Hist. of America*, vol. iv. p. 171, 10th ed

HALAS, a corporate town of Hungary, in the megye or county of Pest-Pilis-Solt-Kis-Kun, is situated about 76 miles S.S.E. from Budapest, in 46° 24′ N. lat. and 19° 31′ E. long. The most noteworthy buildings are the Calvinist and Roman Catholic churches, and the Jewish synagogue. Halas contains also a Protestant gymnasium, various literary institutions, and a local tribunal. The inhabitants of the town and neighbourhood are mostly engaged in cattle-breeding and agricultural pursuits. Not far from Halas is a lake of the same name, containing an island which was once fortified, and served as a place of refuge to the inhabitants from the incursions of the Turks. Prior to 1876 Halas belonged to the old district of Little Cumania. In the spring of 1879 the town was much injured by floods. The population in 1870 amounted to 13,127, of whom the greater number were Magyars.

HALBERSTADT, the chief town of a circle in the government district of Magdeburg, Prussian province of Saxony, is situated in a beautiful and fertile country on the Holzemme, a tributary of the Bode, and at the junction point of four railways, 29 miles S.W. of Magdeburg. It has an antique appearance, and in a large number of the buildings the mediæval wood-architecture is still preserved. About a mile and a half distant from Halberstadt are the *Spiegel'sche Berge*, from which there is obtained a fine view of the surrounding country. The town possesses a cathedral in the Pointed style, dating from the 13th and 14th centuries, and restored between 1850 and 1871, containing a rich Gothic screen of the date of 1510, other interesting antiquities, beautiful glass windows, and several valuable paintings. Of the remaining churches the only one of special interest is the Liebfrauenkirche, a basilica in the later Romanesque style, dating from the 12th and 13th centuries, and restored in 1848, containing noteworthy wall paintings and figures in relief. Among the other old buildings may be mentioned the town-house, dating from the 14th century and restored in the 17th century; the town hall crypt, dating from the 15th century; and the Petershof, formerly the residence of the bishop, but now used as a custom house. The principal educational establishments are the gymnasium—the new buildings for which were opened in 1875—with a library of 30,000 volumes; the real-school of the first order; the normal school, connected with which there is a deaf and dumb institute; and the provincial trade school. Near the cathedral is a building called the temple of friendship which contains a collection of the portraits of the friends of the poet Gleim, who was a resident in the town, and whose house was the resort of a large circle of poets and scholars. In the same neighbourhood a beautiful monument in the Early Pointed style has been erected to the memory of those who fell in the late Franco-German war. The principal manufactures of the town are linen and woollen cloth, leather, paper, gloves, wadding, cigars, soap, oil, sugar, chemical products, brandy, and liqueurs. The population in 1875 was 27,757.

Halberstadt owes its origin to the foundation in the 9th century of the bishopric of which it became the seat. It received town rights from Bishop Arnulf in 998. It was burnt down in 1113 by the emperor Henry V., and in 1179 by Henry the Lion. At the peace of Westphalia in 1648 the bishopric was ceded as a principality to Brandenburg. At the Tilsit peace in 1807 it was [illegible] to Westphalia, but in 1813 it again came into the possession of Prussia.

See Lucanus, *Der Dom zu Halberstadt*, 1837; Wegener, *Der Dom zu Halberstadt*, 2d edition 1866, and *Die Liebfrauenkirche zu Halberstadt*, 1872; [illegible] *[illegible] und Legenden Halberstädter [illegible]*, 18[illegible]; Schmidt, *Urkundenbuch der Stadt Halberstadt*, Halle, 1878.

HALBERT, Halberd (French, *Hallebarde*), a weapon consisting of an axe blade balanced by a pick and having an elongated pike head at the end of the staff, which was usually about 5 or 6 feet in length. Various derivations have been suggested for the term, but M. Demmin seems to have hit the right one in the German *Hellbarthe*, "half battle-axe." The earliest halberts represented in the miniatures of the 14th century, or preserved in the collections of Switzerland and Germany, have the axe-blade often prolonged beyond the end of the staff, and thus resemble the English bill of the 15th century. Fauchet, in his *Origines des Dignitez*, printed in 1600, states that Louis XI. of France ordered certain new weapons of war called *hallebardes* to be made at Angers and other places in 1475. The Swiss had a mixed armament of pikes and halbards at the battle of Morat in 1476. We find the same mixture of billmen and halbardiers in the English army at the same period. In the 15th and 16th centuries the halbards became larger, and the blades were formed in many varieties of shape, often engraved, inlaid, or pierced in open work, and exquisitely finished as works of art. This weapon was in use in England from the reign of Henry VII. to the reign of George III., when it was still carried by sergeants in the guards and other infantry regiments. It is still retained as the symbol of authority borne before the magistrates on public occasions in some of the burghs of Scotland. The Lochaber axe may be called a species of halbert furnished with a hook on the end of the staff at the back of the blade.

HALDANE, James Alexander (1768–1851), whose disinterested labours in the cause of religion have secured for his name an honourable place in the ecclesiastical history of Scotland, was the younger son of Captain James Haldane of Gleneagles, Perthshire, and was born at Dundee on July 14, 1768. Educated first at Dundee and afterwards at the High School and university of Edinburgh, he shortly after the completion of his sixteenth year entered the service for which he had been from his childhood destined, by joining the "Duke of Montrose" East Indiaman as a midshipman. After four voyages to India he in the summer of 1793 was nominated to the command of the "Melville Castle"; but having, during a long and unexpected detention of his ship, begun a careful study of the Bible, he came under deep religious impressions and, somewhat abruptly resolving to quit the naval profession, returned to Scotland before his ship had sailed. About the year 1796 he became acquainted with the celebrated evangelical divine, Simeon of Cambridge, in whose society he made through Scotland more than one tour, in the course of which he endeavoured by tract-distribution and other means to awaken others to somewhat of that interest in religious subjects which he himself so strongly felt. In May 1797 he preached, at Gilmerton near Edinburgh, his first sermon with a success which was considered to be very encouraging; and during the next few years he made repeated missionary journeys, preaching wherever he could obtain hearers, and generally in the open air. Not originally disloyal to the Church of Scotland, he was gradually driven by the hostility of the Assembly and the exigencies of his position into a separatistic attitude; in 1799 he was ordained on the principles of Independency as pastor of a large congregation in Edinburgh, to which he continued gratuitously to minister for more than fifty years; and in 1808 he made public avowal of his conversion to Baptist views. As advancing years compelled him to withdraw from the more exhausting labours of itinerancy and open air preaching, he sought more and more to influence the discussion of current religious and theological questions by means of the press, and by numerous pamphlets took part in the controversies connected with the names of Edward Irving, Erskine of Linlathen, Campbell of Row, and others. His latest works were a treatise on the *Doctrine of the Atonement* (1845) and an *Exposition of the Epistle to the Galatians* (1848). He died on the 8th of February 1851.

HALDANE, Robert (1764–1842), elder brother of the preceding, and intimately associated with him in many of his labours, was born in London on February 28, 1764. After attending classes in the Dundee grammar school and in the High School and university of Edinburgh he in 1780 joined H.M.S. "Monarch," of which his uncle Lord Duncan was at that time in command, and in the following year was transferred to the "Foudroyant," on board of which, during the night engagement with the "Pegase," he distinguished himself so much that Captain Jervis (afterwards Lord St Vincent) wrote to Admiral Duncan predicting a brilliant future for his nephew. Haldane was afterwards present at the relief of Gibraltar, but at the peace of 1783 he finally left the navy, and soon afterwards settled on his estate of Airthrey, near Stirling. The earlier phases of the French Revolution as they occurred attracted his attention and at first excited his deepest sympathy, a sympathy which induced him, at the cost of making many enemies, to avow his strong disapproval of the war with France. As his bright and oversanguine visions of a new order of things to be ushered in by political change disappeared, he, unlike Wordsworth's "Solitary," began to direct his thoughts to religious subjects, and underwent a spiritual change which, while neither sudden nor violent, was decisive and complete. Resolving to devote himself and his means wholly to the advancement of Christianity, his first proposal for that end, made in 1796, was to organize a vast mission to Bengal, of which he was to provide the entire expense; with this view the greater part of his estate was sold, but after every arrangement had been well nigh completed, the East India Company refused to sanction the scheme, which therefore had to be reluctantly abandoned. In December 1797 he joined his brother and some others in the formation of the "Society for the Propagation of the Gospel at Home"; and in building chapels or "tabernacles" for its congregations, in supporting its missionaries, and in maintaining institutions for the education of young men to carry on its work, he in the course of the twelve years which followed is stated on good authority to have expended upwards of £70,000. In 1816 he visited the Continent, and first at Geneva and afterwards in Montauban (1817) occupied himself in lecturing with surprising success to theological students, among whom were Malan, Monod, and Merle D'Aubigné. Returning to Scotland in 1819, he lived partly on his estate of Auchengray and partly in Edinburgh, and like his brother took an active part, chiefly through the press, in many of the religious controversies of the time. He died on the 12th of December 1842.

In 1816 he published a work on the *Evidences and Authority of Divine Revelation*, and in 1819 the substance of his theological prelections in a *Commentaire sur l'Épître aux Romains*. Among his later writings, besides numerous pamphlets on what was known as "the Apocrypha controversy" and on the sabbatarian question, are a treatise *On the Inspiration of Scripture* (1828), which has passed through seven editions, and a later *Exposition of the Epistle to the Romans* (1835), which has been frequently reprinted, and has been translated into French and German. See *Memoirs of R. and J. A. Haldane*, by Alexander Haldane (1852).

HALE, Sir Matthew (1609–1676), lord chief-justice of England, was born on November 1, 1609, at Alderley in Gloucestershire, where his father, a retired barrister, had a small estate. His paternal grandfather was a rich clothier of Wotton-under-Edge; on his mother's side he was connected with the noble family of the Poyntzes of Acton. Both his parents having died before he was five years old, the future chief-justice was placed by his guardian under the care of Mr Staunton, vicar of Wotton-under-Edge, through whose influence he became strongly imbued with puritanical principles. There he remained till he attained his sixteenth year, when he entered Magdalen Hall, Oxford, under the tuition of the puritanical but learned Obadiah Sedgwick. At Oxford Hale devoted himself for several terms to the study of Aristotle and Calvin with a view to holy orders, and manifested that steadiness and application which in after years secured his reputation and advancement. But suddenly there came a change. The diligent student, at first attracted by a company of strolling players, threw aside his studies, and plunged carelessly into gay society. He soon decided to change his profession; and resolved to trail a pike as a soldier under the prince of Orange in the Low Countries. Before going abroad, however, Hale found himself obliged to proceed to London in order to give instructions for his defence in a legal action which threatened to deprive him of his patrimony. His leading counsel was the celebrated Serjeant Glanville, who, perceiving in the acuteness and sagacity of his youthful client a peculiar fitness for the legal profession, succeeded, with much difficulty, in inducing him to renounce his military for a legal career, and on the 8th November 1629 Hale became a member of the honourable society of Lincoln's Inn.

He immediately resumed his habits of intense application. The rules which he laid down for himself, and which are still extant in his handwriting, prescribe sixteen hours a day of close application, and prove, not only the great mental power, but also the extraordinary physical strength he must have possessed, and for which indeed, during his residence at the university, he had been remarkable. During the period allotted to his preliminary studies, he read over and over again all the year-books, reports, and law treatises in print, and at the Tower of London and other antiquarian repositories examined and carefully studied the records from the foundation of the English monarchy down to his own time. Even the common-place book which he composed as the result of his study and research may, according to Lord Campbell, "be considered a *corpus juris* embracing and methodizing all that an English lawyer on any emergency could desire to know." But Hale did not confine himself to law. He dedicated no small portion of his time to the study of pure mathematics, to investigations in physics and chemistry, and even to anatomy and architecture; and there can be no doubt that this varied learning enhanced considerably the value of many of his judicial decisions.

Hale was called to the bar in 1637, and almost at once found himself in full practice. Though neither a fluent speaker nor bold pleader, in a very few years he was at the head of his profession. He entered public life at perhaps the most critical period of English history. Two parties were contending in the state, and their obstinacy could not fail to produce a most direful collision. But amidst the confusion Hale steered a middle course, rising in reputation, and an object of solicitation from both parties. Taking Pomponius Atticus as his political model, he was persuaded that a man, a lawyer, and a judge could best serve his country and benefit his countrymen by holding aloof from partisanship and its violent prejudices, which are so apt to distort and confuse the judgment. But he is best vindicated from the charges of selfishness and cowardice by the thoughts and meditations contained in his private diaries and papers, where the purity and honour of his motives are clearly seen. It has been said, but without certainty, that Hale was engaged as counsel for the earl of Strafford; he certainly acted for Archbishop Laud, Lord Maguire, Christopher Love, the duke of Hamilton, and others. It is also said that he was ready to plead on the side of Charles I. had that monarch submitted to the court. The parliament having gained the ascendency, Hale signed the Solemn League and Covenant, and was a member of the famous Assembly of Divines at Westminster in 1644; but although he would undoubtedly have preferred a Presbyterian form of church government, he had no serious objection to the system of modified Episcopacy proposed by Ussher. Consistently with his desire to remain neutral, Hale took the engagement to the Commonwealth as he had done to the king, and in 1653, already serjeant, he became a judge in the Court of Common Pleas. Two years afterwards he sat in Cromwell's parliament as one of the members for Gloucestershire. After the death of the Protector, however, he declined to act as a judge under Richard Cromwell, although he represented Oxford in Richard's parliament. At the Restoration in 1660 Hale was very graciously received by Charles II., and in the same year was appointed chief baron of the exchequer, and accepted, with extreme reluctance, the honour of knighthood. After holding the office of chief baron for eleven years he was raised to the higher dignity of lord chief-justice, which he held till February 1676, when his failing health compelled him to resign. He retired to his native Alderley, where he died on December 25th of the same year. He was twice married, and survived all his ten children save two.

As a judge, Sir Matthew Hale discharged his duties with resolute independence and careful diligence. Lord Campbell says of him that "he is certainly to be considered the most eminent judge who ever filled the office [of chief baron]; and being promoted to be chief-justice of England, he gave new dignity to the supreme magistracy which had been illustrated by Gascoigne, by Fortescue, and by Coke." His sincere piety made him the intimate friend of Barrow, Tillotson, Wilkins, and Stillingfleet, as well as of the Nonconformist leader Baxter. He is chargeable, however, with the condemnation and execution of two poor women tried before him for witchcraft in 1664, a kind of judicial murder then falling under disuse. He is also reproached with having hastened the execution of a soldier for whom he had reason to believe a pardon was preparing.

Of Hale's legal works the only two of importance are his *Historia Placitorum Coronæ, or History of the Pleas of the Crown*, first published in 1739; and the *History of the Common Law of England, with an Analysis of the Law*, &c., 1713. Among his numerous religious writings the *Contemplations, Moral and Divine*, occupy the first place. Others are *The Primitive Origination of Man*, 1677; *Of the Nature of True Religion*, &c., 1684; *A Brief Abstract of the Christian Religion*, 1688. One of his most popular works is the collection of *Letters of Advice to his Children and Grandchildren*. He also wrote an *Essay touching the Gravitation and Non-gravitation of Fluid Bodies*, 1673; *Difficiles Nugæ, or Observations touching the Torricellian Experiment*, &c., 1675; and a translation of the *Life of Pomponius Atticus*, by Cornelius Nepos. His efforts in poetry were [illegible]. He left his valuable collection of MSS. and records to the library of Lincoln's Inn. His Life has been written by Burnet, 1682; by Williams, 1835; by Roscoe, in his *Lives of Eminent Lawyers*, in 1838; and by Lord Campbell, in his *Lives of the Chief Justices*, in 1849.

HALES, Stephen (1677–1761), physiologist and inventor, was born at Bekesbourn in Kent, on the 7th September 1677. He was the sixth son of Thomas Hales, whose father, Sir Robert Hales, was created baronet by Charles II. in 1670. Of his early education little is known, but in June 1696 he was entered as a pensioner of Benet (now Corpus Christi) College, Cambridge, with the view of taking holy orders. On 16th April 1702 he was elected and in February 1703 admitted to a fellowship. He received the degree of master of arts in 1703, and of bachelor of divinity in 1711. While at college one of his most intimate friends was William Stukeley, with whom he studied anatomy, chemistry, &c. In 1710 Hales was presented to the perpetual curacy of Teddington in Middlesex, where he remained all his life, notwithstanding that he was subsequently appointed rector of Porlock in Somerset, and later of Farringdon in Hampshire. In March 1717 he was elected fellow of the Royal Society, to whose *Transactions* he contributed many valuable papers. In 1732 he was named one of a committee for establishing a colony in Georgia, and the next year he received the degree of doctor of divinity. He was appointed almoner to the princess-dowager of Wales in 1750. On the death of Sir Hans Sloane in 1753, Hales was chosen foreign associate of the French Academy of Sciences. He died at Teddington, January 4, 1761.

Hales is celebrated as the inventor of a "ventilator," by means of which fresh air was introduced into jails, hospitals, mines, ships' holds, &c. In the four years (1749–52) after its introduction into the Savoy prison, only 4 prisoners died; while previously the mortality had been from 50 to 100 per annum. The invention met with immediate favour, especially in France. Hales was the designer of other inventions by means of which sea-water was distilled, corn cleaned and preserved, meat preserved on long voyages, &c.

His chief writings are his *Statical Essays* (see CHEMISTRY, vol. v. p. 461), consisting of *Vegetable Staticks, or an Account of some Statical Experiments on the Sap in Vegetables* (1727), and *Hæmostaticks, or an Account of some Hydraulic and Hydrostatical Experiments made on the Blood and Blood-vessels of Animals* (1733). His essay on *The Means of Dissolving the Stone in the Bladder*, &c., gained him the Copley gold medal in 1739. His *Admonitions to the Drinkers of Gin, Brandy*, &c., appeared in 1734; the *Vegetable Staticks*, translated by Buffon, in 1735, and the *Hæmostaticks*, by M. de Sauvages, in 1744. For sketch of his life, with portrait, see *Gardener's Chronicle*, 1877, pp. 16–17.

HALÉVY, Jacques François Fromental (1799–1862), a celebrated French musician, was born May 27, 1799, at Paris. He studied at the Paris Conservatoire under Berton and Cherubini, and in 1819 gained the grand prix de Rome with a cantata called *Herminie*. In accordance with the conditions of his scholarship he started for Rome, where he devoted himself to the study of Italian music, and wrote an opera and various minor works. His first opera produced in Paris after his return from Italy was called *L'Artisan*, which saw the light at the Théâtre Feydeau in 1827, apparently without much success. Other works of minor importance, and now forgotten, followed, amongst which only a ballet named *Manon Lescaut*, produced in 1830, deserves mention. Five years later, in 1835, Halévy produced the tragic opera *La Juive* and the comic opera *L'Éclair*, and on these works his immortality is mainly founded. Both have kept the stage to the present day, and will probably survive changes of taste even greater than those which music has undergone in France during the last forty years. *The Jewess* is in every way representative of the French *grand opéra*, the modern outgrowth of Gluck's music-drama with a strong admixture of the Italian element and of an excess of spectacular splendour wholly strange to the classic simplicity of the original. It is curious that the *grand opéra*, although an essentially national product of France, was both initiated and brought to its highest perfection by two Germans—Gluck and Meyerbeer. The genius of the latter was fatal to Halévy's fame. By the side of the *Huguenots* the merits of *La Juive* appear in almost diminutive proportions. At the same time Halévy's work ought not to be treated with contempt. It is full of fine dramatic features, and especially the introduction of the Jewish element—with which Halévy, himself a Jew, was well acquainted—gives a peculiar interest on this score. *L'Éclair* is a curiosity of musical literature. It is written for two tenors and two soprani, without a chorus, and displays the composer's mastery over the most refined effects of instrumentation and vocalization in a favourable light. After these two works, to which Halévy owed his fame and his seat at the Institute, he wrote numerous operas of various *genres*, amongst which only *La Reine de Chypre*, a spectacular piece analysed by Wagner in one of his Paris letters (1841), and *La Tempesta*, in 3 acts, written for Her Majesty's Theatre, London (1850), need be referred to. In addition to his productive work Halévy also rendered valuable services as a teacher. He was professor at the Conservatoire from 1827 till his death—some of the most successful amongst the younger composers in France, such as Gounod, Victor Massé, and Georges Bizet, the author of Carmen, being amongst his pupils. Halévy also tried his hand at literature, and there exists an agreeable volume of *Souvenirs et Portraits* from his pen. He died at Nice, March 17, 1862.

HALIBURTON, THOMAS CHANDLER (1796–1865), long a judge of Nova Scotia, and a popular literary satirist, was born at Windsor, Nova Scotia, in 1796, and received his education there, at King's College. He was called to the bar in 1820, and took part in the legislature of his native province as a member of the House of Assembly. He distinguished himself as a barrister, and in 1828 was promoted to the bench as a chief justice of the common pleas. But it is as the brilliant humorist and satirist that he is now remembered; for his labours alike as a barrister and a member of parliament were limited to his own province, and could scarcely beget anything beyond a local reputation. Yet confined as he thus was to so narrow a sphere, a true estimate of its disadvantages is necessary in order to do justice to the vigorous individuality of his writings. He was a native of what was then a small and isolated maritime province, detached from Canada. Its exports consisted chiefly of lumber and the produce of its fisheries; and with these trade was carried on with Great Britain, the West Indies, and the United States. Its entire population at the time when Haliburton was called to the bar, including Indians, African refugees from the States, and the Acadian descendants of the original French population, did not amount to 97,000. The English settlers were largely composed of refugees from the former British colonies, animated by the strong Conservative sympathies of the old colonial loyalists. The French Acadians were Roman Catholics, and their national traditions and religion equally tended to alienate them from the neighbouring republic.

In politics Haliburton adhered through life to the Conservative party; and the influence of his early associations is traceable in most of his writings. He was still at the bar when he wrote *An Historical and Statistical Account of Nova Scotia*, in 2 vols. Canada, it will be remembered, then consisted of Upper and Lower Canada only, and, with the French population of the latter and nearer province, was even stranger to the Nova Scotian than the New England States. The leisure which judicial duties secured admitted of literary relaxations in which Judge Haliburton's fine sense of the humorous had free play; and in 1835 he contributed anonymously to a local paper a series of letters professedly depicting the peculiarities of the genuine Yankee. These sketches, which abounded in clever picturings of national and individual character, drawn with great satirical humour, were collected in 1837, and published under the title of *The Clockmaker, or Sayings and Doings of Samuel Slick of Slickville*. A second series followed in 1838, and a third in 1840. *The Attaché, or Sam Slick in England* (2 vols. 8vo), was the result of a visit there in 1841. This also was followed up by a second series in 1844. His other works include—*The Old Judge, or Life in a Colony*; *The Letter Bag of the Great Western*; *Rule and Misrule of the English in America*; *Traits of American Humour*; and *Nature and Human Nature*.

While the judge was thus diligent in such literary recreations, he continued to secure popular esteem in his judicial capacity. In 1840 he was promoted to be a judge of the supreme court; but within two years he resigned his seat on the bench, removed to England, and after a time entered parliament as the representative of Launceston, in the Conservative interest. His literary reputation awoke expectations which were not fulfilled. The bar has rarely proved to be an apt school for training the parliamentary debater, and he was too far advanced in life to adapt himself to the novel requirements of the English House of Commons. The last time he spoke he was listened to with interest on the Canadian defences. But the tenure of his seat for Launceston was brought to an end by the dissolution of the parliament in 1865, and he did not again offer himself to the constituency. His death followed in the month of August of the same year, at Gordon House, Isleworth, when he was in his seventieth year.[1]

HALIBUT. See HOLIBUT.

HALICARNASSUS, an ancient Greek city on the south-western coast of Asia Minor, built on a picturesque and advantageous site at the northern end of the Ceramic Gulf or Gulf of Cos. It originally occupied only the small island of Zephyria, close to the shore, but in course of time this island was united to the mainland and the city extended so as to incorporate Salmacis, an older town of the Leleges and Carians. About the foundation of Halicarnassus various traditions were current; but they agree in the main point as to its being a Dorian colony, and the figures on its coins, such as the head of Medusa or Minerva, the head of Neptune, or the trident, give support to the statement that the mother cities were Trœzen and Argos. The inhabitants appear to have accepted as the legendary founder Anthes, mentioned by Strabo, and were proud of the title of Antheadæ. At an early period Halicarnassus was a member of the Doric Hexapolis, which included Cos, Cnidus, Lindus, Camirus, and Ialysus; but one of the citizens, Agasicles, having taken home the prize tripod which he had won in the Triopian games instead of dedicating it according to custom to the Triopian Apollo, the city was cut off from the league. In the time of Xerxes we find Halicarnassus under the sway of a certain Artemisia, who made herself famous by the assistance she rendered to the great Persian invader. Pigres, her brother or son, was the reputed author of the *Batrachomyomachia*. Of Pisindalis, her son and successor in the sovereignty, little is known; but Lygdamis, who next attained to power, is notorious for having put to death the poet Panyasis and caused Herodotus, the greatest of the Halicarnassians, to leave his native city (*c.* 457 B.C.). About the close of the 5th century B.C., the power of Athens became predominant over Halicarnassus and other Dorian cities of Asia, but the peace of Antalcidas in 387 made them subservient to Persia; and it was under Mausolus, a Persian satrap of almost independent authority, that Halicarnassus attained its highest prosperity. Struck by the natural strength and beauty of its position, Mausolus removed thither from Mylasa, and increasing its population by the inhabitants of six towns of the Leleges, devoted himself to its embellishment and defence. On his death he was succeeded by his widow and sister, Artemisia, whose military ability was shown by the stratagem by which she captured the Rhodian vessels attacking her city, and whose magnificence and taste have been perpetuated to all time by the "Mausoleum," the monument she erected to her husband's memory. In the execution of this wonderful enterprise she employed the architects Satyrus and Pythius, and the sculptors Scopas, Leochares, Bryaxis, and Timotheus; and though she died before its completion, they continued it with all the enthusiasm of artists. In the history of Halicarnassus the next important events were connected with the conquests of Alexander the Great. Memnon, satrap of the west coast, having taken refuge within its walls after the battle of Granicus, it was besieged by the Macedonians, captured, and plundered. Not long afterwards we find the citizens receiving the present of a gymnasium from Ptolemy, and building in his honour a stoa or portico; but the city never recovered altogether from the disasters of the siege, and Cicero describes it as almost deserted. The site is now occupied by the town of Budrun, but the ancient walls can still be traced in nearly all their circuit, and the position of several of the temples and public buildings can be fixed with considerable certainty.

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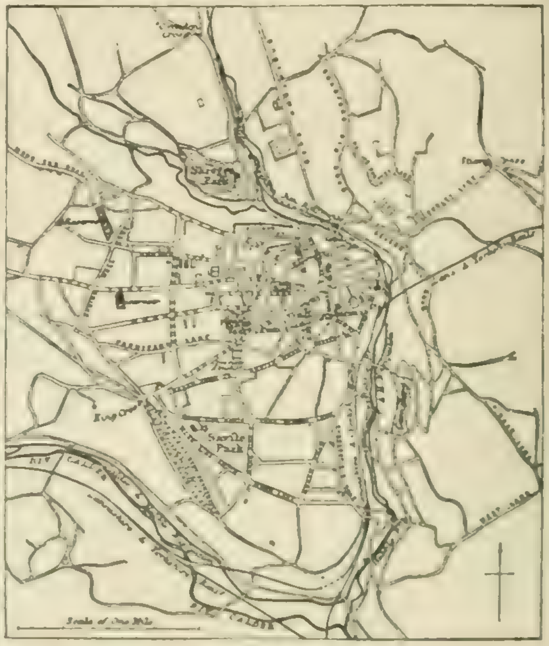
[1] Judge Haliburton was descended from the branch of the Newmains and Merton family which figures in the genealogical memorials of the Haliburtons in their relation to that of Sir Walter Scott, whose paternal grandmother was Barbara Haliburton. The note of all the families of the name drawn up by the father of the poet and novelist was prepared in reply to inquiries of the father of Judge Haliburton, with a view to the establishment of his claims to certain family property. Of a younger branch of the Newmains family that went to Jamaica, one member removed to Massachusetts. A son of his, the father of the judge, migrated to Nova Scotia, and there, in 1790, he revived old hereditary rights, and reclaimed relationship with the original Scottish stock.

From the ruins of the Mausoleum sufficient has been recovered by the excavations carried out in 1867 by C. T. Newton to enable a fairly complete restoration of its design. According to Mr Pullan, Mr Newton's collaborator, the building consisted of five parts—a basement or podium, a pteron or enclosure of columns, a pyramid and pedestal, and a chariot group. The basement, probably 51 feet in height, and covering an area of 114 feet by 92, was built of blocks of greenstone and cased with marble, the monotony of the plain-courses being possibly broken by one or more belts of frieze. The pteron, 37½ feet in height, consisted (according to Pliny) of thirty-six columns of the Ionic order, enclosing a square *cella*, the walls of which were relieved by friezes. From the portions that have been recovered it appears that the principal frieze of the pteron represented combats of Greeks and Amazons. "Throughout," says Mr Newton, "there is a skilful opposition of nude and draped male and female forms; but the groups and figures are much less intermixed than in the Parthenon and Phigalian friezes. The whole surface was coloured, the ground of the relief being ultramarine and the flesh a dim red, while the drapery and armour were picked out with various hues." Fragments have been found of two other friezes of doubtful position in the monument, one representing a chariot race and the other a centaur fight. Above the pteron rose the pyramid, approximately 108 feet long and 86 feet wide at the base, and mounting by 24 steps to an apex or pedestal, which possibly had a length of 25 feet 6 inches and a breadth of 20 feet. On this apex stood the quadriga or chariot with the figure of Mausolus himself and an attendant deity acting as his charioteer. The height of the statue of Mausolus—it has happily been preserved and forms part of the treasures of the British Museum—is 9 feet 9½ inches without the plinth. The hair rising from the forehead falls in thick waves on each side of the face and descends nearly to the shoulder; the beard is short and close, the face square and massive, the eyes deep set under overhanging brows, the mouth well formed with settled calm about the lips. The drapery, consisting of a chiton and mantle, is grandly composed. Such are the main features of the great Mausoleum which deservedly ranked among the wonders of the world. The minor edifices and sculptural remains of Halicarnassus are of secondary moment. Of well-preserved inscriptions the number is comparatively few; but one or two (such as that containing the names of Lygdamis and Panyasis) are of no small interest to the archæologist.

For further details see Ross, *Reise durch den Inseln Griechenlands*; Hamilton's *Researches in Asia Minor*; and Newton's *History of Discoveries at Halicarnassus*, 1862-3, and his *Travels in the Levant*, 1865.

HALIFAX, a municipal and parliamentary borough and market-town of England, in the northern division of the West Riding of Yorkshire, is situated on a gentle acclivity almost surrounded by hills, on the small river Hebble near its junction with the Calder, 7 miles south-west of Bradford. Originally its streets were narrow and irregular, but many of the older houses have been pulled down and new streets opened up, while the constant additions made to it through the rapid increase of population have completely changed its appearance. The principal buildings are the parish church of St John, the restoration of which was completed in 1879 at a cost of £16,000, a structure in the Perpendicular style, of different dates, and having the western tower 117 feet in height; All Souls Church, begun in 1859 from the designs of Sir Gilbert Scott, and erected at the expense of Mr Edward Akroyd, in the Early Decorated style, very richly ornamented with statues and carvings in Italian marble, serpentine, and alabaster, and consisting of nave, aisles, transepts, and chancel, with a very graceful tower and spire at the north-west angle 236 feet in height, and a sacristy at the north-east; the Square Church, erected by the Congregationalists in 1857 at a cost of £16,000, an ornate cruciform building with a tower and elaborate crocketed spire rising to a height of 235 feet; the town-hall, completed in 1863 after the designs of Sir Charles Barry at a cost of £40,000; the infirmary, a large and elegant building in which medical and surgical aid is afforded to outdoor as well as indoor patients; the Waterhouse charity school, a handsome set of buildings forming three sides of a quadrangle, erected in 1855; the Crossley almshouses, erected and endowed by Sir Francis and Mr Joseph Crossley; the piece-hall, a large quadrangular structure occupying more than 2 acres of ground, erected in 1799 for the lodgment and sale of piece goods, but now used as a market for fish and vegetables; the free grammar school, founded in 1585 under royal charter for instruction in the classical languages; the Crossley orphan home and school, built by the Crossley brothers at a cost of £46,000; the museum, the oddfellows' hall, the working men's college, the mechanics' institute, the assembly and concert rooms, and the theatre. There are three public parks, viz., Savile Park, 50 acres in extent; the People's Park, 12½ acres, laid out in a highly ornamental style from the designs of Sir Joseph Paxton, and presented to the town in 1858 by Sir Francis Crossley; and the Shrogg's Park, 25 acres, opened in 1877. The North Bridge, a fine structure of iron, spans the Hebble valley in two arches. Halifax derives its importance from its manufactures of cloth, which began in the 15th century. It ranks in Yorkshire with Leeds, Bradford, and Huddersfield as a seat of the woollen and worsted manufacture. The principal staples are carpets, cashmeres, orleanses, coburgs, merinoes, lastings, alpacas, damasks, baizes, broad and narrow cloths, kerseymeres, blankets, muslin-de-laines, shalloons, and figured vestings. A considerable number of persons are employed in iron-works, machine works, and chemical works, and in the



Plan of Halifax.

1. Workhouse.
2. Oddfellows' Hall.
3. Town-Hall.
4. Mechanics' Institute.
5. St John's Church.
6. Square Church.
7. Piece Hall.
8. Post Office.
9. Museum.
10. Infirmary.
11. Theatre.
12. Prince Albert's Monument.
13. Crossley Orphan Home.

neighbouring coal mines and stone quarries. The borough sends two members to parliament. The parish is the largest in Great Britain, embracing 79,[illegible] acres. The population of the municipal and parliamentary borough in 1861 was 37,014, and in 1871 (with an extended area of 3704 acres) 65,510.

Two derivations are given for the name Halifax. According to Camden it means "holy hair," and he accounts for the origin of the name from the fact that the head of a virgin who had been murdered by a wicked clerk was suspended on a yew tree in the neighbourhood, and came to be regarded as a holy relic. According to another account the name means "holy face," and is derived from an image of St John, once preserved in a hermitage near the church. The first mention of the town is in the 12th century, when its church was granted by William earl of Warren, to the priory of Lewes in Sussex. Woollen manufacture was introduced in the beginning of the 15th century; the number of its houses was only 13, but they had increased in 1540 to 520. It is said to have received a considerable increase to its inhabitants and impulse to its prosperity from the number of those who fled from the Netherlands to escape the persecution carried on there under the auspices of the duke of Alva. In 1642 it was garrisoned by the forces of the parliament, and near it at a place still called the Bloody Field an engagement took place between them and the royalists. In the forest of Hardwick, then coextensive with the parish of Halifax, there at one time existed a custom called the "gibbet law," according to which any person suspected to be in the unlawful possession of goods to the value of 13½d. was tried by the frith-burghers of the liberty, and if condemned was executed on a market day by a kind of axe resembling the modern guillotine. The last execution took place in 1650. A number of eminent men have been born in the town or neighbourhood of Halifax, including the mathematician Henry Briggs, Archbishop Tillotson, Sir Henry Savile, and John Foster. Daniel Defoe resided for some time in the town.

HALIFAX, a city and seaport of British North America, capital of Nova Scotia, is situated on the south-east coast of the province on the declivity of a hill about 250 feet in height, rising gradually from the south west side of Chebucto Bay or Halifax harbour, a deep inlet of the sea. The hill is commanded by a citadel about a mile in circumference and of great strength, and the harbour is defended by several forts and batteries. Originally the houses were chiefly of wood plastered or stuccoed, but the frequent recurrence of fires has led to a more general use of stone or brick as building materials. Many of them have an imposing and elegant appearance; and the streets are spacious and regularly laid out, crossing each other at right angles. Including its suburbs the city is from 2 to 3 miles long and about 1 mile broad. The principal buildings are the Government house, the official residence of the lieutenant governor of Nova Scotia, a solid sombre-looking structure at the south of the town; the provincial building, near the centre of the town, 140 feet long by 70 feet broad, with a fine Ionic colonnade, and comprising the Government offices, the post-office, the city library and the provincial museum; the parliament building, the court-house, the admiralty house, the exchange, the Roman Catholic cathedral of St Mary, the rooms of the young men's Christian association, the Wellington barracks, the military hospital, the lunatic asylum, the workhouse, the jail, and the penitentiary. The educational establishments include the Dalhousie college and university, the St Mary's Roman Catholic college, the Presbyterian theological college, the High School, the almshouse of industry for girls, two orphan asylums, a blind asylum, a lunatic asylum for the Lower Provinces, two industrial schools, and nearly twenty public schools. A lighthouse has been erected on the west side of the entrance to the harbour on a small island off Sambro Cape. After passing Sambro the course for large vessels is to the west of M'Nab's Island, on which a lighthouse has also been erected; but there is also a passage sufficient for small vessels to the east of the island. Recently a lighthouse has been erected on the west side of St George's Island opposite the city. Halifax is the seat of a considerable fishery. Its principal trade is with Great Britain, the British colonies, and the United States. In 1878 the number of ships that entered was 887, with a tonnage of 317,336. The value of imports was $4,991,265, and of exports $4,102,335. The imports are chiefly manufactures from England, manufactures and produce from the United States, and sugar, molasses, rum, and other products from the West Indies; the chief exports are dried and pickled fish, timber, cattle, agricultural and dairy produce, fur, and whale and seal oil. Halifax is now used instead of Portland in the State of Maine as the winter port (the St Lawrence being closed with ice) for the Dominion of Canada. The principal industries of Halifax are ironfounding, brewing, distilling, sugar-refining, and the manufacture of woollen and cotton goods, paper, leather, tobacco, gunpowder, agricultural and musical instruments, carriages, machinery, candles, and soap. On account of its fine air and the beautiful scenery of the neighbourhood, Halifax has a high reputation as a watering place. An abundant supply of water for the city is obtained from two lakes 2 miles distant. The city is the seat of an Anglican bishop and a Roman Catholic archbishop. Nearly one-third of the population is Roman Catholic. It is named after the earl of Halifax, and was founded by Governor Cornwallis in 1749. In 1790 it contained only 700 houses and 4000 inhabitants. It was declared a free port in 1817, at which time the number of houses was 1200. The population in 1861 was 25,026, and in 1871, 29,582.

HALIFAX, CHARLES MONTAGUE, EARL OF (1661-1715), English statesman and poet, fourth son of the Honourable George Montague, who was fifth son of the first earl of Manchester, was born at Horton, Northamptonshire, on the 16th April 1661. In his fourteenth year he was sent to Westminster school, where he was chosen king's scholar in 1677, and distinguished himself in the composition of extempore epigrams made according to custom upon theses appointed for king's scholars at the time of election. In 1682 he entered Trinity College, Cambridge, where he acquired a solid knowledge of the classics and surpassed all his contemporaries at the university in logic and ethics. Latterly, however, he preferred to the abstractions of Descartes the practical philosophy of Sir Isaac Newton, and he was one of the small band of students who assisted Newton in forming the Philosophical Society of Cambridge. But it was his facility in verse writing, and neither his scholarship nor his practical ability, that first opened up to him the way to fortune. His clever but absurdly panegyrical poem on the death of Charles II., which was published in the *Book of Condolence and Congratulation* presented by the university to James II., secured for him the notice of the earl of Dorset, who invited him to town and introduced him to the principal wits of the time; and in 1687 his joint authorship with Prior of the *Town and Country Mouse*, a happy parody of Dryden's *Hind and Panther*, not only increased his literary reputation but directly helped him to political influence. In 1688, through the patronage of the earl of Dorset, he entered parliament as member for Maldon, and sat in the convention which resolved that William and Mary should be declared king and queen of England. About this time he married the countess-dowager of Manchester, and it would appear, according to Johnson, that it was still his intention to take orders; but after the coronation he purchased a clerkship to the council. On being introduced by Earl Dorset to King William, after the publication of his poetical *Epistle occasioned by his Majesty's Victory in Ireland*, he was ordered to receive an immediate pension of £500 per annum, until an opportunity should present itself of "making a man of him." In 1691 he was chosen chairman of the committee of the House of Commons appointed to confer with a committee of the Lords in regard to the Bill for regulating trials in cases of high treason; and he displayed in these conferences such tact and debating power that he was made one of the commissioners of the treasury and called to the privy council. It was during these debates that he had recourse to the peculiar oratorical device of losing his presence of mind, in order to give a practical illustration of the necessity of allowing the privilege of counsel to criminals before a court of justice. But his success as a politician was less due to his oratorical gifts than to his skill in finance, and in this respect he soon began to manifest such brilliant talents as completely eclipsed the painstaking abilities of Godolphin. Indeed it may be affirmed that no other statesman has initiated schemes which have left a more permanent mark on the financial history of England. Although perhaps it was inevitable that England should sooner or later adopt the Continental custom of lightening the annual taxation in times of war by contracting a national debt, the actual introduction of the expedient was due to Montague, who on the 15th December 1692 proposed to raise a million of money by way of loan. Previous to this a Scotchman named William Paterson had submitted to the Government his plan of a national bank, and when in the spring of 1694 the prolonged contest with France had rendered another large loan absolutely necessary, Montague introduced a Bill for the incorporation of the Bank of England. The bill after some opposition passed the House of Lords in May, and immediately after the prorogation of parliament Montague was rewarded by the chancellorship of the exchequer. In the following year he was triumphantly returned for the borough of Westminster to the new parliament, and succeeded in passing his celebrated measure to remedy the depreciation which had taken place in the currency on account of dishonest manipulations. To provide for the expense of recoinage, Montague, instead of reviving the old tax of hearth money, introduced the window tax, and the difficulties caused by the temporary absence of a metallic currency were avoided by the issue for the first time of exchequer bills. His other expedients for meeting the emergencies of the financial crisis were equally successful, and the rapid restoration of public credit secured him a commanding influence both in the House of Commons and at the board of the treasury; but although Godolphin resigned office in October 1696, the king hesitated for some time between Montague and Sir Stephen Fox as his successor, and it was not till 1697 that the former was appointed first lord. In 1698 and 1699 he acted as one of the council of regency during the king's absence from England. When in February of the former year he had been accused of peculation in connexion with the issue of exchequer bills, not only had he been triumphantly acquitted but the House had declared that for his good services to the Government he had deserved his Majesty's favour; and his reputation was still further increased in the same year by the extraordinary popularity of his project for a new East India Company. With the accumulation of his political successes his vanity and arrogance became, however, so offensive that latterly they greatly lost him the influence he had acquired by his administrative ability and his [illegible], and when his power began to [illegible] on the wane he set the seal to his political overthrow by conferring the [illegible] office of auditor of the exchequer on his brother in trust for himself should he be [illegible] to resign the power. For some time after [illegible] attempting to lead the House of Commons he had to [illegible], and after the [illegible] he resigned [illegible] the Government [illegible] to the House of Lords by the title of Lord Halifax. In the same year he was impeached for malpractices along with Lord Somers and the earls of Portland and Orford, but all the charges were dismissed by the Lords; and in 1703 a second attempt to impeach him was still more unsuccessful. He remained out of office during the reign of Queen Anne, but in 1706 he was named one of the commissioners to negotiate the union with Scotland; and after the passing of the Act of Settlement in favour of the house of Hanover, he was appointed ambassador to the elector's court to convey the insignia of order of the garter to George I. On the death of Anne (1714) he was appointed one of the council of regency until the arrival of the king from Hanover; and after the coronation he received the office of first lord of the treasury in the new ministry, being at the same time created Earl of Halifax and Viscount Sunbury. He died on the 19th May of the following year, and left no issue. His nephew succeeded to the barony, and was raised to the earldom; he left it to his son George Dunk, a statesman of some eminence, with whose death without issue in 1771 the Halifax titles became extinct.

Montague's association with Prior in the travesty of Dryden's *Hind and Panther* has no doubt largely aided in preserving his literary reputation; but he is perhaps indebted for it chiefly to his subsequent influential position and to the fulsome flattery of the men of letters who enjoyed his friendship, and who, in return for his liberal donations and the splendid banqueting which they occasionally enjoyed at his villa on the Thames, "fed him," as Pope says, "all day long with dedications." That, however, his beneficence to needy talent, if sometimes attributable to an itching ear for adulation, was at others prompted by a sincere appreciation of intellectual merit, is sufficiently attested by the manner in which he procured from Godolphin a commissionership for Addison, and also by his lifelong intimacy with Newton, for whom he obtained the mastership of the mint. The small fragments of poetry which he left behind him, and which were almost solely the composition of his early years, display a certain facility and vigour of diction, but their thought and fancy are never more than commonplace, and not unfrequently in striving to be eloquent and impressive he is only grotesquely and extravagantly absurd. In administrative talent he was the superior of all his contemporaries, and his only rival in parliamentary eloquence was Somers; but the skill with which he managed measures was superior to his tact in dealing with men, and the effect of his brilliant financial successes on his reputation was gradually almost nullified by the affected arrogance of his manner and by the eccentricities of his sensitive vanity. So eager latterly was his thirst for fame and power that perhaps Marlborough did not exaggerate when he said that "he had no other principle but his ambition, so that he would put all in distraction rather than not gain his point."

Among [illegible] of Halifax by contemporaries may be mentioned [illegible] Addison's [illegible] *Tatler*; [illegible] *Poets*, and [illegible]. His [illegible] *Works* were published [illegible]

HALIFAX, George Savile, Marquis of (c. 1630–[illegible]), [illegible] statesman, and author, son of Sir William [illegible], and of Anne, daughter of [illegible] and sister of the [illegible] earl of [illegible], was born about 1630.

He succeeded to the baronetcy on the death of his father, and, having taken an active part in the Restoration, he was in 1667 created Baron Savile and Viscount Halifax. Subsequently his political conduct gave deep offence to the king, but although, on his being mentioned in 1672 for a seat in the privy council, Charles at first "kicked at the name," the necessities of the political situation induced him to yield to the solicitations of his ministers, whose arguments for the admission of Halifax were based upon "his family, his abilities, his state in the county, as well as talent for ridicule and humour whatever he was opposed to it." Already he was known as one of the most brilliant orators in the House of Lords, and although his general opinions seemed to be vacillating and uncertain, the fascination of his manner aided his brilliant talents in gradually securing him the permanent favour of the king. In June 1672 he was sent to negotiate terms of peace with France, but he was kept in ignorance of the agreement between Charles and Louis in regard to the establishment of popery in England. He strenuously opposed the Test Bill introduced by Lord Danby in 1675, but continued to sit at the council board till the following year when, having provoked Lord Danby by a witticism in reference to his mild manner of refusing a bribe, the latter procured his dismissal. In 1679 he was, however, created an earl, and having become a member of the new council after the fall of Danby, he differed from the earl of Shaftesbury and his other colleagues in reference to the Exclusion Bill, and by an extraordinary manifestation of nearly all the resources of oratory was instrumental in causing its rejection by the Lords. On this account an address was presented by the Commons praying his "dismissal from the king's person and councils for ever;" but the king, whose confidence he had now completely won, retained him in the council, and in 1682 he was created a marquis and became lord privy seal. Although, however, chiefly instrumental in securing the duke of York's succession, his proposed limitations of James's authority when the crown should devolve upon him, as well as his subsequent leaning to Whig principles, awakened the duke's settled hostility, and this was further deepened by his exposure of the malversation of the earl of Rochester. After the accession of James he was accordingly removed from the office of privy seal to that of president of the council, a less important position; and when in 1685 he refused to give his vote for the repeal either of the Test Act or of the Habeas Corpus Act, he was dismissed from the cabinet. But though made privy to the negotiations entered into with the prince of Orange, Halifax, notwithstanding his political humiliation, was opposed to armed intervention, and endeavoured to obtain such concessions from the king as would render this unnecessary. Even after the landing of the prince he consented to act as one of the three commissioners appointed to treat with him, and it was only the cowardly and traitorous flight of James that induced him finally to abandon his cause and to take measures for raising William to the throne. In the Convention Parliament he was chosen speaker of the Lords, and strongly opposed the motion for a regency. On the accession of William he was made lord privy seal, but the disasters of the Irish campaign gave such a plausible colour to the arguments of his opponents against his competency, and to their insinuations regarding his political honesty, that, though still retaining the office of privy seal, he in October 1689 ceased to take part in the councils of the king. He succeeded before the committee of the House of Lords in clearing himself from all guilt in connexion with the murder of Russell and Sidney, but shortly afterwards resigned his office. Irritated doubtless by the bitter animosity of the Whigs and by the coldness of William, he now at first joined himself to the opposition, and even went so far as to hold communications with St Germains; but either because his anger had cooled, or because he had become convinced of the hopelessness of the fortunes of the Stuarts, he gradually veered back to the support of the Government. He died somewhat suddenly, 20th April 1695. He was succeeded by his son William, with whose death in 1699 the title became extinct in his family. A daughter by his second marriage was the mother of the fourth and celebrated earl of Chesterfield; and from his natural son, Henry Carey the dramatist, was descended the celebrated Edmund Kean.

Halifax is portrayed in Dryden's *Absalom and Achitophel* as—

"Jotham of piercing wit and pregnant thought,
Endued by nature and by learning taught
To move assemblies."

Of his speeches not the smallest fragment remains, but it is admitted that his highest efforts far excelled in effect even those of Shaftesbury, who was his only rival. "Old men," says Macaulay, "who lived to admire the eloquence of Pulteney in its meridian and that of Pitt in its splendid dawn, still murmured that they had heard nothing like the great speeches of Lord Halifax on the Exclusion Bill." The key to the greater part of his political conduct is to be found in the pamphlet *On the Character of a Trimmer*, of which he was undoubtedly the author. He was a trimmer, but a trimmer in the best sense of the term; for though not insensible to worldly advantages, and, notwithstanding his philosophical professions, a lover of pomp and external honours, he was remarkably uncontaminated by the political corruption then almost universally prevalent, and was so emancipated both from party prejudice and selfish ambition as to be able generally to guide his political course by a regard to the best interests of the nation. His sudden changes from one side in politics to another, so far from indicating a loose political morality, were in reality due to the very opposite reason; for in times so unsettled violent and dangerous oscillations were apt to result from a tendency to extremes in both parties. But though his peculiar mental constitution enabled him to play a more important and beneficent part in the politics of his time than any of his contemporaries, it unfitted him for achieving success as a minister of the crown, and rendered his political career a seeming failure. His bent was philosophical rather than practical, and, notwithstanding his great prudence and judgment in several important emergencies, he was apt to be timid and indecisive when the chief burden of responsibility rested upon himself. His writings are neither large nor numerous; but their pure, polished, and nervous English, acute reasoning, mature if somewhat worldly wisdom, apt and varied illustration, and clever and genial wit, fairly entitle them to a place among English classics. Privately he was, according to Burnet, "a man of a great and ready wit, full of life and very pleasant, much given to satire." He had the reputation of holding atheistical opinions, but on his deathbed "professed himself a sincere Christian."

He was the author of *The Anatomy of an Equivalent*, printed in the collection of *State Tracts*, vol. ii.; *A Letter to a Dissenter*; an *Essay upon Taxes*; *Advice to a Daughter*; *The Character of a Trimmer*, published anonymously; *Maxims of State applicable to all Times*; *Character of Bishop Burnet*; *A Seasonable Address to both Houses of Parliament*; *Cautions for Choice of Parliament Men*; *A Rough Draught of a New Model at Sea*; *Observations upon the Reigns of Edward I., II., III., and Richard II.*; and *A Character of King Charles the Second, and Political, Moral, and Miscellaneous Thoughts and Reflections*, first published in 1750. His *Miscellanies*, consisting of seven of the above pamphlets, appeared in 1700. A notice by the Hon. Hugh F. Elliot of a "New Manuscript of George Savile, first marquis of Halifax," will be found in *Macmillan's Magazine* for October 1877. He also left *Memoirs of his Life*, which were destroyed. See besides the histories of Hume, Fox, Lingard, and Macaulay; Birch's *Lives*; Burnet's *History of his Own Times*; Clarendon's *Memoirs*; Walpole's *Royal and Noble Authors*; Courtenay's *Life of Sir William Temple*; and Seward's *Anecdotes* vol. ii.

HALL, a town in northern Tyrol, Austria, government district of Innsbruck, is picturesquely situated between two mountains on the left bank of the Inn, which is navigable there, and on the railway from Rosenheim to Innsbruck, 5 miles east of the latter. It is the seat of a district court, of a board of salt works, and of a provincial board of mines. The beautiful Gothic parish church, dating from the 13th century, contains an altar-piece by a pupil of Rubens and the copy of a Christ by Albert Durer. The principal other public buildings are several monasteries, the gymnasium, the deaf and dumb institute, and the lunatic asylum. The prosperity of the town depends chiefly upon its salt-works, which are supplied by pipes from the mines at Salzberg, 9 miles distant; the annual yield of salt is from 15,000 to 16,000 tons. A considerable number of invalids visit the town on account of its salt-water baths. The principal other industries are the manufacture of woollen cloth, thread, paper, and substitutes for coffee. Hall obtained town rights in 1303. It suffered considerably from earthquakes in 1663 and 1670. In 1809 the patriot Speckbacher on three separate occasions succeeded in storming the position of the Bavarians on the bridge which crosses the Inn at this point. The population in 1870 was 5010.

HALL (generally known as Swabian Hall), a town of Würtemberg, circle of Jagst, is situated in a deep valley on both sides of the Kocher, and on the railway from Heilbronn to Krailsheim, 35 miles N.E. of Stuttgart. It is surrounded by strong walls, and possesses seven churches, one of them dating from the 15th century and having fine mediæval carving; a town house, a lyceum, a real-school of the second order, a hospital, and a house of correction. A short distance south from the town is the old castle of Komburg, now used as a garrison for invalid soldiers, with a richly adorned Benedictine church dating from the 12th century. The town is chiefly known for its extensive salt-works, supplied by means of a pipe from Wilhelmsgluck mine, 5 miles distant. Connected with the salt-works there is a salt-bath and whey-diet establishment. The other industries of the town are cotton-spinning and weaving, and the manufacture of leather, soap, starch, sago, brushes, pencils, machines, carriages, and metal wares. The population in 1875 was 8430.

Hall originally belonged to the counts of Westheim, and later to the Knights Templars. It was made a free imperial city in the 14th century, and was afterwards included in the different leagues of the towns, knights, and counts. In 1802 it came into the possession of Würtemberg.

HALL, BASIL (1788–1844), British traveller and miscellaneous writer, was born at Edinburgh, December 31, 1788. His father, Sir James Hall of Dunglass, was author of an essay on *Gothic Architecture*, and contributed to the Royal Society of Edinburgh, of which he for a time was president, several ingenious papers on geology, in support of Hutton's theory as against that of Werner. His mother was Helen, daughter of Dunbar, fourth earl of Selkirk. Basil Hall was educated at the High School of Edinburgh, and in 1802 entered the navy, where he rose to the rank of post-captain in 1817. By observing the ethnological as well as the physical peculiarities of the countries he visited he collected the materials for a very large number of scientific papers, which he contributed to various journals and encyclopædias. In 1816 he commanded the sloop "Lyra," which accompanied Lord Amherst's embassy to China; and in that vessel he performed the cruise which he describes in the most popular and perhaps the most characteristic of his works—*An Account of a Voyage of Discovery to the West Coast of Corea and the Great Loo-choo Island in the Japan Sea* (London, 1818). In 1820 he had a command on the Pacific coast of America, and in 1824 published two volumes of *Extracts from a Journal written on the Coasts of Chili, Peru, and Mexico in the years* 1820–21–22. Retiring on half-pay in 1824, Hall in 1825 married a daughter of Sir John Hunter, and in her company travelled (1827–28) through the United States. In 1829 he published his *Travels in North America in the years* 1827 *and* 1828, a book almost as popular as his first, less from its intrinsic merit than from the violence with which it was assailed by the American press for its views of American society. *Schloss Hainfeld, or a Winter in Lower Styria* (1836), is partly a romance, partly a description of a visit paid by the author to the castle of the Countess Purgstall. *Spain and the Seat of War in Spain* appeared in 1837. The *Fragments of Voyages and Travels* (9 vols.) were issued in three detachments between 1831 and 1840. Captain Hall was a fellow of the Royal Societies of London and Edinburgh, and a member of the Astronomical Society of London, and has left a number of scientific and miscellaneous writings besides those mentioned. His last work, a collection of sketches and tales under the name of *Patchwork* (1841), had not been long published before its author was seized with insanity, from which he was only released by his death, in Haslar Hospital, Portsmouth, September 11, 1844.

HALL, CHARLES FRANCIS (1821–1871), an Arctic explorer, was born at Rochester, New Hampshire, United States, in 1821. After following the trade of blacksmith he became a journalist in Cincinnati, but his enthusiasm for Arctic exploration led him in 1859 to volunteer to the American Geographical Society to "go in search of the bones of Franklin." With the proceeds of a subscription he was equipped for his modest expedition, and obtained a passage in May 1860 on board a New London whaling vessel commanded by Captain Buddington, the same who had picked up the English search-ship "Resolute." The whaler having become blocked up with ice, Hall took up his abode with the Eskimo, living with them for two years, adopting their habits and acquiring their language, making special friends of two natives, man and wife, who had been in England and knew something of our language. He wandered about with the Eskimo in the region to the north of Hudson's Bay, acquiring much information, especially about the people. He published an account of his experiences in 1864, under the title of *Arctic Researches, and Life among the Esquimaux.* Having learned little or nothing, however, about the fate of the Franklin expedition, he returned in 1864, remaining among the Eskimo till 1869. Unfortunately the full journal he kept of his five years' wanderings has never been published. The expedition which brought Hall most prominently into notice was fitted out in 1871 in the steamer "Polaris," which was sent out at the expense of the United States Government, its object being to reach the supposed open Polar Sea, and if possible attain the Pole. Hall was in command, while Buddington was sailing master. There was a modest but competent scientific staff, and among the crew were Hall's two old Eskimo friends, who had become devoted to him. On June 29, 1871, the "Polaris" left New York, and making a remarkably rapid passage up Davis Straits and Smith Sound, reached on August 30 the lat. of 82° 16′ N., until the last English expedition the highest northern latitude reached of which there is any authentic report. Hall and most of the officers and crew were for proceeding onwards, but they were overruled by Buddington, and went into winter quarters in a sheltered cove on the Greenland coast named Polaris Bay, in 81° 38′ N. On October 24th Hall returned from a successful sledge expedition to the north, and was suddenly seized by an illness of which he died on November 8th. As there were some suspicions of poison, an inquiry was made by the Navy Department, which found that there was no proof of foul play. Captain Buddington, on whom the command devolved, determined in August of next year to return, but the "Polaris" was greatly hampered by the ice. The danger became so great that on October 15th boats and stores were put on the ice, on which nineteen of the crew had disembarked. Suddenly the ship broke away, and the party on the ice drifted slowly southwards for 195 days, and were picked up off the coast of Labrador, in 53° 35′ N., by a whaling steamer 2000 miles from where they had parted with the "Polaris." The party in the ship reached Littleton's Island, where they passed the winter, building two boats from the boards of the vessel, in which they set sail southwards in June 1873. On the 23d of that month they were picked up by a Dundee whaler, and were brought to that town, from which they ultimately reached the United States. The scientific results of the unfortunate Hall's last expedition were of considerable importance, and have been published by the United States Government, as also has an independent account in German by Dr Bessels, one of the scientific staff.

HALL, or HALLE, EDWARD (*ob.* 1547), an English lawyer who takes high rank among the earlier narrators of his country's history, was born in London about the close of the 15th century and died in 1547, the year of the death of King Henry VIII. Though his name has all the appearance of a purely English word, it is none the less of foreign origin, John Hall of Northall, in Shropshire, our author's father, tracing his lineage back to Frederick of Halle in Tyrol, natural son of Albert of Austria. From Eton Edward Hall passed to Cambridge, and according to some accounts it would appear that at a later date he was also a student at Oxford. Entering Gray's Inn he was duly called to the bar; and we find him afterwards filling the offices of common sergeant, under-sheriff of the city of London, summer reader of Gray's Inn (1533), double reader in Lent (1540), and judge of the sheriff court. The date of the first appearance of his chronicle has been matter of question; but it is generally agreed that there was no such edition as that of 1542 assigned by the older bibliographers to Berthelette. The real *editio princeps* is almost certainly that issued by Grafton in 1548, the year after Hall's death, with a continuation compiled mainly from the author's MSS.; it is remarkable, says Mr Hazlitt (*Collections and Notes*), as having probably more variations in the copies than any book in the language. A reprint was published in 1809 under the supervision of Sir Henry Ellis, who, however, furnished neither introduction nor comment.

Hall's work deserves a higher title than that of chronicle; partly, perhaps, by a happy accident, but partly also by the author's judicious management, it possesses no small unity of theme and construction. Beginning with the famous combat at Coventry between Henry of Hereford and Thomas Mowbray, it follows the tragic progress of the strife between York and Lancaster till it is brought to a close by the marriage of Henry VII. with Margaret of York, and then it shows England united and at rest under Henry VIII. The policy of this monarch is presented under a very favourable light, and in the religious question the author sides emphatically and intolerantly with Protestantism. For all kinds of ceremonial in utterance and action he has all a lawyer's respect, and his pages are often adorned and encumbered with the pageantry and material garniture of his story. In his style he unites the redundant reduplication and painful particularisation of his profession with that evident effort after balance of clauses and fanciful and forcible phraseology which not long afterwards resulted in "Euphuism." On the whole the work is not only valuable but attractive. To the historian it furnishes what is evidently the testimony of an eye-witness on several matters of interest which are neglected by other narrators; and to the student of literature it has the exceptional charm of being one of the prime sources of Shakespeare's historical plays. Compare James Gairdner, *Early Chroniclers of Europe: England*, London, 1879.

HALL, JAMES (1793–1868), an American judge and the author of a number of books chiefly relating to the Western States, was born at Philadelphia, August 19, 1793. After for some time prosecuting the study of law, he in 1812 joined the army, and in the war with Great Britain distinguished himself in engagements at Lundy's Lane, Niagara, and Fort Erie. On the conclusion of the war he accompanied an expedition against Algiers, but in 1818 he resigned his commission, and continued the study of law at Pittsburg. In 1820 he removed to Shawneetown, Illinois, where he commenced practice at the bar and also edited the *Illinois Gazette*. Soon after he was appointed public prosecutor of the circuit, and in 1824 legislature judge. On the abolition of the latter office four years afterwards he was appointed State treasurer, but he continued at the same time his legal practice and also edited the *Illinois Intelligencer*. Subsequently he became editor of the *Western Souvenir*, an annual publication, and of the *Illinois Monthly Magazine*, afterwards the *Western Monthly Magazine*. He died near Cincinnati, July 5, 1868.

The following are his principal works:—*Letters from the West*, originally contributed to the *Portfolio*, and collected and published in London in 1828; *Legends of the West*, 1832; *The Soldier's Bride and other Tales*, 1832; *The Harpe's Head, a Legend of Kentucky*, 1833; *Sketches of the West*, 2 vols., 1835; *Tales of the Border*, 1835; *Notes on the Western States*, 1838; *History of the Indian Tribes*, in conjunction with T. L. M'Kenney, 3 vols., 1838–44; *The Wilderness and the War-Path*, 1845; *Romances of Western History*, 1857.

HALL, JOSEPH (1574–1656), bishop of Norwich, one of the wittiest as well as wisest writers of his century, was born at Bristow Park, parish of Ashby-de-la-Zouch, Leicestershire, July 1, 1574. Designed from infancy for the church, he received his early education at the school of his native place, whence in his fifteenth year he passed to Emmanuel College, Cambridge. After being chosen for two years in succession to read the rhetoric lectures in the public schools, Hall became a fellow of his college in 1595, and in the following year received the degree of master of arts. Having taken holy orders, he in 1601 became rector of Halstead in Suffolk, near Bury St Edmunds. Two years later he married; and in 1605 he accompanied Sir Edmund Bacon to the Spanish Netherlands. In 1612 Hall was presented to the curacy of Waltham-Holy-Cross, in Essex, and about the same time received the degree of doctor of divinity. Meanwhile his talents as a preacher, and the ability shown in his controversial writings, had brought him into notice at court. He was appointed chaplain to Prince Henry and prebendary of Wolverhampton. The latter dignity he soon resigned. In 1616 Hall accompanied the earl of Carlisle on his mission to France but was compelled by illness to return; in 1617 he went with James I. into Scotland, and in 1618 was appointed by him one of the English deputies to the synod at Dort; but he was again forced by sickness to return before the business of the assembly was finished. The year before (1617) he had been appointed dean of Worcester. In the years that followed Hall preached frequently before the court and took an active part in the controversies of the day, especially in that between the Arminian and Calvinistic parties in the Church of England, to the latter of which he belonged. In 1624 he refused the see of Gloucester, but in 1627 became bishop of Exeter. In this position, by his toleration of lecturings and his Calvinistic mode of preaching and administering his diocese, he incurred the suspicion of disaffection to episcopacy, and on three occasions appeared on his knees before the king, to answer for his puritanical practices. Hall felt bitterly these undeserved charges of Laud, and threatened to "cast up his rochet" rather than be subject to them. No better proof of his attachment to the Church of England is needed than his *Episcopacy by Divine Right Asserted*, written in 1640 at the suggestion of Laud. In 1641 Hall was translated to the see of Norwich. The same year he joined eleven other bishops in presenting to parliament a protest against all laws passed in their enforced absence. Upon this the bishops were accused of high treason and thrown into the Tower. Hall in his *Hard Measure* relates the trials he underwent both at this time and afterwards. The accusation fell to the ground, and in six months the bishops were released (June 1642), only, however, on each finding security for £5000. Hall proceeded to Norwich, which he had not yet visited, and set about his pastoral duties; but in April 1643 his revenues and personal property were sequestrated by parliament, a nominal allowance of £400 a year being made for his maintenance. Mrs Hall with great difficulty obtained a fifth of her husband's property. The bishop was next ejected from his palace, and the cathedral was dismantled. Having retired to a small estate at Higham near Norwich, which he had been able to buy, he there, with his books, bought for him by a friend, spent the rest of his life, writing and preaching "till he was first forbidden by man, and at last disabled by God." He died 8th September 1656, in his eighty-third year.

The great bulk of Bishop Hall's writings is controversial, and consists of comparatively ephemeral literature; but some of his other works deserve attention. His satires, published under the name of *Virgidemiarum, Sixe Bookes*, consist of three books of *Toothless Satyrs*, namely, (1) Poeticall, (2) Academicall, and (3) Morall, published in 1597, and three books of *Byting Satyres*, published in 1598. They appeared together in 1602. Hall claims to be the first English satirist, though Hallam disputes his title, and at the same time rather disparages the satires, which have on the other hand been very highly praised by Campbell and Warton. In his *Epistles* (1608-11) Hall claims to be the introducer of that style of prose composition also into English; but both Ascham and Howell anticipated him. The *Contemplations upon the Principal Passages of the History of the New Testament* (1612-15), a devout and pious work, one by which perhaps Hall is most generally known, are happily distinguished from most compositions of the class to which they belong by a shy and racy wit which not unfrequently puts the reader in mind of Thomas Fuller. *Mundus alter et idem*, a species of allegorical romance, published in 1643, was translated into English by John Healey, under the title of *Discovery of a New World*. Other writings of this "English Seneca," as Sir Henry Wotton called him, are *Explications of Hard Texts* (1633-34), *Christian Meditations* (1640), and *Horae* [illegible], translated in 1769. An edition of his works was published in 1808 at London, in 10 vols., by the Rev. Josiah Pratt; and a later and better one, in 12 vols., at Oxford (1837-39), by the Rev. Peter Hall. A life of Bishop Hall by the Rev. John Jones appeared in 1826.

HALL, MARSHALL (1790–1857), the discoverer of the "diastaltic nervous system," was born at Basford, Notts, February 18, 1790. His father, Robert Hall, a cotton manufacturer at that place, is well known as the introducer of the modern processes of bleaching on a large scale. Having attended Blanchard's academy at Nottingham, where Kirke White was educated, Marshall Hall commenced in 1809 his studies for the medical profession at Edinburgh university. In 1811 he was elected senior president of the Royal Medical Society; the following year he took the M.D. degree, and was immediately appointed resident house physician to the Royal Infirmary, Edinburgh. This appointment he resigned after two years, when he visited Paris and its medical schools, and, on a walking tour, those also of Berlin, Göttingen, &c. In 1817, taking up his abode at Nottingham, he published his *Diagnosis*, in which he insisted that, before treatment, the exact nature of a malady should be ascertained. He rapidly acquired an extensive country practice, his improved method [illegible] attracting many patients. In 1818 he wrote the *Mimoses*, a work on the affections denominated bilious, nervous, &c. The next year he was elected a fellow of the Royal Society of Edinburgh, and in 1825 became physician to the Nottingham general hospital. In 1826 he removed to London, and in the following year he published his *Commentaries* on the more important diseases of females. He pursued his studies of the effects of blood-letting, and his observations published in 1830 were acknowledged by the medical profession to be of vast practical value. Much good had also resulted from his warning [illegible]. He married in 1829, and the same year he made the discovery which placed him in rank with Harvey. It is described in *A Critical and Experimental Essay on the Circulation of the Blood in the Capillary Vessels*, in which he showed that the blood-channels intermediate between arteries and veins serve the office of bringing the fluid blood into contact with the material tissues of the system. About this time he made his original investigations on quantity of respiration, detailed in *The Inverse Ratio which subsists between the Respiration and Irritability in the Animal Kingdom*, a work which led to the treatises on hibernation. In 1831 he proposed a simple and bloodless operation for the removal of vascular nævus. His most important discovery in physiology was the "diastaltic spinal system," his views being embodied in a paper on *The Reflex Function of the Medulla Oblongata and the Medulla Spinalis*, 1832, in which year he was elected fellow of the Royal Society, London. This paper was supplemented in 1837 by another *On the True Spinal Marrow, and the Excito-motor System of Nerves*, in which he explained the real classification and distribution of the entire nervous system. The "reflex function" excited great attention in Germany and Holland, and M. Flourens described it as "a great epoch in physiology." Hall thus became the authority on the multiform deranged states of health referable to an abnormal condition of the nervous system, and he made plain the obscure class of convulsive affections. The action of strychnia as a spinal tonic or excitant, the relief of the epileptic, tracheotomy in laryngismal epilepsy, and the "ready method" in asphyxia, were among the later objects of his investigation. His "ready method"—sometimes called Marshall Hall's method—for resuscitation in drowning and other forms of suspended respiration—is perhaps the most popular of his discoveries; by it innumerable lives have been preserved. Dr Hall lectured at various medical schools, at the college of physicians, and also at New York during his American tour. His papers in medical and scientific journals, including the *Comptes Rendus*, are remarkable for lucidity and brevity. He died at Brighton of a throat affection, aggravated by lecturing, August 11, 1857. A list of his works, most of which have been translated into foreign languages, and details of his "ready method," &c., are given in his *Memoirs* by his widow, London, 1861.

HALL, ROBERT (1764–1831), one of the greatest of English pulpit orators, was born May 2, 1764, at Arnsby near Leicester, where his father, a man whose cast of mind in some respects resembled closely that of the son, was pastor of a Baptist congregation. Robert was the youngest of a family of fourteen. In infancy his physical powers were so feeble that until two years of age he was unable to walk, and, although his expression and gestures indicated great mental vivacity, he was equally slow to acquire the faculty of articulate speech. It even appears that he had learned to read before he was able to imitate spoken sounds, his nurse having taught him the letters of the alphabet and the formation of words from the inscriptions on the tombstones of a churchyard lying near his father's dwelling house. When once the interest in this exercise had loosened his reluctant tongue his progress was remarkably rapid, and before he had attained his third year the fluency of his talk gave some indications of his future oratorical eminence. While still at the dame's school his passion for books absorbed the greater part of his time, and in the summer it was his custom after school hours to retire to the churchyard with a volume which he continued to peruse there till nightfall, making out the meaning of the more difficult words with the help of a pocket dictionary. From his sixth to his eleventh year he attended the school of Mr Simmons at Wigston, a village 4 miles from Arnsby.

There his precocity assumed the exceptional form of an intense interest in metaphysics, partly perhaps on account of the restricted character of his father's library, and before he was nine years of age he had read and re-read Jonathan Edwards's *Treatise on the Will* and Butler's *Analogy*. This incessant study at such an early period of life seems, however, to have had an injurious influence on his health, and may have been partly the cause of the disease from which he experienced such suffering in after life, and symptoms of whose existence began at this time to manifest themselves. Occasionally he was already troubled with intense pain in the back, and after he left Mr Simmons's school his appearance was so sickly as to awaken fears of the presence of consumption. In order therefore to obtain the benefit of a change of air, he stayed for some time in the house of a gentleman near Kettering, who with an impropriety which Hall himself afterwards referred to as "egregious," prevailed upon the boy of eleven to give occasional addresses at prayer meetings. As his health seemed rapidly to recover, he was sent to a school at Northampton conducted by the Rev. John Ryland, where he remained a year and a half, and "made great progress in Latin and Greek." On leaving school he for some time studied divinity under the direction of his father, and in October 1778 he entered the Bristol academy for the preparation of students for the Baptist ministry. Here the self possession which had enabled him in his twelfth year to address unfalteringly various audiences of grown-up people seems to have strangely forsaken him; for when, in accordance with the arrangements of the academy, his turn came to deliver an address in the vestry of Broadmead Chapel, he broke down on two separate occasions and was unable to finish his discourse. On the 13th August 1780 he was set apart to the ministry, but he still continued his studies at the academy; and in 1781, in accordance with the provisions of an exhibition which he held, he entered King's College, Aberdeen, where he took the degree of master of arts in March 1785. At the university he was without a rival of his own standing in any of the classes, distinguishing himself alike in classics, philosophy, and mathematics. He there formed the acquaintance of Mackintosh (afterwards Sir James), who, though a year his junior in age, was a year his senior as a student, and who became attached to him "because he could not help it." While they remained at Aberdeen the two were inseparable, reading together the best Greek authors, especially Plato, and discussing, either during their walks by the sea-shore and the banks of the Don or in their rooms until early morning, the most perplexed questions in philosophy and religion. The interest of their conversation seems to have lain more in the difference than the agreement of their opinions; but their controversies, so far from causing any even temporary estrangement, tended only to cement more closely their friendship and to deepen in each the respect for the mental and moral qualities of the other.

During the vacation between his last two sessions at Aberdeen, Hall acted as assistant pastor to Dr Evans at Broadmead Chapel, Bristol, and three months after leaving the university he was appointed classical tutor in the Bristol academy, an office which he held for more than five years. Even at this period his extraordinary eloquence had excited an interest beyond the bounds of the denomination to which he belonged, and when he preached the chapel was generally crowded to excess, the audience including many persons of intellectual tastes. It would appear, however, that, in the case of Mr Fuller, Dr Ryland, and other theological authorities, his exuberant intellectual energy and his outspoken expression of tolerance for certain aspects of Socinianism caused trembling to be greatly mingled with their admiration; and ultimately, suspicions in regard to his orthodoxy having in 1789 led to a misunderstanding with his colleague and a part of the congregation, he in July 1790 accepted an invitation to make trial of a congregation at Cambridge, of which he became pastor in July of the following year. From a statement of his opinions contained in a letter to the congregation which he left, it would appear that, while a firm believer in the proper divinity of Christ, he had at this time disowned the cardinal principles of Calvinism—the federal headship of Adam, and the doctrine of absolute election and reprobation; and that he was so far a materialist as to "hold that man's thinking powers and faculties are the result of a certain organization of matter, and that after death he ceases to be conscious till the resurrection." It was during his Cambridge ministry, which extended over a period of fifteen years, that his oratory was most brilliant and most immediately powerful. At Cambridge the intellectual character of a large part of the audience supplied a stimulus which was wanting at Leicester and Bristol, but besides this his physical powers were then at their best, and were still unaffected by the constant pain which already so severely tested his powers of endurance and rendered the discharge of his duties such a marvellous triumph of will. Above all it was not till near the close of this period that his intellectual pathway was crossed by the shadow of mental derangement, and an element of weakness and uncertainty introduced into his career which for some time clouded the horizon of his hopes and perhaps placed a permanent check on his highest form of intellectual enterprise. While at Cambridge he gave to the world some of the more important of the few and small publications which, although those who were his constant hearers have affirmed that several of his imperfectly reported sermons convey a juster impression of the usual character of his oratory, are the only correct and properly authenticated records of his style of thought and composition. His first published compositions had a political origin. In 1791 appeared *Christianity consistent with the Love of Freedom*, in which he defended the political conduct of dissenters against the attacks of the Rev. John Clayton, minister of Weighhouse, and gave eloquent expression to his hopes of great political and social ameliorations as destined to result nearly or remotely from the subversion of old ideas and institutions in the maelstrom of the French Revolution. In 1793 he expounded his political sentiments in a powerful and more extended pamphlet entitled an *Apology for the Freedom of the Press*, which at once obtained an extensive circulation, and doubtless to some extent aided in the formation of that public opinion which has given birth in England to the present remarkable era of gradual and unswerving political progress. On account, however, of certain asperities into which the warmth of his feelings had betrayed him, and his conviction that he had treated his subject in too superficial a manner, he refused to permit the publication of the pamphlet beyond the third edition, until the references of political opponents and the circulation of copies without his sanction induced him in 1821 to prepare a new edition, from which he omitted the attack on Bishop Horsley, and to which he prefixed an advertisement stating that his political opinions had undergone no substantial change. His other publications while at Cambridge were three sermons—*On Modern Infidelity* (1801), *Reflections on War* (1802), and *Sentiments proper to the present Crisis* (1803). From his first attack of insanity, which occurred in November 1804, he recovered so speedily that he was able to resume his duties in April 1805, but a more severe recurrence of the malady rendered it advisable for him on his second recovery to resign his pastoral office, which he did in March 1806. On leaving Cambridge he paid a visit to his relatives in Leicestershire, and then for some time resided at Enderby, preaching occasionally in some of the neighbouring villages. Latterly he ministered to a small congregation in Harvey Lane, Leicester, from whom at the close of 1806 he accepted a call to be their stated pastor. In the autumn of 1807 he changed his residence from Enderby to Leicester, and in 1808 he married the servant of a brother minister. His proposal of marriage had been made after an almost momentary acquaintance, and, according to the traditionary account, in very abrupt and peculiar terms; but, judging from his subsequent domestic life, his choice did sufficient credit to his penetration and sagacity. His writings at Leicester embraced various tracts printed for private circulation; a number of contributions to the *Eclectic Review*, among which may be mentioned his articles on "Foster's Essays" and on "Zeal without Innovation"; several sermons, including those *On the Advantages of Knowledge to the Lower Classes* (1810), *On the Death of the Princess Charlotte* (1817), and *On the Death of Dr Ryland* (1825); and his pamphlet on *Terms of Communion*, in which he advocated intercommunion with all those who acknowledged the "essentials" of Christianity. In 1819 he published an edition in one volume of his sermons formerly printed. On the death of Dr Ryland, Hall was invited to return to the pastorate of Broadmead Chapel, Bristol, and as the peace of the congregation at Leicester had been to some degree disturbed by a controversy regarding several cases of discipline, he resolved to accept the invitation, and removed there in April 1826. About this period the malady—renal calculus—which had for many years rendered his life an almost continual martyrdom, and whose influence he had triumphed over with such marvellous fortitude, began to show signs of indirectly obtaining the mastery over his vigorous constitution; and henceforth increasing infirmities and sufferings, which rest and change of scene could do little to alleviate, surrounded with deepening external gloom the spirit whose cheerfulness and peace they seemed to leave almost totally uninjured. Gradually the inability to take proper exercise, by inducing a plethoric habit of body and impeding the circulation, led to a diseased condition of the heart, which resulted in his death, February 21, 1831.

The private manners of Hall were remarkably simple and unaffected; and if his method of expressing his opinions was frequently impetuous, and occasionally somewhat brusque and imperious, this was owing rather to his constitutional energy and straightforward impulsive honesty than to an overbearing and dogmatic temper. Though exercising his sarcastic powers with great unrestraint, he reserved his severity chiefly for errors which implied some kind of moral culpability, and he was always careful to be respectful to true worth even when concealed or deformed by many superficial defects, or conjoined with humble rank or weak mental capacity. In reality few were more unassuming or unselfish or more continuously actuated by feelings truly charitable and benevolent. His mental absorption led to the contraction of many minor eccentricities, one of which was a frequent obliviousness to the flight of time and a consequent inability to remember his engagements. Towards the close of his Cambridge ministry he acquired the habit of smoking, and from that time his pipe was his almost constant companion and one of his principal solaces in his bodily suffering. Indeed talk and tobacco may be said to have supplied his chief means of recreation. In his conversation the calibre and [illegible] of his genius were better displayed than in any of the writings he has left us, and it is said to have exercised an even more captivating charm than did his finest orations. Its most striking characteristics were keen, biting, and original wit, and wild and soaring imaginative flights.

Both physically and mentally Hall possessed a rare combination of qualities fitting him to excel as a public speaker, [illegible] and the attainments [illegible] his culture, [illegible] faults which hampered his capabilities were not of a formidable character. He was of powerful and athletic build, and his great breadth of chest, while it lent an impression of massiveness to his bearing, indicated abundant capacity to sustain the kind of physical exertion which oratory entails. His voice was deficient in strength and volume, but exceptionally pure and melodious, and capable of being thoroughly interpenetrated by emotion. Its inadequacy in tone was also compensated for by its great flexibility, which enabled him by the momentum of rapid utterance to obtain all the vocal force necessary to the highest oratorical effects. According to Foster, his countenance "was formed as if on purpose for the most declared manifestation of power." The forehead was high and sloping, with well-arched brows, beneath which his dark and brilliant eye, in his more excited moments, burned and glowed with thought and passion. The lower part of his countenance indicated a vehement and headstrong temperament under the control of an iron will—doubtless powerfully reinforced by the strong moral sensibility which gave a peculiar elevation and dignity to features possessing no trait of grace or beauty. Perhaps the "stern, intense, and somewhat formidable expression," which Foster referred to as wanting in the portrait accompanying his works, had its origin partly in his constant suffering.

His gestures in speaking were few and simple, and his manner seemed to be naturally determined by his mental emotions without conscious purpose on his part. He gave the impression of thorough self forgetfulness and absorption in his subject, and during the latter part of an oration of being wholly possessed and dominated by the thoughts and sentiments which he uttered. It is generally affirmed that in his spoken sermons his style was more easy, graceful, and various than in any of the sermons which he prepared for the press. In the latter the structure of the sentences is often formal and laboured, the rhythm artificial and monotonous; and idiomatic vigour is in some degree sacrificed to elegance and pomp. In the higher flights of his eloquence his language was, however, unsurpassed for purity and happy adaptation to the thought. Indeed one of his most remarkable gifts is said to have been his extemporaneous command of a clean and felicitous vocabulary, which seemed to clothe every shade of his meaning with its appropriate expression, and whose musical cadences formed a not unimportant element in the fascination exercised by his oratory. It is true that in many cases his language had before he spoke undergone considerable mental elaboration, but he was nevertheless so little enslaved to his memory that, according to his own statement, he never entered the pulpit without omitting something which he wished to say and saying something which he wished to omit. In preaching his severe taste and deep sense of solemnity restrained every tendency to eccentricity or extravagance, and he never permitted his brilliant wit to emit even the faintest and most momentary sparkle. It may therefore be believed that on a secular platform his oratory would have been more racy and natural, and from the scope afforded for the free exercise of all his powers would have attained to a more varied perfection. In his occasional reviews his style is clear and pointed, but apart from this it is his sarcasm that chiefly conveys the impression of more than average ability. The predominant element of his eloquence was reasoning. His statements and propositions were animated with passion and illuminated by a vivid and rich if not strikingly powerful and original imagination; but in no instance did passion or imagination seem to obtain the chief sway. It was generally not till towards the close of his sermon that the spell of his eloquence asserted its highest influence over his audience. Then [illegible] trains of thought through which he had been building them seemed to meet in an intense focus where reason, imagination, and passion were blended together, and in whose light the theme he had been expounding stood revealed in such vivid truth and beauty as to captivate for the moment every heart. But though he taught truth chiefly in the form of doctrine, he constantly exhibited it rather in its moral than in its theological aspects. His eloquence was indeed morally more than intellectually powerful, and its moral purpose was besides achieved not so much by the direct inculcation of moral duties, or the detection and exposure of moral deformities, as by his unconscious exhibition of his own moral elevation and of the ardour and purity of his hopes and aims. Indeed in many of his sermons both the form and matter of his thought seemed to be determined rather by his own individual interest in his subject than by the consideration of the capacities and wants of his hearers. Though exhibiting a catholicity of spirit much in advance of his time, the range of his thought is completely included within the limits of traditional opinion. In treating of what he regarded as the cardinal truths of religion he is of course oratorically effective, but the dexterous and brilliant manner in which he wields the old controversial weapons does not compensate for their inherent inadequacy. He indulges too frequently in innuendoes against the moral character and motives of his opponents, and fails to sound the full depth of the speculative problems upon which he attempts to dogmatize. His sermons will always be esteemed by the student of English literature for their many passages of splendid and finished eloquence, but his theological writings as a whole are of course without that quaint interest attaching to representations of truth which though now old and effete originally exhibited it with the freshness and vividness of a discovery, while on the other hand they have no sufficient colouring from modern tendencies to give to them a more than superficial value in relation to those phases of religious thought which are predominant at the present time.

See *Works of Robert Hall, A.M., with a Brief Memoir of his Life, by Olinthus Gregory, LL.D., and Observations on his Character as a Preacher by John Foster*, originally published in 6 vols., London, 1832; *Reminiscences of the Rev. Robert Hall, A.M.*, by John Greene, London, 1832; *Biographical Recollections of the Rev. Robert Hall*, by J. W. Morris, 1848; *Fifty Sermons of Robert Hall from Notes taken at the time of their Delivery*, by the Rev. Thomas Grinfield, M.A., 1843; *Reminiscences of College Life in Bristol during the Ministry of the Rev. Robert Hall, A.M.*, by Frederick Trestrail, 1879. (T. F. H.)

HALLA. See HALA.

HALLAM, HENRY, the celebrated English historian, was born at Windsor in the year 1777,—some authorities make the date one year later,—and he died at Pickhurst, Kent, on the 21st of January 1859. Notwithstanding his great fame and recent death very little seems to be known of the personal history of Hallam. He was the son of a dean of Bristol, and was educated at Eton, and afterwards went to Christ Church, Oxford, where he took his degree in 1799. He was called to the bar by the Inner Temple, and afterwards became a bencher of that society, but he does not appear to have at any time attempted to obtain practice. Early in life he devoted himself to literary work, and became connected with the brilliant band of authors and politicians who then led the Whig party. A commissionership of audits, obtained through that connexion, together with some private means, made him independent in point of worldly fortune, and enabled him to devote himself entirely to the studies of his life. He took no active part in practical politics, and was in fact unsuited by nature for the rough work of party polemics. But he was an active supporter of many popular movements—particularly of that which ended in the abolition of the slave trade; and he was throughout his entire life sincerely and profoundly attached to the political principles of the Whigs, both in their popular and in their aristocratic aspect. Hallam's earliest literary work was undertaken in connexion with the great organ of the Whig party, the *Edinburgh Review*, where his review of Scott's *Dryden* attracted much notice. His first great work, *The View of the State of Europe during the Middle Ages*, was produced in 1818, and was followed nine years later by the *Constitutional History of England*. In 1838-39 appeared the *Introduction to the Literature of Europe in the 15th, 16th, and 17th Centuries*. These are the three works on which the fame of Hallam rests. They at once took a place in English literature which has never been seriously challenged. A volume of supplemental notes to his *Middle Ages* was published in 1848. These facts and dates represent nearly all the events of Hallam's career. The strongest personal interest in his life was the affliction which befell him in the loss of his children, one after another. His eldest son, Arthur Henry Hallam,—the "A. H. H." of Tennyson's *In Memoriam*, and by the testimony of his contemporaries a man of the most brilliant promise,—died in 1833 at the age of twenty-two. Seventeen years later, his second son, Henry Fitzmaurice Hallam, was cut off like his brother at the very threshold of what might have been a great career. The premature death and high talents of these young men, and the association of one of them with the most popular poem of the age, have made Hallam's family afflictions better known than any other incidents of his life. He survived wife, daughter, and sons by many years. In 1834 Hallam published *The Remains in Prose and Verse of Arthur Henry Hallam, with a Sketch of his Life.* In 1852 a selection of *Literary Essays and Characters* from the *Literature of Europe* was published. Hallam was a fellow of the Royal Society, and a trustee of the British Museum, and enjoyed many other appropriate distinctions. In 1830 he received the gold medal for history, founded by George III.

The *Middle Ages* is described by Hallam himself as a series of historical dissertations, a comprehensive survey of the chief circumstances that can interest a philosophical inquirer during the period from the 5th to the 15th century. The work consists of nine long chapters, each of which is a complete treatise in itself. The history of France, of Italy, of Spain, of Germany, and of the Greek and Saracenic empires, sketched in rapid and general terms, is the subject of five separate chapters. Others deal with the great institutional features of mediæval society—the development of the feudal system, of the ecclesiastical system, and of the free political system of England. The last chapter sketches the general state of society, the growth of commerce, manners, and literature in the Middle Ages. The book may be regarded as a general view of early modern history, preparatory to the more detailed treatment of special lines of inquiry carried out in his subsequent works, although Hallam's original intention was to continue the work on the scale on which it had been begun.

The *Constitutional History of England* takes up the subject at the point at which it had been dropped in the *View of the Middle Ages*, viz., the accession of Henry VII.,[1] and carries it down to the accession of George III. Hallam stopped here for a characteristic reason, which it is impossible not to respect and to regret. He was unwilling to excite the prejudices of modern politics which seemed to him to run back through the whole period of the reign of George III. As a matter of fact they ran back much further, as Hallam soon found. The sensitive impartiality which withheld him from touching perhaps the most interesting period in the history of the constitution did not save him from the charge of partisanship. The *Quarterly*

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[1] Lord Brougham, overlooking the constitutional chapter in the *Middle Ages*, censured Hallam for making an arbitrary beginning at this point, and proposed to write a more complete history himself.

Review for 1828 contains an article on the *Constitutional History*, written by Southey, full of railing and reproach. The work, he says, is the "production of a decided partisan," who "rakes in the ashes of long-forgotten and a thousand times buried slanders, for the means of heaping obloquy on all who supported the established institutions of the country." No accusation made by a critic ever fell so wide of the mark. Absolute justice is the standard which Hallam set himself and maintained. His view of constitutional history was that it should contain only so much of the political and general history of the time as bears directly on specific changes in the organization of the state, including therein judicial as well as ecclesiastical institutions. But while abstaining from irrelevant historical discussions, Hallam dealt with statesmen and policies with the calm, and fearless impartiality of a judge. It was his cool treatment of such sanctified names as Charles, Cranmer, and Laud that provoked the indignation of Southey and the *Quarterly*, who forgot that the same impartial measure was extended to statesmen on the other side. If Hallam can ever be said to have deviated from perfect fairness, it was in the tacit assumption that the 19th century theory of the constitution was the right theory in previous centuries, and that those who departed from it on one side or the other were in the wrong. He did unconsciously antedate the constitution, and it is clear from incidental allusions in his last work that he did not regard with favour the democratic changes which he thought to be impending. Hallam, like Macaulay, ultimately referred all political questions to the standard of Whig constitutionalism. This prepossession may be connected with the legal tone that runs through all his political writings. The spirit of the English lawyer is as strong in Hallam as in Bentham, who, like him, was never a practising lawyer. It is no doubt owing to this quality that the *Constitutional History* has become one of the text-books of English politics. Hallam, like Blackstone, has become an authority to whom men of all parties appeal. The origin of English institutions has since been explored with greater elaborateness by Professor Stubbs, but our leading guide to the constitution in its maturity is still Hallam.

Like the *Constitutional History*, the *Introduction to the Literature of Europe* continues one of the branches of inquiry which had been opened in the *View of the Middle Ages*. In the first chapter of the *Literature*, which is to a great extent supplementary to the last chapter of the *Middle Ages*, Hallam sketches the state of literature in Europe down to the end of the 14th century,—the extinction of ancient learning which followed the fall of the Roman empire and the rise of Christianity; the preservation of the Latin language in the services of the church; and the slow revival of letters, which began to show itself soon after the 7th century,—"the nadir of the human mind"—had been passed. For the first century and a half of his special period he is mainly occupied with a review of classical learning, and he adopts the plan of taking short decennial periods and noticing the most remarkable works which they produced. The rapid growth of literature in the 16th century compels him to resort to a classification of subjects. Thus in the period 1550-1600 we have separate chapters on ancient literature, theology, speculative philosophy and jurisprudence, the literature of taste, and scientific and miscellaneous literature; and the subdivision of subjects is carried [illegible] further in the later periods. Thus poetry, the drama, and polite literature form the subjects of separate chapters. One inconvenient result of the arrangement is that the same author is scattered over many chapters, according as his works fall within this category or that period of time. Names like Shakspeare, Grotius, Bacon, Hobbes appear in half a dozen different places. The individuality of great authors is thus dissipated except when it has been preserved by an occasional sacrifice of the arrangement—and this defect, if it is to be esteemed a defect, is increased by the very sparing references to personal history and character with which Hallam was obliged to content himself. His plan excluded biographical history, nor is the work, he tells us, to be regarded as one of reference. It is rigidly an account of the books which would make a complete library of the period,[1] arranged according to the date of their publication and the nature of their subjects. The history of institutions like universities and academies, and that of great popular movements like the Reformation, are of course noticed in their immediate connexion with literary results; but Hallam had little taste for the speculative generalization which such subjects suggest. The great qualities displayed in this work have been universally acknowledged,—conscientiousness, accuracy, judgment, and enormous reading. Not the least striking testimony to Hallam's powers is his mastery over so many diverse forms of intellectual activity. In science and theology, mathematics and poetry, metaphysics and law, he is a competent and always a fair if not a profound critic. The bent of his own mind is manifest in his treatment of pure literature and of political speculation,—which seems to be inspired with stronger personal interest and a higher sense of power than other parts of his work display. Not less worthy of notice in a literary history is the good sense by which both his learning and his tastes have been held in control. Probably no writer ever possessed a juster view of the relative importance of men and things. The labour devoted to an investigation is with Hallam no excuse for dwelling on the result, unless that is in itself important. He turns away contemptuously from the mere curiosities of literature, and is never tempted to make a display of trivial erudition. Nor do we find that his interest in special studies leads him to assign them a disproportionate place in his general view of the literature of a period.

Hallam is generally described as a "philosophical historian." The description is justified not so much by any philosophical quality in his method as by the nature of his subject and his own temper. Hallam is a philosopher to this extent that both in political and in literary history he fixed his attention on results rather than on persons. His conception of history embraced the whole movement of society. Beside that conception, the issue of battles and the fate of kings fall into comparative insignificance. "We can trace the pedigree of princes," he reflects, "fill up the catalogue of towns besieged and provinces desolated, describe even the whole pageantry of coronations and festivals, but we cannot recover the genuine history of mankind." But, on the other hand, there is no trace in Hallam of anything like a philosophy of history or society. Wise and generally melancholy reflexions on human nature and political society are not infrequent in his writings, and they arise naturally and incidentally out of the subject he is discussing. His object is the attainment of truth in matters of fact. Sweeping theories of the movement of society, and broad characterizations of particular periods of history, seem to have no attraction for him. The view of mankind on which such generalizations are usually based, taking little account of individual character, was highly distasteful to him. Thus he objects to the use of statistics because they favour that tendency to regard all men as morally and mentally equal which is so unhappily strong in modern times. At the same time Hallam by no means assumes the tone of the mere scholar. He is even solicitous to show that his point of view is that of the cultivated gentleman and not of the specialist of any order. Thus he tells us that Montaigne is the first French author whom an English gentleman is ashamed not to have read. In fact, allusions to the necessary studies of a gentleman meet us constantly, reminding us of the unlikely erudition of the schoolboy in Macaulay. Hallam's prejudices, so far as he had any, belong to the same character. His criticism is apt to assume a tone of moral censure when he has to deal with certain extremes of human thought,—scepticism in philosophy, atheism in religion, and democracy in politics.

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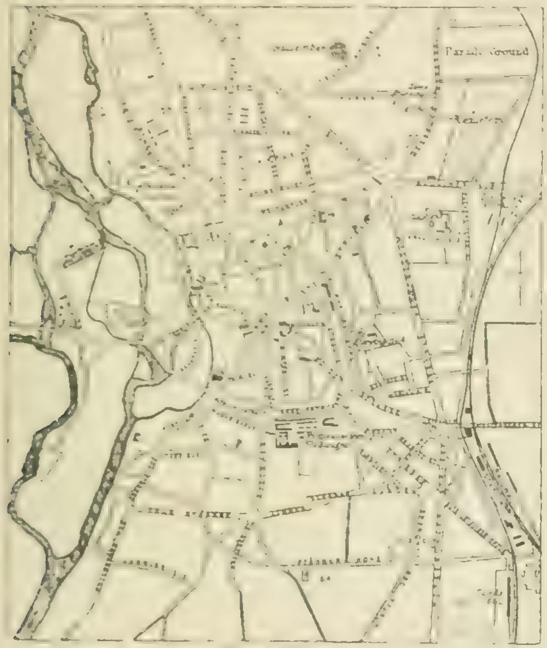
[1] Treatises on surgery and medicine [illegible] have been excluded by Hallam, and have been only incidentally and partially treated.

Hallam's style is singularly uniform throughout all his writings. It is sincere and straightforward, and obviously innocent of any motive beyond that of clearly expressing the writer's meaning. In the *Literature of Europe* there are many passages of great imaginative beauty. (E. R.)

HALLE (formerly called, to distinguish it from other towns of the same name, Halle in Sachsen, but now generally known as Halle an der Saale), a city of Prussian Saxony, government district of Merseburg, is situated on the right bank of the Saale and at the junction of six railways, 20 miles N.W. of Leipsic. It consists of the old town, or Halle proper, with five suburbs, and the two small towns of Glaucha and Neumarkt, which were added to it in 1817. Halle is under the immediate jurisdiction of the crown, and is the seat of the imperial chief office of mines for the provinces of Saxony, Brandenburg, and Pomerania, of a head tax-office, of a circle court, and of a provincial office. The greater part of the town is irregularly built, and presents a somewhat unattractive appearance to the eye of a stranger; but of late years it has been much improved by the construction of new promenades on the site of the old fortifications, and by the repaving of many of the streets and the addition of new buildings. Its well-known university was founded by King Frederick I. in 1694 in behalf of the jurist Thomasius, whom many students followed to Halle when he was expelled from Leipsic through the enmity of his fellow professors. It was closed by Napoleon in 1806 and again in 1813, and in 1815 it was united with that of Wittenberg. It has faculties of theology, law, medicine, and philosophy. From the beginning it has been recognized as one of the principal schools of Protestant theology, and has numbered among its professors some of the most eminent men of Germany. Its maximum number of students occurred in 1829 when they exceeded 1300. Subsequently the number declined below 600, but at present the average attendance is between 900 and 1000. The present buildings were erected in 1834. In connexion with the university there are a botanical garden, a theological and normal seminary, a medical and surgical clinical institute, a maternity hospital, an observatory, and a library of over 100,000 volumes, which also contains collections of coins and engravings. The *Francke'sche Stiftungen*—founded in 1691 by August Hermann Francke, a bronze statue of whom by Rauch was erected in 1829 in the inner court of the building—embrace an orphanage, a laboratory where medicines are prepared and distributed, a Bible press from which Bibles are issued at a cheap rate, and a number of schools of various grades, viz., a Latin school, a higher real-school, a citizen school, a higher female school, and a free school, attended in all by over 3000 pupils. The principal other institutions are the city gymnasium, the provincial trade school, the provincial lunatic asylum, the penitentiary, the town hospital and infirmary, and the deaf and dumb institute. Among the other public buildings may be mentioned the church of St Mary, containing some fine paintings, an interesting Gothic structure of the 16th century, with four towers, two of which are connected by a bridge; the church of St Maurice, dating from the 12th century, with interesting wood-carvings and sculptures; the church of St Ulrich, dating from the 14th century; the cathedral, founded in the 16th century, and containing an altar-piece representing Duke Augustus of Saxony and his family; the red clock tower in the market-place, 276 feet in height; the old town-house; the ruins of the castle of Moritzburg, erected in 1484, formerly the residence of the archbishops of Magdeburg, but destroyed by fire during the Thirty Years' War, with the exception of the left wing, which is now used for military purposes; the lodge of the free masons; and the theatre. In 1859 a bronze statue was erected in the market-place to Handel, who was born at Halle in 1685; and in the outskirts of the town there is a monument to the Germans who fell at the battle of Leipsic in 1813. The salt-springs of Halle have been known from a very early period. Some rise within the town and others on an island in the Saale; and together their annual yield of salt is about 12,000 tons. The workmen employed in connexion with the manufacture are a peculiar and distinct race known by the name of *Halloren*, probably descended from an old Frankish colony. They observe several ancient customs, and enjoy certain special exemptions and privileges. The principal other industries of Halle are the manufacture of starch, beetroot-sugar, chemicals, lignite, candles, pottery-wares, sausages, oil, machines and waggons, sugar-refining, brewing, printing, and bookbinding. Considerable trade, especially in corn, is now carried on by means of the railways, but the shipping trade is unimportant. The population has increased with great rapidity during the last quarter of a century, for while the numbers in 1831 were 25,594, they had risen in 1849 to 33,848 and in 1875 to 60,503.



Plan of Halle.

1 Penitentiary.
2 Observatory.
3 Moritzburg.
4 Library.
5 University.
6 Theatre.
7 Gymnasium.
8 Post Office.
9. District Court.
10. Town Hall.
11. Red Clock Tower.
12. Cathedral.
13. Church of St Mary.
14. Church of St Maurice.

Halle was first mentioned in 806 as the fortress of Halla erected by Charlemagne. The place was, however, in existence before the Christian era, and owes its origin as well as its name to its salt-springs. Otto the Great presented it in 965 along with the salt-springs to the bishopric of Magdeburg, and in 981 Otto II. raised it to the rank of a town. At the beginning of the 12th century it had attained considerable importance, and in the 13th and 14th centuries as a member of the Hanseatic League it carried on successful wars with the archbishops of Magdeburg; and in 1435 it resisted an army of 30,000 men under the elector of Saxony. On account, however, of [illegible] between the democracy and the patricians it was subdued in 1478 by Archbishop Ernest, who in order to hold it in check built the castle of Moritzburg. Notwithstanding the efforts of the archbishops of Mainz and Magdeburg, the Reformation found an entrance into the city in 1522; and in 1541 a Lutheran superintendent was appointed. After the peace of Westphalia in 1648 the city came into the possession of the house of Brandenburg. In 1806 it was stormed and taken by the French, after which, at the peace of Tilsit, it was united to the new kingdom of Westphalia. After the battle between the Prussians and French, May 2, 1813, it was taken by the Prussians. The rise of Leipsic was for a long time hurtful to the prosperity of Halle, and its present rapid increase in population and trade is principally due to its position as the centre of a network of railways.

See Dreyhaupt, *Ausführliche Beschreibung des Saalkreises*, Halle, 2 vols., 1755 (2d edition, 1771-73; 3d edition, 1842-44); Hoffbauer, *Geschichte der Universität zu Halle*, 1806; *Halle in Vorzeit und Gegenwart*, 1851; Knauth, *Kurze Geschichte und Beschreibung der Stadt Halle*, 3d edition, 1861; Vom Hagen, *Die Stadt Halle*, 1866-67; Hertzberg, *Geschichte der Vereinigung der Universitäten von Wittenberg und Halle*, 1867; Voss, *Zur Geschichte der Autonomie der Stadt Halle*, 1874; A. Kirchhoff, "Ueber die Lagenverhältnisse der Stadt Halle," in *Mittheilungen des Vereins für Erdkunde zu Halle*, Halle, 1877.

HALLECK, Fitzgreene (1790-1867), an American poet, was born at Guildford, Connecticut, July 8, 1790. By his mother he was descended from John Eliot, the "Apostle of the Indians." At an early age he became clerk in a store at Guildford, and at eighteen he entered a banking-house in New York. Having made the acquaintance of Joseph Rodman Drake in 1819, he assisted him under the signature of "Croaker junior" in contributing to the *New York Evening Post* the humorous series of "Croaker Papers." In 1821 he published his longest poem, *Fanny*, a satire on local politics and fashions in the measure of Byron's *Don Juan*. He visited Europe in 1822-23, and after his return published anonymously in 1827 a volume of poems in which were included "Alnwick Castle" and "Burns." From 1824 to 1849 he was confidential agent of John Jacob Astor, who named him one of the trustees of the Astor Library, and left him an annuity of 200 dollars, on which he retired to Guildford, where he lived with an unmarried sister. In 1864 he published in the *New York Ledger* a poem of 300 lines entitled "Young America." He died at Guildford, November 19, 1867. The poems of Halleck are written with great care and finish, and manifest the possession of a fine sense of harmony and of genial and elevated sentiments.

Editions of his poems appeared in 1836, 1842, 1849, 1858, and 1869. He is also the author of an edition of *Byron* with notes and a memoir, and of two volumes of *Selections from the British Poets*. His *Life*, by J. G. Wilson, appeared in 1869.

HALLECK, Henry Wager (1815-1872), an American general, was born at Waterville, Oneida county, New York, January 15, 1815. After studying a short time at Union College, he in 1835 entered the West Point military academy, whence he was in 1839 promoted to the army as second lieutenant in the corps of engineers, being at the same time appointed assistant professor of engineering at the academy. In the following year he was made an assistant to the board of engineers at Washington, and from 1841 to 1844 he was employed in connexion with the fortification of New York harbour. In 1845 he was sent by the Government to examine the principal military establishments of Europe, and during his absence he was promoted to the rank of first lieutenant. After his return he in the winter of 1845-46 delivered at the Lowell Institute, Boston, a course of twelve lectures on the science of war, published in 1846 under the title *Elements of Military Art and Science*, and republished with additions in 1861. On the outbreak of the Mexican war in 1846 he as military engineer accompanied the expedition to California and the Pacific coast, where he distinguished himself not only as an engineer but by his administrative skill as secretary of state, and by his presence of mind and bravery in several skirmishes with the enemy. In 1847 his services were recognized by promotion to the rank of captain. He continued for several years to act on the staff of General Riley in California, holding at the same time the office of secretary of state of the province; and he took a leading part in framing the State constitution of California, on its being admitted into the Union. In 1852 he was appointed inspector and engineer of lighthouses, and in 1853 he was promoted captain of engineers. He, however, in 1854 resigned his commission in order to devote his chief attention to the practice of law, which he had already for some time carried on; and so great was his success in his profession that the firm of which he was senior partner soon obtained one of the largest legal businesses in the State. He was also from 1850 director of the New Almaden quicksilver mine, and in 1855 he became president of the Pacific and Atlantic Railroad from San Francisco to San José. On the outbreak of the civil war he was in August 1861 appointed major-general of the United States army, and in the following November was appointed commander of the western department, where he conducted the campaign with great energy and with such uniform success against the Confederates that in 1862 they evacuated Corinth, which they had strongly fortified. In July of the same year he was appointed general-in-chief of the armies of the United States—a position he held till March 1864, when he was succeeded by Grant and was appointed chief of the staff. In April 1865 he held the command of the military division of the James and in August of the same year of the military division of the Pacific, which he retained till March 1869, when he was transferred to that of the south, a position he held till his death at Louisville, January 9, 1872.

Besides his work on the *Science of War*, General Halleck was the author of *Bitumen, its Varieties, Properties, and Uses*, 1841; *The Mining Laws of Spain and Mexico*, 1859; a translation of De Fooz *On the Law of Mines*, with an introduction, 1860; *International Law*, 1861; a translation of Jomini's *Life of Napoleon*, 1864; and a *Treatise on International Law and the Laws of War, prepared for the use of Schools and Colleges*, 1866.

HALLER, Albrecht von (1708-1777), one of the greatest of the anatomists and physiologists of the 18th century, was born of an old Swiss family at Bern, October 16, 1708. Prevented by long-continued ill-health from taking part in boyish sports, he had the more opportunity for the development of his precocious mind. At the age of four, it is said, he used to read and expound the Bible to his father's servants; before he was ten he had sketched a Chaldee grammar, prepared a Greek and a Hebrew vocabulary, compiled a collection of two thousand biographies of famous men and women on the model of the great works of Bayle and Moreri, and written in Latin verse a satire on his tutor, who had warned him against a too great excursiveness. When still hardly fifteen he was already the author of numerous metrical translations from Ovid, Horace, and Virgil, as well as of original lyrics, dramas, and an epic of four thousand lines on the origin of the Swiss confederation, writings which he is said on one occasion to have rescued from a fire at the risk of his life, only, however, to burn them a little later (1729) with his own hand. Haller's attention had been directed to the profession of medicine while he was residing in the house of a physician at Biel after his father's death in 1721; and, following the choice then made, he while still a sickly and excessively shy youth went in his sixteenth year to the university of Tubingen (December 1723), where he studied under Camerarius and Duvernoy. Dissatisfied with his progress, he in 1725 exchanged Tubingen for Leyden, where Boerhaave was in the zenith of his fame, and where Albinus had already begun to lecture in anatomy. At that university he graduated in May 1727, undertaking successfully in his thesis to prove that the so-called salivary duct, claimed as a recent discovery by

Coschwitz, was nothing more than a blood vessel. Haller then visited London, making the acquaintance of Sir Hans Sloane, Cheselden, Pringle, Douglas, and other scientific men; next, after a short stay in Oxford, he visited Paris, where he studied under Ledran and Winslow; and in 1728 he proceeded to Basel, where he devoted himself to the study of the higher mathematics under John Bernoulli. It was during his stay there also that his first great interest in botany was awakened; and, in the course of a tour through Savoy, Baden, and several of the Swiss cantons, he began a collection of plants which was afterwards the basis of his great work on the flora of Switzerland. In 1729 he returned to Bern and began to practise as a physician; his best energies, however, were devoted to the botanical and anatomical researches which rapidly gave him a European reputation, and procured for him from George II. in 1736 a call to the chair of medicine, anatomy, botany, and surgery, in the newly founded university of Gottingen. The quantity of work achieved by Haller in the seventeen years during which he occupied this post was immense. Apart from the ordinary work of his classes, which entailed upon him the task of newly organizing a botanical garden, an anatomical theatre and museum, an obstetrical school, and similar institutions, he carried on without interruption those original investigations in botany and physiology, the results of which are preserved in the numerous works associated with his name; he continued also to persevere in his youthful habit of poetical composition, while at the same time he conducted a monthly scientific journal to which he is said to have contributed twelve thousand articles relating to almost every branch of human knowledge. He also warmly interested himself in most of the religious questions, both ephemeral and permanent, of his day; and the erection of the Reformed church in Göttingen was mainly due to his unwearied energy. Notwithstanding all this variety of absorbing interests he never felt at home in Göttingen; his untravelled heart kept ever turning towards his native Bern (where he had been elected a member of the great council in 1745), and in 1753 he resolved to resign his chair and return to Switzerland. The twenty-one years of his life which followed were largely occupied in the discharge of his duties as "amman," to which honourable office he had been chosen by his fellow-citizens, and in the preparation of his *Bibliotheca Medica*, the botanical, surgical, and anatomical parts of which he lived to complete; but he also found time to write the three philosophical romances, —*Usong* (1771), *Alfred* (1773), and *Fabius and Cato* (1774),—in which his views as to the respective merits of despotism, of limited monarchy, and of aristocratic republican government are fully set forth. About 1773 the state of his health rendered necessary his entire withdrawal from public business; for some time he supported his failing strength by means of opium, on the use of which he communicated a paper to the *Proceedings* of the Göttingen Royal Society in 1776; the excessive use of the drug is believed, however, to have hastened his death, which occurred on the 17th of December 1777. Haller, who had been three times married, left eight children, the eldest of whom, Gottlieb Emanuel, attained to some distinction as a botanist and as a writer on Swiss history.

For some account of Haller's contributions to the sciences of which he was especially an ornament, see the articles ANATOMY vol. i. p. 814, and PHYSIOLOGY. Subjoined is a classified but by no means an exhaustive list of his very numerous works in various branches of science and literature:—(1) Anatomical:—*Icones anatomicæ* (1743-54); *Disputationes anatomicæ selectiores* (1746-52); and *Opera acad. minora anatomici argumenti* (1762-68). (2) Physiological:—*De respiratione experimenta anatomica* (1747); *Primæ lineæ physiologiæ* (1747); and *Elementa physiologiæ corporis humani* (1757-66). (3) Pathological and surgical:—*Opuscula pathologica* (1755); *Disputationum chirurg. collectio* (1777); also careful editions of Boerhaave's *Prælectiones academicæ in proprias institutiones rei medicæ* (1739), and of the *Artis medicæ principia* of the same author (1769-74). (4) Botanical:—*Enumeratio stirpium Helvetiarum* (1742), *Opuscula botanica* (1749), *Bibliotheca botanica* (1771). (5) Theological:—*Briefe über die wichtigsten Wahrheiten der Offenbarung* (1772), and *Briefe zur Vertheidigung der Offenbarung* (1775-77). (6) Poetical:—*Gedichte* (1732, 12th ed. 1777). His three romances have been already mentioned. Several volumes of lectures and "Tagebücher" or journals were published posthumously.

See J. G. Zimmermann, *Das Leben des Herrn von Haller* (1755), and the articles by [illegible] and [illegible], in Ersch and Gruber's *Encyklopädie*.

HALLEY, EDMUND (1656-1742), an eminent astronomer, was born at Haggerston, near London, October 29, 1656. His father, a wealthy soapboiler, desiring to give his only son an education suitable to his promising genius, placed him at St Paul's School, where he was equally distinguished for classical as for mathematical ability. Before leaving it for Queen's College, Oxford, which he entered as commoner in 1673, he had observed the change in the variation of the compass, and, at the age of nineteen, he supplied a new and improved method of determining the elements of the planetary orbits. His detection of considerable errors in the tables then in use led him to the conclusion that a more accurate ascertainment of the places of the fixed stars was indispensable to the progress of astronomy; and, finding that Flamsteed and Hevelius had already undertaken to catalogue those visible in northern latitudes, he assumed to himself the task of making observations in the southern hemisphere. A recommendation from Charles II. to the East India Company procured for him an apparently suitable, though, as it proved, ill-chosen station, and in November 1676 he embarked for St Helena. On the voyage he noticed the retardation of the pendulum in approaching the equator; and during his stay on the island he observed the transit of Mercury, which suggested to him the important idea of employing similar phenomena for the calculation of the solar distance. He returned to England in November 1678, having by the registration of 360 stars won the title of the "Southern Tycho," and by the translation to the heavens of the "Royal Oak," earned a degree of master of arts, conferred at Oxford by the king's command December 3, 1678, almost simultaneously with his election as fellow of the Royal Society. Six months later, the indefatigable astronomer started for Dantzic to set at rest a dispute of long standing between Hooke and Hevelius as to the respective merits of plain or telescopic sights; and towards the end of 1680 he proceeded on a Continental tour. In Paris he observed with Cassini the great comet of 1680 after its perihelion passage; and having returned to England, he married in 1682 Mary, daughter of Mr Tooke, auditor of the exchequer, with whom he lived harmoniously for fifty-five years. He now fixed his residence at Islington, engaged chiefly upon lunar observations, with a view to the great desideratum of a method of finding the longitude at sea. His mind, however, was also busy with the momentous problem of gravity. Having reached so far as to perceive that the central force of the solar system must decrease inversely as the square of the distance, and applied vainly to Wren and Hooke for further elucidation, he made in August 1684 that journey to Cambridge for the purpose of consulting Newton, which resulted in the publication of the *Principia*. The labour and expense of passing this great work through the press devolved upon Halley, who also wrote the prefixed hexameters ending with the well-known line—

> Nec fas est propius morti attingere divos.

In 1696 he was, although a zealous Tory, appointed comptroller of the mint at Chester, and (August 19, 1698) he received a commission as captain of the "Paramour Pink" for the purpose of making extensive observations on the conditions of terrestrial magnetism. This task he accomplished in a voyage which lasted two years, and extended to the 52d degree of S. latitude. The results were published in a *General Chart of the Variation of the Compass* in 1701; and immediately afterwards he executed by royal command a careful survey of the tides and coasts of the British Channel, an elaborate map of which he produced in 1702. On his return from a journey to Dalmatia, for the purpose of selecting and fortifying the port of Trieste, he was nominated, November 1703, Savilian professor of geometry at Oxford, and received an honorary degree of doctor of laws. Between 1713 and 1721 he acted as secretary to the Royal Society, having previously during eight years (1685–93) filled the same office, and early in 1720 he succeeded Flamsteed as astronomer-royal. Although in his sixty-fourth year, he undertook to observe the moon through an entire revolution of her nodes (eighteen years), and actually carried out his purpose. He died in the full possession of his faculties, January 14, 1742, at the age of eighty-five.

Halley's most notable scientific achievements were—his detection of the "long inequality" of Jupiter and Saturn, and of the acceleration of the moon's mean motion; his discovery of the proper motions of the fixed stars; his theory of variation, including the hypothesis of four magnetic poles, revived by Hansteen in 1819, and his suggestion of the magnetic origin of the aurora borealis; his calculation of the orbit of the 1682 comet (the first ever attempted), coupled with a prediction of its return, strikingly verified in 1759 and 1835; and his indication (in 1716, *Phil. Trans.*, No. 348) of a method still used for determining the solar parallax by means of the transits of Venus.

His principal works are *Catalogus Stellarum Australium*, London, 1679, the substance of which was embodied in vol. iii. of Flamsteed's *Historia Cœlestis*, 1725; *Synopsis Astronomiæ Cometicæ*, Oxford, 1705; *Astronomical Tables*, London, 1752; also eighty-one miscellaneous papers of considerable interest, scattered through the *Philosophical Transactions*. To these should be added his version from the Arabic (which language he acquired for the purpose) of the treatise of Apollonius *De Sectione Rationis*, with a restoration of his two lost books *De Sectione Spatii*, both published at Oxford in 1706; also his fine edition of the *Conics* of Apollonius, with the treatise by Serenus *De Sectione Cylindri et Coni*, Oxford, 1710, folio. His edition of the *Sphærics* of Menelaus was published by his friend Dr Costard in 1758.

HALLOWEVEN or HALLOWE'EN, the vigil of Hallowmas or All Saints' Day. For some account of the singular observances by which it used to be, and to some extent still is, distinguished in Scotland and elsewhere, reference may be made to such works as Brand's *Popular Antiquities*, Chambers's *Book of Days*, or better still to the well known poem of Burns. Though sometimes neglected in modern practice, the most essential part of Hallowe'en ritual seems to consist in the lighting by each household of a bonfire at nightfall. This points to the very ancient and widely-diffused practice of kindling sacred fires at certain seasons of the year. While the Germanic nations had their Osterfeuer and Johannisfeuer, the Celts had their Bealtine or Beltine (see BELTANE), and Samhtheine, the former on the eve of May 1, and the latter on the eve of November 1. Probably the winter as well as the summer festival was from the beginning regarded as a season at which the fairies were both unusually active and unusually propitious, but there is no evidence to show that the methods of divination at present usually resorted to, although of great antiquity, were originally regarded as limited in their efficacy to any one day. See Grimm's *Deutsche Mythologie*, ch. xx. (Elemente), and ch. xxxiv. (Aberglaube).

HALLUIN, a town of France, in the department of Nord and arrondissement of Lille, and 11 miles N.N.E. of Lille, is situated near the right bank of the Lys. It contains several religious and benevolent institutions, including a hospital. The manufactures comprise linen and cotton goods, bricks, and oil. The family of Halluin or Halowin is mentioned as early as 1266. Baron Walter II. was one of the forty hostages sent to England in 1360 in exchange for the French King John. George of Halluin or Halowin was a general in the service of Henry V., and an ambassador to England. He died in 1537, leaving several treatises in Latin. The family, to which the title of duke had been granted in 1581, became extinct about the middle of the 17th century. Population of the town (1876), 8584.

HALMSTAD, the chief town of the Swedish län Halland or Halmstad, is situated on the east shore of the Cattegat, about 76 miles S.S.E. of Gothenburg, and at the mouth of the river Nissa. The castle is the residence of the governor of the province. Mention of the church of Halmstad occurs as early as 1462, and the fortifications are mentioned first in 1225. The latter were demolished in 1736. The Dominican and Franciscan monasteries, formerly in the town, are now quite destroyed. The harbour, built in 1837–40, at a cost of about £5250, admits ships of 10 feet draught, by means of which some trade in deals, pitch, and tar is carried on. The salmon fishery is important. An archæological society holds its meetings in Halmstad, and the popular magazine *Svenska Familj Journalen* is published there. There are both mineral and sea water baths in the neighbourhood. The oldest town-privileges of Halmstad date from 1307, while the first recorded event in its military history is the battle of Nissa, between Harold Hardrada and Sven Ulfsson. During the revolt of the miner Engelbrekt, it twice fell into the hands of the rebels —in 1434 and 1436. The town appears to have been frequently chosen as the meeting-place of the rulers and delegates of the three northern kingdoms; and under the union of Calmar it was appointed to be the place for the election of a new Scandinavian monarch whenever necessary. The län of Halland formed part of the territory of Denmark in Sweden, and accordingly, in 1534, during his war with the Danes, Gustavus Vasa assaulted and took its chief town. In 1660, by the treaty of Copenhagen, the whole district was ceded to Sweden. In 1676 Charles XII. defeated near Halmstad a Danish army, which was attempting to retake the district, and since that time Halland has formed part of Sweden. The population of the town in 1875 was 7136.

HALO (Latin, *halo*; Greek, ἅλως), a luminous circle of light surrounding one of the heavenly bodies. A better definition perhaps would be "a ring of coloured light formed by refraction, on the passage of light from one of the heavenly bodies through the aqueous vapour surrounding the earth." This would include coronæ and rainbows, and similar phenomena.

Halos may be divided into the following classes:—

1. Encircling...	A. Simple. B. Compound, i.e., halo systems. C. Coronæ.
2. Opposite	α Rainbows. β Fog bows and mist halos. γ Mountain spectres.

They are usually seen surrounding the sun or the moon, but in the tropics small halos were observed by Humboldt round the planet Venus. The formation of encircling halos of the classes A and B is generally attributed to refraction and reflexion of the rays of light by the presence of minute snow crystals in the upper strata of the air, and they occur usually when cirrus or cirro-stratus clouds exist. This theory was originated by Descartes, and was adopted by Mariotte (in 1686), and subsequently followed by Dr Young and Sir Isaac Newton. It is, however, probable that some halos and certainly all coronæ (class C) are formed by refraction of light from globules of water suspended in the atmosphere. Simple halos are either about 22½ degrees or 47 degrees in diameter. The ice or snow crystals, being hexagonal in form, sometimes produce a double refraction, and then the large and small halos are seen at the same time, and, reflexion taking place from the surfaces of the crystals, additional halos or parts of halos are formed as in

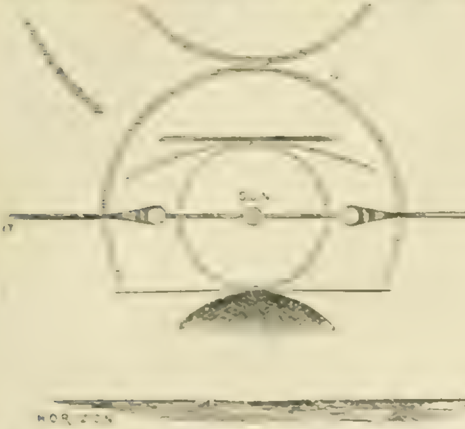


Fig. 1.—[illegible] seen at Brighton, June [illegible] 187[illegible], by F. E. Sawyer, from 4 to [illegible]. The [illegible] was a large [illegible], having the zenith for its centre and [illegible]. It was a white band, and passed through the sun and the mock suns. The parhelia were of prismatic colours and had flaming tails.

figs. 1 and 2. At the points of intersection of the halos, images of the sun or moon sometimes appear; when seen with the former, they are called *parhelia* or *mock-suns*, and when with the latter, *paraselenæ* or *mock-moons*. They are sometimes accompanied with flaming tails, and are usually of prismatic colours, as also are the halos and coronæ. The latter are seen when fleecy clouds or mist intervene between the spectator and the sun or moon, to which they are in immediate proximity, thereby being distinguished from the halos, which are formed at a distance from those luminaries. The predominating colour in coronæ is red or orange.

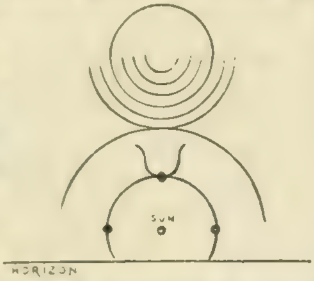


Fig. 2.—Halo system observed at Aberdeen, January 23, 1870, at 2 p.m. (see Symons's *Monthly Meteorological Magazine*, 1870, pp. 1 and 32, and frontispiece).

The second principal division of halos includes those which are seen opposite to the sun and moon. The first class of these comprises rainbows (*a*), which are occasioned by refraction of the light from the sun or moon, produced by falling rain, causing a bow with the prismatic colours in concentric bands and arranged as they appear in the solar spectrum. When the rain is abundant an inner bow is formed, the colours in which are in inverted order. Rainbows when seen from mountain tops and the topmasts of ships are completely circular. Fog bows and mist halos (*β*) are somewhat similar. The former are frequently white in colour, and are seen in the English Channel, and also off the banks of Newfoundland, being called by sailors "fog-eaters," from their indicating a dispersion of the fog or mist. They appear to be formed in a horizontal or very oblique plane. Mist halos are seen in the vapour of fountains or waterfalls, and resemble rainbows. Mountain spectres (*γ*) are caused by reflexion, and often appear accompanied by chromatic halos (see fig. 3). They generally occur on mountains when the sky between the observer and the sun is clear and there is a mist or cloud on the side of the mountain opposite to the sun, on which the summit of the mountain and the buildings and persons standing near are reflected. The most notable of mountain spectres is that of the Brocken, in the Harz mountains. Howitt says of this:—

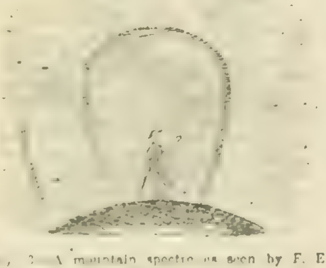


Fig. 3.—A mountain spectre as seen by F. E. Sawyer on the Rigi, shortly after sunrise, August 18, 1877.

> "If the fog is very dry, you see not only yourself but your neighbour; if very damp, only yourself, surrounded by a rainbow-coloured glory, which becomes more lustrous and beautiful the damper and thicker the fog is, and the nearer it approaches."

Many of the ancient descriptions of miraculous appearances in the heavens may be attributed to the phenomena before mentioned. Among the chief of these is the appearance of a cross which the emperor Constantine alleged he saw in the heavens about noon when marching against Maxentius (about 313 A.D.), and which was the cause of his conversion to Christianity (Eusebius, *Vita Constant.*, i. 27). Some writers have doubted the occurrence; but it is quite possible Constantine saw part of a system of solar halos, and two of these at right angles would form a cross (see fig. 4). The *Brighton Herald* of April 10, 1852, records a similar phenomenon on April 1st of that year at Brighton:—

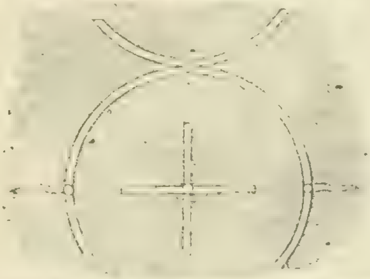


Fig. 4.—A system of lunar halos and paraselenæ figured in Buchan's *Meteorology*, p. 193.

> "Sun setting, evening very fine with slight haze westward, when a ray of brilliant light shot upwards about 20 degrees above the horizon, directly perpendicular from the sun, and soon after its appearance it was crossed by a horizontal band of light of a paler colour, but about the same breadth. It formed a perfect cross, and lasted half an hour."

Halos and rainbows are considered valuable prognostications of future weather. Fragments of rainbows seen on detached clouds are called *wind-dogs*, and are said to be a sign of wind. When the diameter of a corona contracts it shows the water particles are uniting into larger ones which may fall in rain, whereas if the corona extends, the particles are growing smaller, indicating increasing dryness. The open side of a halo is in some places considered to foretell the quarter from which bad weather may be expected.

See M. A. Bravais, "Mémoire sur les Halos et les Phénomènes optiques qui les accompagnent" (*Journal de l'École Royale Polytechnique*, 31 cahier, tome 18, Paris, 1847); Buchan, *Introductory Text-Book of Meteorology*, 1871; *Proc. Met. Soc.*, 1875, vol. ii., new ser., pp. 438 to 444. (F. E. S.)

HALS, Frans, was born at Antwerp according to most authorities in 1584, and died at Haarlem in 1666. As a portrait painter second only to Rembrandt, he displayed extraordinary talent and quickness in the exercise of his art coupled with improvidence in the use of the means which that art secured to him. At a time when the Dutch nation fought for independence and won it, Hals appears in the ranks of its military guilds. He was also a member of the chamber of rhetoric, and (1644) chairman of the painters' corporation at Haarlem. But as a man he had failings unhappily common to persons of his professon in that age. He so ill-treated his first wife that she died prematurely in 1616; and he barely saved the character of his second by marrying her in 1617. Another defect was partiality to drink, which led him into low company. Still he brought up and supported a family of ten children with success till 1654, when the forced sale of his pictures and furniture, at the suit of a baker to whom he was indebted for bread and money, brought him to absolute penury. Subsequently to this he was reduced to still greater straits, and his rent and firing were paid by the municipality, which afterwards gave him (1664) an annuity of 200 florins. We may admire the spirit which enabled him under these circumstances to produce some of his most striking productions. We regret to find his widow seeking outdoor relief from the guardians of the poor and dying obscurely in a hospital.

Hals's pictures illustrate the various strata of society into which his misfortunes led him. His banquets or meetings of officers, of sharpshooters, and guildsmen are the most interesting of his works. But they are not more characteristic than his low-life pictures of itinerant players and singers. His portraits of gentlefolk are true and noble, but hardly so expressive as those of fishwives and tavern heroes. His first master was Van Mander the painter and historian, of whom he possessed some pictures which went to pay the debt of the baker above alluded to. But he soon left behind him the practice of the time illustrated by Schoreel and Moro, and, emancipating himself gradually from tradition, produced pictures remarkable for truth and dexterity of hand. We prize in Rembrandt the golden glow of effects based upon artificial contrasts of low light in immeasurable gloom. Hals was fond of daylight of silvery sheen. Both men were painters of touch, but of touch on different keys. Rembrandt was the bass, Hals the treble. The latter is perhaps more expressive than the former. He seizes with rare intuition a moment in the life of his sitters. What nature displays in that moment, he reproduces thoroughly in a very delicate scale of colour, and with a perfect mastery over every form of expression. He becomes so clever at last that exact tone, light and shade, and modelling are all obtained with a few marked and fluid strokes of the brush.

In every form of his art we can distinguish his earlier style from that of later years. Two Boys Playing and Singing in the gallery of Cassel, and a Banquet of Officers (1616) in the museum of Haarlem, exhibit him as a careful draughtsman capable of great finish, yet spirited withal. His flesh, less clear than it afterwards becomes, is pastose and burnished. Further on he becomes more effective, displays more freedom of hand, and a greater command of effect. At this period we note the beautiful full length of a young lady of the Berensteyn family in the house of that name at Haarlem, and a splendid full length of a Patrician leaning on a Sword in the Liechtenstein collection at Vienna. Both these pictures are equalled by the Banquet of Officers of 1627, and a Meeting of the Company of St George of 1633 in the Haarlem Museum. A picture of the same kind in the town hall of Amsterdam, with the date of 1637, suggests some study of the masterpieces of Rembrandt, and a similar influence is apparent in a picture of 1641 at Haarlem, representing the "Regents" of the Company of St Elizabeth. But Rembrandt's example did not create a lasting impression on Hals. He gradually dropped more and more into grey and silvery harmonies of tone; and two of his canvases, executed in 1664, the Regents and Regentesses of the Oudemannenhuis at Haarlem, are masterpieces of colour, though in substance all but monochromes.

There are portraits by Hals in many Continental galleries. Comparatively few have found their way to England. Sir Richard Wallace's Cavalier, Lord Chesterfield's Toper, Lord Radnor's Likenesses of an Old Man and Woman, are the best that we can point out. Abroad a better selection may be found. At Amsterdam is the celebrated Flute Player, once in the Dupper collection at Dort, and the pair called Hals and his Wife; at Brussels, the patrician Heythuysen; at the Louvre, Descartes; at Dresden, the painter Van der Vinne. Hals's sitters were taken in every class of society,—admirals, generals, and burgomasters jostling with merchants, lawyers, clerks. To register all that we find in public galleries would involve much space. There are nine portraits at Berlin, five at Frankfort, six at Cassel, five at St Petersburg, three at the Louvre, two at Brussels, four at Dresden, two at Gotha. In private collections, chiefly in Paris, Haarlem, and Vienna, we find an equally important number. Amongst his most successful representations of fishwives and termagants we should distinguish the Hille Bobbe of the Berlin Museum, and the Hille Bobbe with her Son in the Dresden Gallery. Itinerant players are best illustrated in the Neville-Goldsmith collection at the Hague, and the Six collection at Amsterdam. Boys and girls singing, playing, or laughing, or men drinking, are to be found in the gallery of Schwerin, in the Arenberg collection, and in the royal palace at Brussels. The latest works of Hals in each of these branches are distinguished by comparatively black shadow.

Of the master's numerous family none has left a name except Frans Hals the younger, born about 1622, who died in 1669. His pictures represent cottages and poultry; and the Vanitas at Berlin, a table laden with gold and silver dishes, cups, glasses, and books is one of his finest works and deserving of a passing glance.

Quite in another form, and with much of the freedom of the elder Hals, Dirk Hals, his brother (born at Haarlem, died 1656), is a painter of festivals and ball rooms. But Dirk had too much of the freedom and too little of the skill in drawing which characterized his brother. He remains second on his own ground to Palamedes. A fair specimen of his art is a Lady playing a Harpsichord to a Young Girl and her Lover in the Van der Hoop collection at Amsterdam. More characteristic, but not better, is a large company of gentlefolk rising from dinner, in the academy at Vienna.

HALSTEAD, a market-town of England, county of Essex, is situated on the Colne Valley Railway and on a steep acclivity rising from the river Colne, 48 miles N.E. of London. Though irregularly built it has a neat appearance, and most of the streets are wide and clean. The principal buildings are the parish church, a fine Gothic edifice in the Perpendicular style, containing a monument supposed to be that of Sir Robert Bourchier, lord chancellor to Edward III.; the church of the Holy Trinity, in the Early English style, erected in 1844; the Lady Mary Ramsay's grammar school, the mechanics' institute, and the corn exchange. The principal industries are the manufacture of silk, crape, and velvet. Straw plaiting, at one time the principal occupation of the women, is now nearly extinct. The population of the town in 1871 was 5783, and of the parish 6904.

HALYBURTON, THOMAS (1674-1712), a distinguished Scottish divine, was born at Dupplin, near Perth, on the 25th of December 1674. His father one of the ejected ministers, having died in 1682, he was taken by his mother in 1685 to Rotterdam, where he for some time attended with advantage the school founded by Erasmus. On his return to his native country in 1687 he completed his elementary education at Perth and Edinburgh, and in 1692 entered the university of St Andrews. In 1700 he was ordained minister of the parish of Ceres, and in 1710 he was recommended by the synod of Fife for the chair of theology in St Leonard's College, St Andrews, to which accordingly he was appointed by Queen Anne. After a brief term of active professional life he died in 1712. The works by which he continues to be known, especially in Scotland, were all of them published after his death.

The treatise entitled *Natural Religion Insufficient, and Revealed Necessary, to Man's Happiness in his present State* (1714) is an able reply to some of the arguments of Lord Herbert and of Blount; the *Great Concern of Salvation* (1721), still read, handles questions of practical and experimental religion with great earnestness and in a manner that exhibits favourably one of the best types of piety current in his time; the *Memoirs* written by himself, which have been frequently reprinted, are similarly interesting and valuable.

HAM (חם), the second son of Noah (Gen. v. 32), and the progenitor of Cush, Mizraim, Phut, and Canaan (Gen. x. 6). On the assumption that these early genealogies are geographical rather than personal or even ethnological, the name Ham, which in Hebrew radically signifies "hot," would seem to indicate the torrid zone; and this inference, though not supported, so far as has been hitherto discovered, by any corresponding explanation of the names of Shem and Japheth, at least harmonizes well with the fact that on the whole Shem seems intended to denote the intermediate and Japheth the northern regions of the world as known to the compiler of the Book of Genesis. The attempt has sometimes been made to identify Ham with Keme or Chemi, an old native name of Egypt, signifying "black," and having reference, it is supposed, to the colour of the soil. But this identification has no adequate etymological support (see Lepsius in Herzog and Plitt's *Encykl.*, i. 166); and the allusions in several of the Psalms to Egypt as the land of Ham (Ps. cv. 23, cvi. 22) are not inconsistent with the belief that the latter name was primarily used in a much wider and less local sense. The solitary incident regarding Ham related in Gen. ix. 20-27 seems intended to indicate, from the Israelite point of view, the immodest and sensual tendencies of the Canaanites and other "Hamitic" peoples.

HAM, a small town of France, in a marshy district on the left bank of the Somme, about 40 miles south-east of Amiens, on the railway between Amiens and Rheims. It had in 1876 a population of only 3122; but historically it is a place of very considerable importance. From the 9th century onwards it appears as the seat of a lordship which, after the extinction of its hereditary line, passed in succession to the houses of Coucy, Enghien, Luxembourg, Rohan, Vendôme, and Navarre, and was finally united to the French crown on the accession of Henry IV. In 1108 an abbey of canons regular of the congregation of France was founded at Ham; and it continued to exist till the great Revolution, the revenue of its abbot about that time amounting to 15,000 livres. The abbey church (Notre Dame) dates from the 12th century, but in April 1760 all the inflammable portions of the building were destroyed by a conflagration caused by lightning, and during the present century a process of restoration has been carried out under the direction of M. Corroyer. Of special note are the bas reliefs of the nave and choir, executed in the 17th and 18th centuries, and the crypt of the 11th century, which contains the sepulchral effigies of Odo of Ham and his wife Isabella of Bethencourt. The castle, founded by Odo in the 12th century, was rebuilt in the 13th and extended in the 14th, and its present appearance is mainly due to Louis of Luxembourg, count of St Pol, who between 1436 and 1470 not only furnished it with outworks, but gave such a thickness to the towers and curtains, and more especially to the great tower or donjon which still bears his motto *Mon Myeux*, that they would offer a long resistance even to modern artillery (Viollet-le-Duc). It forms a rectangle 335 feet long by 263 feet broad, with a round tower at each angle and two square towers protecting the curtains. The eastern and western sides are each defended by a demi-lune. The Constable's Tower, for so the great tower is usually called in memory of St Pol, has a height of about 100 feet, and the thickness of the walls is 36 feet; the interior is occupied by three large hexagonal chambers in as many stories. As the castle of Ham has frequently been used as a state prison both in ancient and modern times, the list of those who have tasted its hospitality is an interesting one, including Joan of Arc, Louis of Bourbon, the ministers of Charles X., Louis Napoleon, Cavaignac, and Lamoricière. Louis Napoleon was there for six years, and at last effected his escape in the disguise of a workman. During 1870-71 Ham was several times captured and recaptured by the belligerents.

A view and plan of the town will be found in Caspar Merian's *Topographia Galliæ*, Frankfort, 1656; and the former is copied in the *Gentleman's Magazine*, 1851. See also De Feulinde, *Le Château de Ham*, 1842; and Ch. Gomart, *Ham, son château*, 1864.

HAMADAN, a town of Persia, in the province of Irak-Ajemi, 162 miles W.S.W. of Teheran, in the district of the Ojelal at the foot of the Elvend or Arwand Mountain, the Orontes of the ancients. It is a busy place of about 50,000 inhabitants, and has large and well-stocked bazaars. Its principal industry is the manufacture of copper wares. Gold is collected in the streams traversing the town, and the surrounding country is remarkable for its beauty and fertility. Every quarter is shut off from its neighbours by gates which are closed at night. The chief objects of interest are the tombs of Esther and Mordecai, and of the Arabian philosopher Avicenna. The former, constructed of black wood, are adorned with Hebrew inscriptions which may be seen figured in Ker Porter's *Travels*. According to these, the pavilion or temple over the tombs was erected in the year of the creation 4474. The ordinary inhabitants of Hamadan attach more importance to a stone image of a lion which they assert was set up by Belinas a magician, to mitigate the cold from which their city suffers severely. "Hamadan," says Hamadani, echoing a common Persian complaint, "is the most hateful of towns; its children are old men for ugliness, and its old men are children for silliness." At the same time the town has produced many eminent men, among whom are Abu 'l Fadhl Ahmed Hamadani himself, Zafer ed Din the Persian poet, and Zamiri. The origin of the city is carried back by Hischam el Kelbi to Hamadan a grandson of Shem, but other writers are contented with a less antiquity. Its claims to be identified with the Ecbatana of the classical authors have been treated of under ECBATANA. The present town has almost no ancient remains, and especially there are no sculptured works. See Meynard, *Dictionnaire géographique de la Perse*.

HAMAH, the Hamath of the Bible, one of the oldest cities of Syria (Gen. x. 18), situated in the valley of the Orontes, 110 English miles N. (by E.) of Damascus. It finds a place among the northern boundaries of the Holy Land (Num. xxxiv. 8), and is frequently mentioned in Old Testament history (Num. xiii. 21, 2 Sam. viii. 9, 1 Kings viii. 65, 2 Kings xviii. 34, 2 Chron. viii. 3, Isa. x. 9, Amos vi. 2). The city lies in a narrow valley, the pass south of it being probably the "entering in of Hamath" (1 Kings viii. 65). The Orontes flows winding through it, and is spanned by four bridges. On the south-east the houses rise 150 feet above the river, and there are four other hills, that of the *Kalah* or castle being to the north 100 feet high. Twenty-four minarets rise from the various mosques. The houses are principally of mud, and the town stands amid poplar gardens with a fertile plain to the west. The castle is ruined, the streets are narrow and dirty, but the bazaars are good, and the trade with the Bedawin considerable. The numerous water-wheels (*naûrah*), of enormous dimensions, raising water from the Orontes are the most remarkable features of the view. The population is stated in official returns to consist of about 39,000 Moslems and 4000 non-Moslems. The curious Hamath inscriptions first mentioned by Burckhardt have lately attracted much attention. Four stones exist covered with ideographic designs in a character as yet quite unknown. The latest researches of Mr George Smith, however, indicate that the inscriptions are probably of Hittite origin, and other relics of that once powerful nation resembling the Hamath stones have been discovered farther east.

In the year 854 B.C. (according to the late George Smith) Hamath was taken by Shalmaneser, king of Assyria, who defeated an army of 1400 chariots and 10,000 footmen under Irhulena, king of the district. Again in 743 B.C. Tiglath Pileser II. reduced the city to tribute, and in 740 B.C. he defeated the Hamathites, who were assisted by Azariah, king of Judah. Another rebellion was crushed by Sargon in 720 B.C. After the Macedonian conquest of Syria Hamath was called Epiphania by the Greeks in honour of Antiochus IV., Epiphanes, and in the early Byzantine period it was known by both its Hebrew and its Greek name. In 639 A.D. the town surrendered to Abu 'Obeideh, one of Omar's generals, and the church was turned into a mosque. In 1108 A.D. Tancred captured the city and massacred the Ism'aileh defenders. In 1115 it was retaken by the Moslems, and in 1178 was occupied by Saladin. Abulfeda, prince of Hamah in the early part of the 14th century, is well known as an authority on Arab geography.

HAMANN, Johann Georg (1730–1788), a distinguished writer on philosophical and theological subjects, was born at Königsberg in Prussia in 1730. His parents were of humble rank and small means. The education he received was comprehensive but unsystematic, and the want of definiteness in this early training doubtless tended to aggravate the peculiar instability of character which troubled Hamann's after life. In 1746 he began theological studies, but speedily deserted them and turned his attention to law. That too was taken up in a desultory fashion and quickly relinquished. Hamann seems at this time to have thought that any strenuous devotion to "bread-and-butter" studies was lowering, and accordingly gave himself entirely to reading, criticism, and philological inquiries. Such studies, however, were pursued without any definite aim or systematic arrangement, and consequently were productive of nothing. In 1752, constrained to secure some position in the world, he accepted a tutorship in a family resident in Livonia, but only retained it a few months. A similar situation in Courland he also resigned after about a year. In both cases apparently the rupture might be traced to the curious and unsatisfactory character of Hamann himself. After leaving his second post he was received into the house of a merchant at Riga named Berens, who contracted a great friendship for him and selected him as his companion for a tour through Dantzic, Berlin, Hamburg, Amsterdam, and London. Hamann, however, was quite unfitted for business, and, when left in London, gave himself up entirely to his fancies, and was quickly reduced to a state of extreme poverty and want. It was at this period of his life, when his inner troubles of spirit harmonized with the unhappy external conditions of his lot, that he began an earnest and prolonged study of the Bible; and from this time dates the tone of extreme pietism which is characteristic of his writings, and which undoubtedly alienated many of his friends. He returned to Riga, and was well received by the Berens family, in whose house he resided for some time. A quarrel, the precise nature of which is not very clear though the occasion is evident, led to an entire separation from these friends. In 1759 Hamann returned to Königsberg, and lived for several years with his father, filling occasional posts in Königsberg and Mitau. In 1767 he obtained a situation as translator in the excise office, and ten years later a post as storekeeper in a mercantile house. During this period of comparative rest Hamann was able to indulge in the long correspondence with learned friends which seems to have been his greatest pleasure. In 1784 the failure of some government speculations greatly reduced his means, and about the same time he was dismissed with a small pension from his situation. The kindness of friends, however, supplied provision for his children, and enabled him to carry out the long-cherished wish of visiting some of his philosophical allies. He spent some time with Jacobi at Pempelfort and with Buchholz at Walbergen. At the latter place he was seized with illness, and died on the 21st June 1788.

Hamann's works resemble his life and character. They are entirely unsystematic so far as matter is concerned, chaotic and disjointed in style. To a reader not acquainted with the peculiar nature of the man, which led him to regard what commended itself to him as therefore objectively true, they must be moreover entirely unintelligible and, front their peculiar pietistic tone and scriptural jargon, probably offensive. A place in the history of philosophy can be yielded to Hamann only because he expresses in uncouth, barbarous fashion an idea to which other writers have given more effective shape. The fundamental thought is with him the unsatisfactoriness of abstraction or onesidedness. The *Aufklärung*, with its rational theology, was to him the type of abstraction. Even Epicureanism, which might appear concrete, was by him rightly designated abstract. Quite naturally, then, Hamann is led to object strongly to much of the Kantian philosophy. The separation of sense and understanding is for him unjustifiable, and only paralleled by the extraordinary blunder of severing matter and form. Concreteness, therefore, is the one demand which Hamann expresses, and as representing his own thought he used to refer to Giordano Bruno's conception of the identity of contraries. The demand, however, remains but a demand. Nothing that Hamann has given can be regarded as in the slightest degree a response to it. His hatred of system, incapacity for abstract thinking, and intense personality rendered it impossible for him to do more than utter the disjointed, oracular, obscure dicta which gained for him among his friends the name of "Magus of the North." Two results only appear throughout his writings,—first, the accentuation of belief, and, secondly, the transference of many philosophical difficulties to language. Belief is, according to Hamann, the groundwork of knowledge, and he accepts in all sincerity Hume's analysis of experience as being most helpful in constructing a theological view. In language, which he appears to regard as somehow acquired, he finds a solution for the problems of reason which Kant had discussed in the *Critique*. On the application of these thoughts to the Christian theology one need not enter.

None of Hamann's writings are of great bulk; most are mere pamphlets of some thirty or forty pages. A complete collection has been published by Roth (*Schriften*, 8vo, 1821–42), and by Gildemeister (*Leben und Schriften*, 6 vols., 1851-73). See also Petri, *Hamann's Schriften u. Briefe*, 4 vols., 1872-3; Poel, *Hamann, der Magus im Norden, sein Leben u. Mittheilungen aus seinen Schriften*, 2 vols., 1874-76. A very comprehensive essay on Hamann is to be found in Hegel's *Vermischte Schriften*, ii. (*Werke*, bd. xvii.).

HAMÂSAH (more correctly Hamâseh), the name of a famous Arabian anthology compiled by Habib ibn Aus et-Tâi, surnamed Abû Temmâm (corruptly Abu-Temam, *q.v.*). The collection is so-called from the title of its first book, containing poems descriptive of constancy and valour in battle, patient endurance of calamity, steadfastness in seeking vengeance, manfulness under reproach and temptation, all which qualities make up the attribute called by the Arabs *hamâseh* (briefly paraphrased by Et-Tebrizi as *esh-shiddeh fil-amr*). It consists of ten books or parts, containing in all 884 poems or fragments of poems, and named respectively—(1) *El-Hamâseh*, 261 pieces; (2) *El-Marâthi*, "Dirges," 169 pieces; (3) *El-Adab*, "Manners," 54 pieces; (4) *En-Nesîb*, "The Beauty and Love of Women," 109 pieces; (5) *El-Hijâ*, "Satires," 80 pieces; (6) *El-Adyâf wal-Medîh*, "Hospitality and Panegyric," 143 pieces; (7) *Es-Sifât*, "Miscellaneous Descriptions," 3 pieces; (8) *Es-Seyr wan-No'âs*, "Journeying and Drowsiness," 9 pieces; (9) *El-Mulah*, "Pleasantries," 38 pieces; and (10) *Medhammet-en-nisâ*, "Dispraise of Women," 18 pieces. Of these books the first is by far the longest, both in the number and extent of its poems, and the first two together make up more than half the bulk of the work. The poems are for the most part fragments selected from longer compositions, though a considerable number are probably entire. They are taken from the works of Arab poets of all periods down to that of Abû Temmâm himself (the latest ascertainable date being 832 A.D.), but chiefly of the poets of the Ante-Islamic time (*Jâhiliyyûn*), those of the early days of El-Islâm (*Mukhadramûn*), and those who flourished during the reigns of the Umawî caliphs, 660–749 A.D. (*Islâmiyyûn*). Perhaps the oldest in the collection are those relating to the war of Basûs, a famous legendary strife which arose out of the murder of Kuleyb, chief of the combined clans of Bekr and Teghlib, and lasted for forty years, ending with the peace of Dhu-l-Mejâz, about 534 A.D. Of the period of the 'Abbâsî caliphs, under whom Abû Temmâm himself lived, there are probably not more than sixteen fragments.

Most of the poems belong to the class of extempore or occasional utterances, as distinguished from *qasîdehs*, or elaborately finished odes. While the latter abound with comparisons and long descriptions, in which the skill of the poet is exhibited with much art and ingenuity, the poems of the *Hamâseh* are short, direct, and for the most part free from comparisons; the transitions are easy, the metaphors simple, and the purpose of the poem clearly indicated. It is due probably to the fact that this style of composition was chiefly sought by Abû Temmâm in compiling his collection that he has chosen hardly anything from the works of the most famous poets of antiquity. Not a single piece from Imra'el-Qeys occurs in the *Hamâseh*, nor are there any from 'Alqameh, Zuheyr, or El-A'shà; En-Nâbighah is represented only by two pieces (pp. 408 and 742 of Freytag's edition) of four and three verses respectively, 'Antarah by two pieces of four verses each (*Id.*, pp. 206, 209), Tarafeh by one piece of five verses (*Id.*, p. 632), Lebîd by one piece of three verses (*Id.*, p. 468), and 'Amr son of Kulthûm by one piece of four verses (*Id.*, p. 236). The compilation is thus essentially an anthology of minor poets, and exhibits (so far at least as the more ancient poems are concerned) the general average of poetic utterance at a time when to speak in verse was the daily habit of every warrior of the desert.

To this description, however, there is an important exception in the book entitled *En-Nesîb*, containing verses relating to women and love. In the classical age of Arab poetry it was the established rule that all *qasîdehs*, or finished odes, must begin with the mention of women and their charms (*teshbîb*), in order, as the old critics said, that the hearts of the hearers might be softened and inclined to regard kindly the theme which the poet proposed to unfold. The fragments included in this part of the work are therefore generally taken from the opening verses of *qasîdehs*; where this is not the case, they are chiefly compositions of the early Islamic period, when the school of exclusively erotic poetry (of which the greatest representative was 'Omar son of Abû Rabî'ah) arose.

The compiler was himself a distinguished poet in the style of his day, and wandered through many provinces of the Muslim empire earning money and fame by his skill in panegyric. About 220 A.H. he betook himself to Khurâsân, then ruled by 'Abd-allâh son of Tâhir, whom he praised and by whom he was rewarded; on his journey home to El-'Irâq he passed through Hamadân, and was there detained for many months a guest of Abu-l-Wafâ son of Selemeh, the road onward being blocked by heavy falls of snow. During his residence at Hamadân Abû Temmâm is said to have compiled or composed, from the materials which he found in Abu-l-Wafâ's library, five poetical works, of which one was the *Hamâseh*. This collection remained as a precious heirloom in the family of Abu-l-Wafâ until their fortunes decayed, when it fell into the hands of a man of Dînawar named Abu-l-'Awâdhil, who carried it to Isfahân and made it known to the learned of that city.

The worth of the *Hamâseh* as a store-house of ancient legend, of faithful detail regarding the usages of the pagan time and early simplicity of the Arab race, can hardly be exaggerated. The high level of excellence which is found in its selections, both as to form and matter, is remarkable, and caused it to be said that Abû Temmâm displayed higher qualities as a poet in his choice of extracts from the ancients than in his own compositions. What strikes us chiefly in the class of poetry of which the *Hamâseh* is a specimen, is its exceeding truth and reality, its freedom from artificiality and hearsay, the evident first-hand experience which the singers possessed of all of which they sang. For historical purposes the value of the collection is not small; but most of all there shines forth from it a complete portraiture of the hardy and manful nature, the strenuous life of passion and battle, the lofty contempt of cowardice, niggardliness, and servility, which marked the valiant stock who bore El-Islâm abroad in a flood of new life over the out-worn civilizations of Persia, Egypt, and Byzantium. It has the true stamp of the heroic time, of its weaknesses and crime as of its strength and beauty.

No less than twenty commentaries on it are enumerated by Hâjî Khalîfeh. Of these the earliest was by Abû Riyâsh (otherwise Er-Riyâshî), who died in 257 A.H.; excerpts from it, chiefly in elucidation of the circumstances in which the poems were composed, are frequently given by Et-Tebrîzî. He was followed by the famous grammarian Abu-l-Fath ibn el-Jinnî (died 392 A.H.), and later by Shihâb ed-Dîn Ahmed el-Marzûqî of Isfahân (died 421 A.H.). Upon El-Marzûqî's commentary is chiefly founded that of Abû Zekeriyâ Yahyà et-Tebrîzî (born 421 A.H., died 502), which has been published by the late Professor G. W. Freytag of Bonn, together with a Latin translation and notes (1828-1851). This monumental work, the labour of a life, is a treasure of information regarding the classical age of Arab literature which has not perhaps its equal for extent, accuracy, and minuteness of detail, in Europe. No other complete edition of the *Hamâseh* has been printed in the West; but in 1856 one appeared at Calcutta under the names of Maulavî Ghulâm Rabbânî and Kabîru-d-dîn Ahmad. Though no acknowledgment of the fact is contained in this edition, it is a simple reprint of Professor Freytag's text (without Et-Tebrîzî's commentary), and follows its original even in the misprints (corrected by Freytag at the end of the second volume, which being in Latin the Calcutta editors do not seem to have consulted). It is thus worthless as a fresh critical authority, and, owing to the absence of a commentary, of little use to the student; its only merit is that it contains in an appendix of 12 pages a collection of verses (and some entire fragments) not found in Et-Tebrîzî's recension, but stated to exist in some copies consulted by the editors; these are, however, very carelessly edited and printed, and in many places unintelligible.

The *Hamâseh* has been rendered with the utmost skill and spirit into German verse by the illustrious Friedrich Rückert (Stuttgart, 1846), who has not only given translations of almost all the poems proper to the work, but has added numerous fragments drawn from other sources, especially those occurring in the *Scholia* of Et-Tebrîzî, as well as the *Mo'allaqahs* of Zuheyr and 'Antarah, the *Lâmiyyeh* of Esh-Shenferà, and the *Banet So'ad* of Ka'b son of Zuheyr. No such faithful interpretation of the ways and thoughts of the ancient Arabs exists to our knowledge in any modern European language; it is comparable, for fidelity, spirit, and fluency, only to Lane's translation of the *Thousand and One Nights*.

When the *Hamâseh* is spoken of, that of Abû Temmâm, as the first and most famous of the name, is meant; but several collections of a similar kind, also called *Hamâseh*, exist. The best known and earliest of these is the *Hamâseh* of El-Bohturî (died 284 A.H.), of which some fragments were published by Theo. Nöldeke in his *Beiträge zur Kenntniss der Poesie der alten Araber* (Hanover, 1864). Four other works of the same name, formed on the model of Abû Temmâm's compilation, are mentioned by Hâjî Khalîfeh. Besides these, a work entitled *Hamâset er-Râh* (the Hamâseh of wine), was composed by Abu-l-'Alâ el-Ma'arrî (died 449 A.H.). (C. J. L.)

HAMBATO, a form of the name AMBATO (*q.v.*).

HAMBURG, a state of the German empire, which consists of the city of Hamburg with its incorporated suburbs of St George's and St Paul's, the surrounding district with the sixteen suburban hamlets (*Vororte*), several islands in the Elbe, the five enclaves of Volksdorf, Hansdorf, &c., in Holstein, the communes of Moorburg in Lüneburg and Cuxhaven-Ritzebüttel in the north-west of the duchy of Bremen at the mouth of the Elbe, the island of Neuwerk about five miles from the coast, and the bailiwick (*amt*) of Bergedorf, which up to 1867 was held in common by Lubeck and Hamburg. The whole territory has an area of 157·18 square miles, exclusive of 99 square miles occupied by the Elbe. Of this area 124 square miles are within the limits of the German customs, but the rest continues to be practically "abroad" in relation to the commerce of the empire. In 1871 the total population was 338,974; by 1875 it had increased to 388,618 (191,339 males and 197,279 females); by 1877 to 406,014; and by 1878 to 417,239. Administratively the state is divided into the city or metropolitan district, which had 239,107 inhabitants in 1871, the domain of the Geestland[1] with 57,216 inhabitants, the domain of the Marschland with 22,982, the bailiwick of Bergedorf with 13,112, and the bailiwick of Ritzebüttel with 6557. Cuxhaven-Ritzebuttel and Bergedorf are the only towns besides the capital, and they had respectively 4102 and 3899 inhabitants in 1875. The Geestland comprises the suburban districts of Rotherbaum, Harvestehude, Eimsbüttel, Eppendorf, Hohenfelde, Uhlenhorst, Eilbeck, Barmbeck, Winterhude, Borgfelde, Harum, and Horn, which encircle the city on the north and east; and the Marschland includes various "werders,"[2] such as the Billwerder Ausschlag to the east of the city, the Steinwerder and the Little Grasbrook to the south of the Elbe, the Billwerder, the Ochsenwerder, and the so-called Vierlande or Four Districts (Corslake, Altegamme, Nauegamme, and Kirchwerder) as far east as Geesthacht. While the Geestland has in many places an almost unproductive soil, the Marschland is of extraordinary fertility, and its pastures, corn-fields, and market-gardens furnish Hamburg with large quantities of country produce.

As a state of the empire Hamburg is represented in the federal council by one plenipotentiary and in the diet by three deputies. According to the present constitution, which has been in force since September 28, 1860, the legislative power is in the hands of the senate and the general body of citizens, and the executive is committed to the senate alone. Of the 18 members of the senate no less than 9 must have studied law and finance, and of the remaining 9, 7 must be representatives of commerce. The members are chosen by the senate and the burgesses after a complicated process, and the burgess upon whom their choice falls is obliged to accept office for at least six years, on pain of losing his civic rights. The senate by itself has the election of the first and the second burgomaster, each of whom holds office for only a year. There are 196 burgesses, of whom 88 are chosen by ballot by the general community, 48 by and from the owners of ground within the town, and 60 by the courts and administrative bodies. They are elected for a period of six years, but as half of each class go out at the end of every three years the elections occur twice as often. Both the senate and the burgesses have the right of introducing new bills. The basis of the civil law is the Jus Hamburgicum, revised in 1603 and supplemented by the Roman law; but in some of the rural districts local customs prevail, and in Bergedorf the Lubeck rights are still partly in force. Hamburg has appeal to the common high court of the Free Cities in Lubeck. There is a special court for commercial disputes. Juries are summoned in the more important trials; and since 1860 there has been public and responsible prosecution of criminal cases. The ecclesiastical arrangements of Hamburg have undergone great modifications since the general constitution of 1860. From the Reformation to the French occupation in the beginning of this century, Hamburg was a purely Lutheran state; according to the "Recess" of 1529, re-enacted in 1603, non-Lutherans were subject to legal punishment and expulsion from the country. Exceptions were gradually made in favour of foreign residents; but it was not till 1785 that regular inhabitants were allowed to exercise the religious rites of other denominations, and it was not till after the war of freedom that they were allowed to have buildings in the style of churches. In 1860 full religious liberty was guaranteed, and the identification of church and state abolished. By the new constitution of the Lutheran Church, published at first in 1870 for the city only, but in 1876 extended to the rest of the Hamburg territory, the parishes or communes are divided into three church-districts, and the general affairs of the whole community are entrusted to a synod of 53 members and to an ecclesiastical council of 9 members which acts as an executive. A central fund for the church was formed in 1870 out of the surplus property of the convent of St John; and in some of the communes there is a church rate. According to the returns of 1871 there were 300,968 Lutherans, 5585 members of other Evangelical Churches, 7771 Roman Catholics, 194 Mennonites, 2696 Christians of other sects, and 13,796 Jews, while 628 described themselves as without religion or heathens, and 7071 gave no information as to creed. Since 1871 the ratio of Lutherans to non-Lutherans must have somewhat diminished. The German Reformed Church, the French Reformed, the English Episcopal, the English "Reformed," the Roman Catholic, and the Baptist are all recognized by the state. Civil marriages have been permissible in Hamburg since 1866, and since the introduction of the imperial law in January 1876 the number of such marriages has greatly increased.

The finances of the state of Hamburg are in a generally satisfactory state; for, although the public debt has been increasing, this is due mainly to such undertakings as railways, harbour improvements, and schools. In 1876 the revenue was estimated at £1,2[illegible],161 sterling, in 1877 at £1,264,[illegible], in 1878 at £1,[illegible], and in 1879 at £1,[illegible], and the corresponding expenses were stated at £1,2[illegible], £1,3[illegible]915, £[illegible]175, and £1,[illegible]. The public debt which was £6,[illegible] in the end of 1874, was reduced by 1878 to £5,[illegible]. Of the former sum £[illegible]775 was the remains of the great conflagration loan of 1842, which originally amounted to £2,[illegible].

In 1868 the old civic militia, which then consisted of 7654 men, was dissolved; all citizens and residents between the ages of 20 and 45 had been obliged to serve except certain state officials, and school teachers &c. By convention with Prussia Hamburg furnishes two battalions to the 2d Hanseatic infantry regiment.

See *Statistik des Hamburgischen Staats*, 1878; J. Neumann, *Statist. [illegible] für den Hamb. Staat*, 1874 and 1876; Gustav [illegible] *[illegible] im Hamburg* 1876.

HAMBURG, one of the most remarkable cities of Germany and indeed of Europe, ranking as it does as the first of all the seats of commerce on the Continent, is situated on the right bank of the northern arm of the Elbe, about 93 miles from the mouth of that river, just where it is joined by the Alster and the Bille. The latitude of the observatory in the western part of the city is 53° 33′ 5·0″ N. and the longitude 9° 58′ 23·6″ E., the latitude of the tower of St Michael's 53° 32′ 55·7″ N. and the longitude 9° 58′ 41·7″ E. Were it not for political and municipal boundaries Hamburg might be considered as forming one town with Altona and Ottensen, the three presenting to the river a continuous frontage of nearly 4 miles and long lines of suburbs radiate inland in various directions. The city proper lies on both sides of the Alster, which having been dammed up a short distance from its mouth now forms a considerable lake, of which the southern portion within the line of the fortifications bears the name of the Inner Alster (*Binnen Alster*), and the other and larger portion (2500 metres long and 1200 metres wide at the widest) that of the Outer Alster (*Aussen Alster*). The fortifications as such were removed in 1815, but they have left their trace in a fine girdle of green round the city, though too many inroads on its completeness have been made by railways and roadways. The oldest portion of the city is that which lies to the east of the Alster; but, though it still retains the name of Altstadt, nearly all trace of its antiquity has disappeared, as it was rebuilt after the great fire of 1842. To the west lies the new town, incorporated in 1678; beyond this and contiguous to Altona is the quondam suburb of St Paul's, incorporated in 1876, and towards the north east is the quondam suburb of St George, which arose in the 13th century, but was not incorporated till 1868. The old town lies low, and it is traversed by a great number of narrow canals or "fleets" (for the same word which has left its trace in London nomenclature is used in the Low-German city), which add considerably to the picturesqueness of the meaner quarters, and serve as convenient channels for the transport of goods. They generally form what may be called the back streets, and they are bordered by warehouses, cellars, and the lower class of dwelling houses. As they are subject to the ebb and flow of the Elbe, at certain times they run quite dry, and afford a field of operations for the *fleetenkieker*, who wanders along the oozy channel to pick up any articles of value, and at other times they are filled 15 to 20 feet above their ordinary level.[1] As soon as the telegram at Cuxhaven announces high tide three shots are fired from the Stintfang at the harbour to warn the inhabitants of the "fleets"; and if the progress of the tide up the river gives indication of danger, other three shots add emphasis to the warning. Then the dwellers on the lower levels make a rapid escape with their property. At the time of the equinoxes the inundation may be repeated for several days in succession; but when all is over the people (the Lüd von de Waterkant) return like rats to their oozy and dripping abodes. In fine contrast to the dull and dismal fleets is the bright and handsome appearance of the Inner Alster, which is enclosed on three sides by handsome rows of buildings, the Alsterdamm in the south east, the Old Jungfernstieg in the south-west, and the New Jungfernstieg on the north-west, while it is separated from the Outer Alster by part of the rampart gardens traversed by the railway which unites Hamburg with Altona. These streets and especially the Old Jungfernstieg are fashionable promenades. The largest of the public squares of Hamburg is the Hopfenmarkt, which contains the church of St Nicholas, and is the principal market for fish, meat, vegetables, and fruit; others of importance are the Gänsemarkt or Goose Market, the Zeughausmarkt, and the Great New Market. The churchyards, of which several are pleasantly laid out, are all to be removed to Ohlsdorf, about 4 miles from the town.

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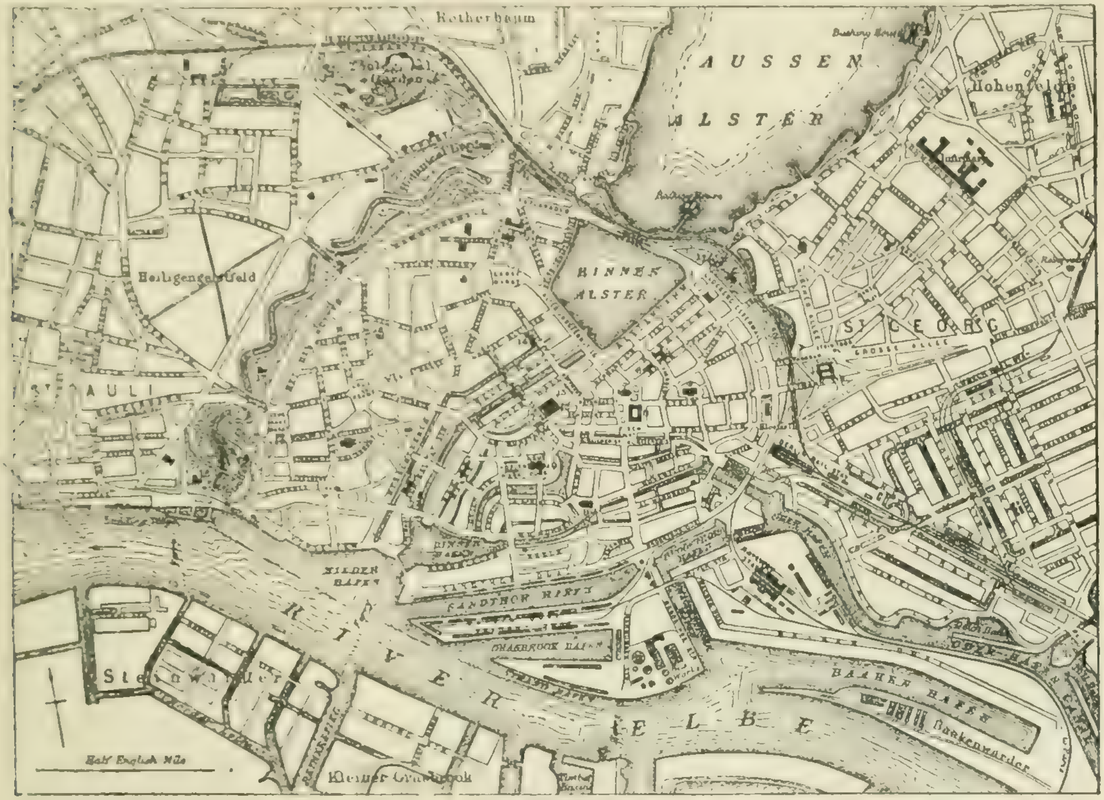
[1] Geest is a Platt-Deutsch word meaning "dry," and the Geestland is consequently the higher and drier district, in contrast to the marshland. The surface of the Geestland is composed of sand and gravel, and part of it is occupied by heath.

[2] Werder, Wärder, or Wörth, is either equivalent to the old English "eyot," a river-island, or signifies a stretch of flat land between a river and a piece of standing water, or a portion of a swamp drained and devoted to tillage.



Plan of Hamburg.

1. Schiller's Monument.
2. Adolph von Schauenburg's Monument.
3. New School Buildings.
4. St James's Church.
5. [illegible]
6. Thalia Theatre.
7. St Peter's Church.
8. Johanneum and Town Library
9. St Catherine's Ch.
10. St Nicholas Ch.
11. Bank.
12. Exchange.
13. Site of Old Town-Hall.
14. Post-Office.
15. Town Theatre.
16. Synagogue.
17. Observatory.
18. Sailors' Home.
19. English Episcopal Church.
20. St Michael's Ch.
21. Town-House or Rathhaus.
22. Sailors' Poor-house.

Of the churches actually existing in Hamburg (the old cathedral had to be taken down in 1805), St Peter's, St Nicholas, St Catharine's, St James's, and St Michael's are those that give name to the five old city parishes. The church of St Nicholas is remarkable more especially for its tower, which until the spire of the Cologne cathedral reaches its projected elevation of 511 feet, will probably continue to be the second highest building in the world, rising as it

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[1] In 1843 *pegels* or water-gauges were established at Hamburg and Cuxhaven. In 1872 their zeros were lowered respectively 9·80 and 4·31 ft., so that they both stand 9·6 ft. above the zero of Harburg and 10·7 above that of Kiel.

does to a height of 473 feet, about 19 feet lower than St Ouen's at Rouen. The actual church dates from 1845–1874, the former St Nicholas having perished in the great fire. It was opened for public worship in 1863. The architect, the late Sir G. Gilbert Scott, selected the rich Gothic style of the 13th century; and both the exterior and interior are elaborately adorned with sculptures. Sandstone from Osterwald near Hildesheim was used for the outside, and for the inner work a softer variety from Postelwitz near Dresden. The roof is wholly constructed of wood. **A large part of the cost, which altogether amounted to £204,220, was defrayed by weekly shilling subscriptions.** St Michael's has a tower which almost rivals that of St Nicholas, as with its height of 428 feet it ranks ninth in the list of loftiest buildings in the world. It was erected by Ernst G. Sonnin between 1750 and 1762, **on the site of the older building of the 17th century destroyed by lightning; and it not only surpasses all the other churches of Hamburg in size, being 229 feet long and 179 feet broad,** but produces a fine effect by the colossal proportions of its **four principal pillars. St Peter's church, originally consecrated in 1352, fell a prey to the great conflagration, but** it was rebuilt by Chateauneuf in 1844–1849. The ring **on the door of the tower (which dates from 1342) is considered the oldest artistic relic in Hamburg; and the** granite columns of the old cathedral, the stained glass **windows by Kellner of Nuremberg, and Schubert's Entombment** of Christ are worthy of notice. St Catharine's and St James's are the only churches of Hamburg **that have been preserved from the Middle Ages, but otherwise neither is of special interest. Of the other churches it is sufficient to mention St George's, built in 1743, St** Paul's in the suburb of that name, the lesser St Michael's **occupied by the Roman Catholics since 1824, and the English Episcopal church dating from 1838. The new** synagogue was built by Rosengarten between 1857 and 1859, **and to the same architect is due the sepulchral** chapel of John Henry Schroder in the churchyard of St **Peter's. The beautiful Gertrude's chapel was unfortunately destroyed in 1842.**

Though Hamburg has comparatively few secular buildings that are of high architectural interest, its list of public institutions is one of which any city might be proud, and several of these are accommodated in spacious structures not unworthy of their destination. The exchange is one of the most important. It was erected on the site of the Mary Magdalen convent in 1836–41, and escaped the catastrophe of 1842. At the business hours between 1 and 3 o'clock as many as from 3000 to 5000 merchants and brokers congregate within its walls. The commercial library in the new wing added in 1873 has upwards of 40,000 vols. In the same neighbourhood are the Hamburg bank and the site of the old rathhaus, which had to be blown up in the great fire. The town house, built by Gortz, minister of finance to Charles XII. of Sweden, was purchased by the town in 1722. The academic gymnasium, founded on 16th August 1610 as a preparatory school for the universities, has since 1873 surrendered its teaching functions, though it still maintains public lectures to which all have access, and is in more or less close connexion with the botanic gardens, the natural history museum, the observatory, the chemical laboratory, and the museum of *Culturgeschichte*. The present botanical gardens, which had been preceded by Veit Schamp's (1547–17[illegible]) and [illegible]'s ([illegible]–13), were laid out by Dr Lehmann on the glacis of the fortifications, and contain about 11 acres. The natural history museum was founded in 1843, and in 1875 the sum of 1,[illegible] marks from the Hamburg share of the French indemnity was assigned for the purpose of supplying better accommodation for its extensive collections, amongst which may be mentioned that from Heligoland and that of [illegible] from South Africa. The observatory, dating from about 1826–18[illegible], was at first a private institution. It possesses a great equatorial telescope made by Repsold & Steinheil [illegible], the object glass of which has an aperture of 9.6 Paris inches and a focal distance of only 9.6 feet; and among the contributions to science are Helmert's observations on the constellation of Sobieski's Shield (1874), and the determination of all the stars down to 9.5 magnitude in the zone between 80° and 81° of N. declination. In connexion with the observatory a time-ball on the tower of the [illegible] is caused to drop at 12 o'clock of Greenwich time; there is a similar **ball at Cuxhaven, and another at Bremerhaven. The chemical laboratory was built in 1841. It was not till 1866 that the ethnographical** collections were put under special curators; and the name *Culturgeschichtliche Museum* only dates from 1872. The principal medical institution in the city is the college of surgeons, founded in 1771 as a general school for doctors and midwives; it received its present constitution in 1833, and was furnished with new buildings in 1861. It was not till 1867, however, that the guild of barbers, with its right of surgical practice, was abolished. The medical union established by H. de Chaufepié about 1815–1816 has published several periodical works, and possesses a library of 12,000 vols. A mathematical society was founded by Heinrich Meissner as early as 1690, the Hamburg-Altona Society for natural science dates from 1837, the Hamburg-Altona branch of the German Anthropological Society from 1870, and the Hamburg branch of the German and Austrian Alpine Club from 1875. A geographical society, which publishes a journal, was founded in 1873; and the firm of Godeffroy, which trades so extensively in the Pacific, has instituted a museum, and sent out scientific explorers and collectors,—Dr E. Graffe, Amalie Dietrich, Johann Kubary, Andrew Garrett, Franz Hubner, &c.,—the results of whose labours are registered in the *Journal des Museum Godeffroy* (1871, &c.). Zoological gardens were founded in 1860–1 by a joint-stock company, and an aquarium has since been added under the superintendence of Alfred Lloyd of the Sydenham **Crystal Palace. Two of the old monasteries of the town—the St** Johanniskloster and the St Maria Magdalenenkloster are still maintained as foundations for the daughters and widows of Hamburg citizens, and the former has funds beyond its requirements. The general infirmary (*allgemeine Krankenhaus*) dates originally from 1606, but the present building was erected in 1823–27, and has since received several additions. The annual number of patients increased between 1825 and 1875 from 2895 to 8266. The subvention from the state rose in the same period from £[illegible] to £[illegible], and the average daily cost of each patient from 9d. to 1s. 9d. A lunatic asylum (Friedrichsberg) was founded in 1841 at Barmbeck at a cost of £[illegible] for the site and £[illegible] for the buildings. Its patients numbered [illegible] in 18[illegible]5 and 492 in 1875. Among minor establishments of a similar class are the sailors' infirmary ([illegible]), the St Mary's hospital founded by the Roman Catholic community on the outbreak of the Danish war in 1864, but open to patients of every creed, the infirmary of the German Jews built by Salomon Heine in 1840, the infirmary of the freemasons, the children's hospital dating from 1846–7, the polyclinicum of the patriotic association for the assistance of women (1872), the deaf and dumb institution ([illegible]), and the blind asylum ([illegible]). The orphanage, originated in [illegible] by [illegible] Grove and Simon von Petkum, admits about 64 children every year. In the beginning of July the orphans, in their [illegible] dress, make a procession through the city and the suburb of St George, and the day, known as the [illegible], is considered a popular holiday. In the suburban village of Horn is the famous Rauhe Haus, and at Alsterdorf there is a home founded in 18[illegible] for idiots and children suffering from incurable disease. It had 2[illegible] inmates in 1875. The workhouse, which dates from the beginning of the 17th century, has been situated since [illegible] in the village of Barmbeck, and since 18[illegible] has had a branch establishment at Fuhlsbüttel. In 1875 it had 1342 inmates, and its revenues were £17,3[illegible]2, besides a state subvention of £[illegible],4[illegible]. The annual cost per head is £14, 15s. About 2[illegible] free dwellings and a number of pensions are provided by the Schroder foundation for respectable families and individuals in reduced circumstances.

Hamburg is well supplied with places of amusements, especially of the more popular kind. Its town theatre, rebuilt in 1874, has room for 1750 spectators; the Thalia theatre dates from 1841, and contains 1700 to 1800; and there are some 7 or 8 minor establishments. Theatrical performances were introduced into the city in the 17th century, and 1678 is the date of the first opera, which was played in a house in the Gansemarkt. Under Schroder and Lessing the Hamburg stage rose into importance.[1] Though contributing few names of the highest rank to German literature, the city has been intimately associated with the literary movement. Lappenberg and Hagedorn were born in Hamburg; and not only Lessing, but Heine and Klopstock lived there for some time. In Schroder and Klose's *Lexicon der Hamburgischen Schriftsteller* there are no fewer than [illegible] names up to S[illegible]; and the library of the society for the encouragement of art and science contains 5000 volumes dealing with Hamburg affairs.

The inhabitants of Hamburg used formerly to have no small variety of distinctive costumes; **but it is only the** [illegible] from the villages that preserve the more picturesque peculiarities.[2]

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[1] See [illegible] 18[illegible].

[2] [illegible] (Hamb. 1843-47). [illegible] March 1783 and 1784 [illegible]

The oldest water-works of Hamburg were those of the Oberdamm, [illegible] 1531; the first of the modern system with steam [illegible] the [illegible] Elbwasserkunst, opened in 1822. In 1849 the new waterworks belonging to the state were set in operation, and they have since [illegible]ated and systematized the older waterworks. In 1876 they had 5 steam-engines with 840 horse-power, and [illegible] cubic feet of water at a cost of about 5d. per [illegible] feet. It was not till after the fire of 1842 that Hamburg [illegible] proper drainage; but it now possesses an extensive and [illegible] system of sewers. In 1843 the upper Old Town, the New Town, and St George's were supplied, and in 1846 the lower Old Town; and [illegible] 1871 and 1875 the system was extended to the [illegible] districts of [illegible] and [illegible]. In [illegible] the total length of sewers was 5[illegible]6 feet, which had cost [illegible]. The [illegible] sewers, of which [illegible] 10 [illegible], have a [illegible] feet, and can be traversed by boats; the second class [illegible] have a diameter of 7 feet, and the third [illegible] of [illegible] feet. The mouths of the sewers are protected by [illegible], which prevent the flooding of the lower districts by the [illegible] water from the river.

The [illegible] of Hamburg in its new [illegible] is a very modern creation. At first the city was at some distance from the main branch of the Elbe, and the mouth of the Alster served as its port; but gradually, owing to natural changes in the bed of the great river, and [illegible] of the inhabitants,—such as the cutting of the [illegible] through the Grasbrook ([illegible]), the [illegible] (1579), and the [illegible],—the principal current was directed into its present course. To trace the history of the [illegible] devoted to the rectification of the stream and the [illegible] of shipping accommodation would be a long and [illegible] task. Suffice it to say that up to the middle of the present century the vessels in the harbour of Hamburg used to anchor in the open stream and fasten themselves to piles called "[illegible] of Alva," and the goods were taken ashore in lighters; but since the [illegible] of the railway it has been found necessary to build quays with hydraulic cranes and other modern appliances. For this purpose the [illegible] Grasbrook was first of all selected. A portion of the Sandthor [illegible] quay was opened in 1872, and by 1876 the [illegible] quay and the Dalmann quay (so named after the [illegible]) were available. The total length of the three quays was [illegible] feet, and the area of ground covered in by the auxiliary buildings [illegible], of [illegible] acres. Since that date the quays have been [illegible] so that they now extend a distance of about 3 [illegible] Altona eastwards. The number of ships which took advantage of the quays in 1866-67 was 665, with a burthen of [illegible] tons; by 1875 they had increased to 1425 ships with [illegible] tons, and by 1878 to 1[illegible], with 1,151,962 tons.

Hamburg is essentially a commercial city, and though within recent years greatly developed, its manufacturing industries are in [illegible]; but only in comparison, for, according to the [illegible] returns of 1875, no fewer than 4931 persons were engaged in metallurgy, 5[illegible] in the manufacture of machinery, instruments, and [illegible], [illegible] in chemical works, 1[illegible]9 in the preparation of heating and lighting materials, 1464 in textile industries, 2687 in the paper and leather manufactures, and 9[illegible] in the wood industries. Shipbuilding is carried on pretty extensively, the greatest establishment in the department, the Reiherstieg or Godeffroy's yards, which was [illegible] about 1849, employing on an average 700 workmen. There are several enormous distilleries, and two establishments for the manufacture of artificial manures from the phosphates of guano, each of which employs from 200 to 300 workmen; as well as [illegible], sugar-refineries, rice-mills, and factories for the preparation of [illegible], sulphuric acid, and other chemical products. The curing of beef and pork forms a large trade. Pianofortes and cigars, [illegible] carriages and artificial flowers, sewing-machines and [illegible] are all manufactured in the town, and tile-works and glass-works [illegible] in the neighbourhood.

In the extent of its commerce Hamburg ranks among European ports immediately after London, Liverpool, and Glasgow. Its imports and exports are more than those of the whole of Holland, of Belgium, or of Spain. From the year 1836, in which it possessed 146 ships, with a total burthen of 25,722, its marine had increased 770 per cent. by 1877.[1] In 1875 it had 433 sea-vessels with 219,567 tons burthen; in 1876 it had 470 with 219,698 tons, and in 1877 463 with 222,919. Of the last number 264 were copper-plated, 6 were zinc-plated, and 147 were built of iron. The steam vessels were 102. The principal line of steamers is that of the Hamburg-American Company, which on 1st January 1876 had 21 first-class British-built vessels, with a total burthen of 60,8[illegible]0 tons. Its voyages are mainly made to New York and the West Indies. On an average of the three years 1874, 1875, and 1876 it carried 31,[illegible]0 passengers and 1[illegible] cubic yards of goods. The Hamburg and South American Company at the same time had six vessels, with a burthen of 8000 tons, trading with Brazil and the river Plate. The German Steamship Company had 8 vessels with a burthen of 6,850 tons trading with China and the Far East; and the Kosmos Company had 7 ships with a burthen of 10,897 tons trading with Chili and Peru. The Sloman or Mediterranean line of six vessels with a burthen of 5276 tons keeps up monthly communication with ports of Spain and Italy.

From the following table a general view of the movement of the port will be obtained. It is to be observed that the increase shown is not so much in the number of the ships as in their average capacity.

	Ships Entered.	Register Tons.	Ships Cleared.	Register-Tons.
1865	5186	1,221,403	5186	1,216,499
1866	5185	1,3[illegible]673	5210	1,[illegible]2,563
1867	[illegible]	1,451,082	5071	1,454,563
1868	5[illegible]7	1,[illegible]	5287	1,[illegible]844
1869	5192	1,603,812	5201	1,[illegible]916
1870	4114	1,[illegible]	4101	1,[illegible]179
1871	5439	1,[illegible]105	5457	1,886,784
1872	5613	2,[illegible]43	5572	2,025,472
1873	5570	1,882,[illegible]	5563	1,9[illegible]040
1874	5225	2,[illegible]102	5249	2,160,193
1875	5260	[illegible]	5209	2,0[illegible]4,748
1876	[illegible]	[illegible]	5481	2,247,129
1877	5673	[illegible]	5489	2,243,500

The average consequently for the years 1866-1875 was—ships entered 5[illegible], tonnage 1,735,242; ships cleared, 5202, tonnage 1,7[illegible]9,978.

The following table shows the imports (in centners of 110 lb) into Hamburg in 1878, first from non-European, and secondly from European countries:—

	Non-European.	European.
Coffee	[illegible]	4[illegible]
Tea	1[illegible]	55,100
Sugar	117,4[illegible]	1[illegible]
Tobacco	274,490	1[illegible]
Rice	72[illegible]	[illegible]
[illegible]	611,820	169,650
[illegible]	[illegible]0	16,990
Herrings	5,250	8[illegible]
Dye-woods	574,170	40,540
Saltpetre	1,074,510	12,030
Copper and silver	52,760	6,070
Guano	1,697,870	95,550
Petroleum	[illegible]	36,770
Train oil	13,500	141,043
Palm oil	75,3[illegible]0	41,550
Cocoa-nut oil	5,920	38,420
Palm-nuts	165,260	57,[illegible]0
Cotton	87,460	782,[illegible]
Cotton wool	...	807,[illegible]0
Raw and bar iron	...	2,415,310
[illegible]	...	31,1[illegible]0
Sulphur	...	106,[illegible]
Coal	...	17,224,[illegible]0
Miscellaneous	2,009,250	8,895,8[illegible]
Total	9,918,250	31,731,[illegible]3

Hamburg is an important outlet of emigration, no fewer than 870,000 persons having left Germany by its vessels between 1836 and 1874, or on an average 30,000 every year. In 1874 the number was 42,952; in 1875, 31,787; in 1876, 28,733; in 1877, 22,143; and in 1878, 24,803.

The monetary transactions of Hamburg have long been maintained on a very extensive scale. As early as 1619 the great Hamburg giro bank was founded on the model of that of Amsterdam, and, in spite of the blow struck by the French in 1813, it continued to flourish till in 1876 it was replaced by a chief office of the German Imperial Bank, which includes in its domain the provinces of Schleswig-Holstein-Lauenburg, the three Hanseatic towns, and the two grand-duchies of Mecklenburg. In 1876 there were, besides, the North German Bank (1856) with a capital of £2,250,000; the Union Bank (1856), with £1,500,000 capital; the Commercial Bank (1870), with £1,500,000; the International Bank (1870), with £750,000; the Anglo-German Bank (1870), with £1,050,000; the Hypothec Bank (1871), with £375,000; the Exchange (Wechsler) Bank (1872), with £187,500; the Brokers' Bank (1871), with £150,000; the Industrial Bank (1871), with £150,000; the St Paul's Credit Bank, with £[illegible]50,000; and the People's Bank (1860). The Imperial Office in 1876 had a total turnover of £336,693,920; and in 1875 the North German Bank had 438 millions, the Union Bank 270 millions and the Commercial 170 millions. There are also 7 savings banks, the total deposits in which rose from £846,070 in 1866 to £1,615,626 in 1874. Few departments are of more extensive development than the marine insurance. In the ten years 1834-43 the average value insured was £17,534,487, at an average premium of 1·50 per cent.; in the corresponding period 1844-53 it was £24,026,991 at 1·58 per cent.; and in the next period, 1854-63, it reached £45,571,543.

The following table shows the figures from 1864 to 1877:—

		Per cent.
1864	£47,112,492	1·35
1865	49,829,617	1·29
1866	50,141,966	1·24
1867	50,377,151	1·25
1868	56,136,088	1·26
1869	59,192,244	1·16
1870	63,445,570	1·12
1871	£81,926,839	0·90
1872	102,816,762	0·93
1873	90,1[illegible]8,1[illegible]5	1·01
1874	86,184,290	1·05
1875	88,817,942	1·11
1876	91,724,790	1·11
1877	112,083,625	1·06

It is only within recent years that Hamburg has obtained a fair amount of railway communication. The proposal made about 1840 to construct a line from Hamburg to Lubeck was frustrated by the opposition of the king of Denmark, who feared it would injure the trade between his two towns of Altona and Kiel, which soon afterwards (in 1844) he united by rail. The people of Hamburg were forced to content themselves with a line to Bergedorf (1842), but this was afterwards extended to Schwerin and Berlin, and a branch line was constructed to Lubeck. The Hamburg-Lubeck direct line was opened in 1865, and in the following year a line was constructed between Altona and Hamburg. Direct communication with Paris by way of Harburg, Bremen, Osnabruck, and Venloo was obtained only in 1872. Though as early as 1862 a scheme was set on foot for such a line, the projectors could not come to terms with the Hanoverian Government, which objected to the duchy of Oldenburg obtaining a share in the advantages of the scheme, and wished to keep to itself the whole authority over the bridges on the Elbe while leaving the cost of their construction wholly to Hamburg. In 1866 the Hanoverian Government was swept away by Prussia, and in 1867 the new rulers formed a treaty for the construction of the line. The two main branches of the Elbe, the north and the south, are crossed by two great bridges on the system named after Lohse, which had never before been employed in Germany. As the soil is unstable, the pillars had to be founded on a bed of concrete 17 or 18 feet thick resting on piles. The Hamburg or north bridge has three spans each 334 feet wide, and the Harburg bridge has four spans. The total weight of iron employed was 84,651 cwts. (36,152 for the one and 48,499 for the other). For internal locomotion the city has a system of tramway lines which run out to Wandsbeck and other neighbouring villages, and a still more extensive omnibus system. Small steamers plying on the Outer Alster give easy access to the places along its shores.

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[1] In 1865 it reached the exceptionally high figures, 630 ships of 179,665 tons burthen.

In 1811 the population of Hamburg (*Stadt* and *Vorstadt*) was 106,983; in 1834 it was 145,418; and by 1861 it had reached 196,214. Its subsequent increase is shown in the following table:—

	1866.	1867.	1871.	1875.	Increase 1866-75	Per cent
Inner town and harbour	158,306	161,772	[illegible]	171,568	13,262	8·4
St Georg Suburb	30,371	31,423	[illegible]	43,911	13,540	44·6
St Pauli Suburb	29,135	31,775	41,921	49,206	20,071	68·8
	217,812	224,970	239,107	264,685	46,873	21·5

If we include in our survey the suburban hamlets or *Vororte*, and Altona, Ottensen, and Wandsbeck, we find that there were clustered together 458,585 persons. In 1871 the proportion of males to females in the whole Hamburg territory was 100 to 105, and in 1875 it was 100 to 103. The number of females in proportion to the males is much greater among the native than among the immigrant part of the population; and the proportion of natives to immigrants is a steadily decreasing one,—76 per cent. in 1867, 68 per cent. in 1871, and 65 in 1875. Most of the strangers are from the neighbouring parts of Germany: 43,523 in 1871 were from Holstein, 30,945 from Hanover, and 15,686 from Mecklenburg-Schwerin. The following table shows the occupations of the people in 1871:—

	Males.	Females.	Total.
Agriculture	7,483	7,292	14,775
Industries	68,878	64,792	133,670
Trade and commerce	48,701	51,589	100,290
Giving personal service	19,816	18,756	38,572
Other callings	10,110	11,566	21,676
Without calling	8,119	17,113	25,232
Not returned	419	1,200	1,619

The number of marriages, partly in consequence of the changes in the marriage laws, is rapidly increasing (8·29 to every thousand inhabitants in 1861, and 12·26 to every thousand in 1875), and a similar increase is observable in the births.

The death rate varied from [illegible] to [illegible] per thousand per annum from 1872 to 1875. Consumption and acute diseases of the respiratory organs are the most prevalent causes of death. Between 1831 and 1873 there were 14 visitations of cholera, by far the most violent being those of 1832 and 1848, which carried off respectively 1652 and 1765 of the population.

History.—Hamburg, or, as the older documents have it, Hammaburg, appears to have taken its rise as a frontier block-house or castle on the Slavonic borders of Germany, which in the 9th century lay thus far to the west. The block-house, which may have been preceded by some indigenous settlement, was founded by Charlemagne's direct orders; and he was just on the point of making the newly erected church the seat of a bishopric when he died in 814. His design was ultimately carried out by his son Louis the Pious in 831, and three years later a charter was issued at Aix la Chapelle and confirmed by Gregory IV raising the bishopric to the rank of an archbishopric, which was to have not only the surrounding [illegible] country, but Iceland, Greenland, and the whole of the [illegible]. Ansgar, the first occupant of the see, founded a monastery and a school, but in 837 (or 840 according to other [illegible]) [illegible] the Norman pirates, [illegible] [illegible] of the archbishopric [illegible] in 847 it was decreed at a synod of Mainz under the presidency of Hrabanus Maurus that Hamburg should be attached to the bishopric of Bremen, and the seat of the archbishop be in the latter city. The title of archbishop of Hamburg remained in use till 1223, though that of archbishop of Bremen appears as early as the 12th century. All through the 10th century Hamburg continued to suffer from the inroads of the Danes and the Slavonians, and the latter indeed were in possession from 983 to 987. In spite of all the settlement advanced: Archbishop Alebrand built a cathedral in 1037, Archbishop Adalbert not long after a castle; and the havoc wrought by Jarl Knako of Denmark in 1072 was promptly repaired. In 1110 the counts of Schauenburg got possession of Holstein and Hamburg, an event which bore in many ways fruit for the town's welfare. In return for a contribution to a crusade, Adolf III. obtained for the town from the emperor Frederick I. in 1189 the right of a separate court and jurisdiction, freedom from toll to the mouth of the Elbe, and right of fishing in the river. Merchants from Flanders now began to visit the place, and its importance as a commercial centre was increased by the destruction of the flourishing town of Bardowiek in 1189 by Henry the Lion. After passing under the lordship of Waldemar of Schleswig (1201) and Albert of Orlamunde (1216), it was recovered by the Schauenburg counts, who erected a strong castle over against it (1231). The alliance with Lubeck, commenced in 1241, and consummated by the treaty of 1255, practically laid the basis of the great Hanseatic League, of which Hamburg continued to be one of the principal members. While its foreign relations were thus improved, its internal organization was also rendered more stable by the new constitution of 1270, and the recognition of the municipal autonomy of the counts of Schauenburg in 1292. The domain of the city was increased in the 14th century by the purchase of Eppendorf, Ritzebuttel, &c.; in the 15th the Frisian pirates who had harassed the merchants at the mouth of the Elbe were completely defeated. The claims of the Danish crown to the homage of the city were rejected, and the imperial diet of 1510 under Maximilian I. declared that it was a city of the empire. Not long after two great changes took place. By the so-called "Long Recess" of 1529 the Reformation was introduced, and disagreements with Lubeck set the city free to follow her own path of progress. Through the troubles of the Thirty Years' War Hamburg escaped almost unscathed; but it suffered from the effects of its own bigoted Lutheranism, which drove many of its dissentient religionists to become the founders of the neighbouring Altona. In 1603 it received a code of exchange, and in 1615 the first imperial post. Its population was not long after increased and its commerce quickened by a number of the Jews who had been expelled from Spain and Portugal. The course of the 17th century was marked by discord and strife between the senate and the lower classes, which ultimately brought about the interference of the empire and the publication of the "Great Recess" of 1712. Though the courts of the empire had decided in 1618 against the claims of the Danish crown, and had confirmed this decision in 1630 and 1643, Christian V. of Denmark made another attempt to take Hamburg by threat of arms; but he accepted a ransom of 280,000 rixdollars, and at length in 1768 by the treaty of Gottorp the Danish crown renounced all its claims, and in 1770 the delegates of the city took their place in the "Rhenish bench" of the imperial diet. From the Seven Years' War and the war of American independence the commerce of Hamburg drew new life but it suffered terribly during the years of the French ascendency. The town was not only obliged in 1803 to pay 2,125,000 francs to the Hanoverian estates, but in 1806 it had to admit a French garrison within its walls, and to feel the effects of the British blockade of the Elbe. In 1810 indeed it had the honour of being incorporated in the French empire as the chief town of the department of the "Mouths of the Elbe," but the retreat of the French commandant Carra Saint-Cyr on 12th March 1813, and the subsequent entrance of the Russian Tettenborn on the 18th, were welcomed by the citizens with joy. But their joy was premature, for by the 30th of May the enemy was again in possession. Davoust, the new general, not only demanded a contribution of 48,000,000 francs, but confiscated the 7,500,000 marks banco (of about 1s. 6d.) at that time in the bank, forced the inhabitants to work at the new fortifications, and drove 20,000 or 30,000 of them out of the city amid the cold of winter. In spite of the attacks of the Russians under Benningsen, Davoust maintained his position till the close of the war. The whole loss of the city from 1806 to 1814 is estimated at £10,000,000 sterling. In 1815 Hamburg became an independent state of the German federation, and formed with Lubeck, Bremen, and Frankfort the union of the free cities. Its trade rapidly revived, and when in 1842 the great fire destroyed 4219 buildings and rendered nearly 20,000 persons homeless, its credit was sufficient to secure a loan of 34 million marks banco. The old oligarchical constitution had been restored after the recovery of independence; and the internal history of the town from 1815 till [illegible] is mainly a protracted contest between the conservative and innovative parties. The year 1848 was remarkable for a great commercial [illegible] and for the meeting in the town of the commission of the [illegible] of the Elbe, and of the delegates appointed by the [illegible] German states to consider maritime law. By the new constitution of 1861 industrial freedom was introduced, possession of land granted to strangers, the conditions of settlement greatly modified, and various improvements made in the taxation and duties. At the outbreak of the contest between Prussia and Austria in 1866, Hamburg sided with the former, and in May 1867 it voted 133 to 1 for the constitution of the North German Confederation. It was allowed to remain a free port, but has to pay an aversum to the Zollverein.

See [illegible] *Hamburgische Geschichte*, published since 1841 by the local historical society; [illegible]

HAMELN, the chief town of a circle in the province of Hanover, Prussia, is situated at the confluence of the Weser and Hamel, and at the junction of four railways, 25 miles S.W. of Hanover. It is surrounded by old walls, and possesses a number of old-fashioned houses with quaint richly-adorned gables. The only public buildings of interest are the minster church, restored in 1872, and the town-house. Hameln is the seat of several courts and public offices, and possesses a gymnasium, a higher city school, a higher female school, a trade school, a poorhouse, two hospitals, and a district prison. The principal industries are the manufacture of woollen and cotton goods and machines, distilling, agriculture, and salmon fishing. By the steamboats on the Weser there is communication with Karlshafen and Minden. In order to avoid the dangerous part of the river near the town a channel was cut in 1734, the repairing and deepening of which, begun in 1868, was completed in 1873. The Weser at Hameln is crossed by an iron suspension bridge 830 feet in length, supported by a pier erected on an island in the middle of the river. The population of Hameln in 1875 was 9519.

The older name of Hameln was Hamelha or Hamelowe, and the town owes its origin to an abbey of St Boniface. It existed as a town as early as the 11th century, and in 1259 it was sold by the abbot of Fulda to the bishop of Minden, but this transaction gave offence to the inhabitants, and after a battle in which many of them lost their lives, they placed themselves under the protection of the house of Brunswick. During the Thirty Years' War Hameln was conquered by the Swedes (1633). In 1757 it capitulated to the French, who, however, vacated it in the following year. Its fortifications were strengthened in 1766 by the erection of Fort George, but they were wholly dismantled in 1807. Hameln is famed as the scene of the story of the piper of Hameln. According to the legend, the town in the year 1284 was so infested by rats as almost to compel the inhabitants to leave it, when one day there appeared upon the scene a piper clad in a fantastic suit, who offered for a certain sum of money to charm all the vermin into the Weser by his piping. His conditions were agreed to, but after he had fulfilled his promise the inhabitants, on the ground that he was a sorcerer, declined to fulfil their part of the bargain, whereupon on the 26th of June he reappeared in the streets of the town, and putting his pipe to his lips began a soft and quaint strain, which drew all the children to come trooping after him while he led them out of the town to the Koppenberg hill, in whose side a door suddenly opened, by which he entered and the children after him, all but one who was lame and could not follow fast enough to reach the door before it shut again and disappeared for ever. Some trace the origin of the legend to the "Children's Crusade," or to an [illegible] of children. For a considerable time the town dated its public documents from the event. The story is the subject of a poem by Robert Browning, and also of one by Julius Wolff, [illegible], Berlin, 1876.

See Baring Gould, *Curious Myths of the Middle Ages*, 2d ser., 1868; Grimm, [illegible] edition of Sprenger's *Geschichte der Stadt Hameln*, Hameln, 1861.

HAMI, the Chinese name of a town in Central Asia, otherwise called KAMIL, KOMUL, or KAMUL, situated on the southern slopes of the Tian Shan mountains, and on the northern verge of the Great Gobi desert, in 42° 46′ lat. and 93° 25′ E. long., at a height above sea-level of 3150 feet. The town is first mentioned in Chinese history in the 1st century, under the name I-wu-lu, and said to be situated 1000 lis north of the fortress Yu-men-kuan, and to be the key to the western countries. This evidently referred to its advantageous position, lying as it did in a fertile tract, at the point of convergence of two main routes running north and south of the Tian Shan and connecting China with the west. It was taken by the Chinese in 73 A.D. from the Hiung-nu (the ancient inhabitants of Mongolia), and made a military station. It next fell into the hands of the Uigurs or Eastern Turks, who made it one of their chief towns and held it for several centuries, and whose descendants are said to live there now. From the 7th to the 11th century I-wu-lu is said to have borne the name of Igu or I-chu, under the former of which names it is spoken of by the Chinese pilgrim Hwen-Thsang, who passed through it in the 7th century. The name Hami is first met in the Chinese *Yuen shi* or "History of the Mongol Dynasty," but the name more generally used there is Hami-li or Komi-li. Marco Polo, describing it apparently from hearsay, calls it Camul, and speaks of it as a fruitful place inhabited by a Buddhist people of idolatrous and wanton habits. It was visited in 1341 by John de Marignolli, who baptized a number of both sexes there, and by the envoys of Shah Rukh (1420), who found a magnificent mosque and a convent of dervishes, in juxtaposition with a fine Buddhist temple. Hadji Mahomet (Ramusio's friend) speaks of Kamul as being in his time (circa 1550), the first Mahometan city met with in travelling from China. When Benedict Goes travelled through the country at the beginning of the 17th century, the power of the king Mahomet Khan of Kashgar extended over nearly the whole country at the base of the Tian Shan to the Chinese frontier, including Kamil. It fell under the sway of the Chinese in 1720, was lost to them in 1865 during the great Mahometan rebellion, and the trade route through it was consequently closed, but was regained in 1873. Owing to its commanding position on the principal route to the west, and its exceptional fertility, it has very frequently changed hands in the wars between China and her western neighbours. As regards the latter quality, it is even now said to yield rice, melons, oranges, and grapes of notable excellence, while, with respect to the former, Baron F. Von Richthofen (probably the highest authority) states that the route from Hsi-ngan-fu past Hami to Kuldja, is by far the best and indeed the only natural line for a railway from China to Europe. The Russian officer Sosnofski, our latest authority respecting Hami, entered it in the autumn of 1875 after eight days' journey across the Gobi steppe lying to the south. He speaks of it as an important mart, whither wool from Turfan and Turkistan goods are brought to be exchanged for the products of Central China. The Mahometan population consists of immigrants from Jitishahr (or Kashgaria), Bokhara, and Samarcand, and of descendants of the Uigurs.

HAMILCAR BARCA, the most illustrious of all the Carthaginian generals and statesmen, next to his son, the great Hannibal. The surname Barca is the same as the Hebrew *Barak*, and signifies "lightning." It was in the eighteenth year of the First Punic War, 247 B.C., that Hamilcar first greatly distinguished himself. He had been known before as a young officer of promise who had made raids on the southern coasts of Italy in the neighbourhood of Locri and Cumæ. Suddenly he appeared with a squadron off the north-west of Sicily, and seized a strong position on Mount Ercte, now known as Mount Pellegrino, near Palermo. He had but a small force of mercenaries, which his military genius soon made into a well-disciplined body of troops. For three years he maintained himself on Mount Ercte, during which time the Romans were in possession of the whole of Sicily with the exception of the two strongholds of Drepanum and Lilybæum, and these they were blockading. They tried their utmost to drive Hamilcar from his position, but in vain. At last he quitted his stronghold, and in 244 B.C. landed at Mount Eryx, on the western coast, now Mount S. Giuliano, 2 miles from the shore and about 6 from Drepanum. A famous temple of Venus crowned the summit, and half-way up the slope was the city, which itself had the name of Eryx. This Hamilcar seized and occupied. His object was to compel the Romans to give up the blockade of Drepanum and Lilybæum. They could not drive him out of the town, and for two more years he held his position, keeping open his communications by sea with the Carthaginian garrison of Drepanum. Hamilcar's chief difficulty was with his mercenaries, who were little better than savages and without an idea of loyalty or good faith. Yet he continued to hold them well in hand. It was a harassing and monotonous warfare, so much so that Polybius, here our chief authority, compares it to a boxing match between two skilful pugilists, the blows in which are delivered in such rapid succession that a spectator could hardly see, much less describe them. The Romans, feeling it necessary to make a supreme effort, in 242 B.C. equipped a fleet, under the command of the consul Lutatius Catulus, and despatched it to the western shores of Sicily. The battle off the Ægates followed, and the Roman victory decided the First Punic War in 241 B.C. Peace had now to be concluded. The cession of Sicily to the Romans was a matter of course. But though Hamilcar had to surrender the island, he refused to comply with the Roman demand that his army should pass under the yoke. The demand was not persisted in, and Hamilcar and his men were allowed to embark from Lilybæum for Africa.

No sooner had peace been concluded than there broke out the so-called African or Libyan War. It was a most formidable mutiny or insurrection. Hamilcar's mercenaries on their return looked for the pay which he had promised them, but had not been able to furnish while he was cooped in within his lines on Mount Eryx. The stupidity of the home Government soon caused trouble. The peace party at Carthage, headed by Hanno, who hated Hamilcar, was foolish enough to raise a dispute about the pay of the troops. The result was a furious mutiny, which Hanno, who was sent to quiet them, could not appease. The men to the number of 20,000 began to march on Carthage itself, and encamped near Tunis. The mutineers were led by Spendius, a fugitive slave from Campania, and by Mutho, an African who had served with distinction under Hamilcar in Sicily. These two men incited all the neighbouring tribes to rise against the dominion of Carthage. Carthage itself was soon cut off from all communication with the interior. Hanno was called to take the command, but it was only to meet with defeat and disaster. The rebels surprised and captured his camp. The Government was now thoroughly frightened, and begged Hamilcar to save them from the consequences of their own folly. With a force of only 10,000 men he had to face what must now have grown into a very formidable host. It would seem that his personal influence led many of the rebels to return to his standard, and he was also skilful enough to secure the friendship and aid of the Numidian sheiks. One especially, Naravas, helped him very materially; and with his assistance he was able to achieve a decisive victory over the mutineers. At last he so effectually hemmed in Spendius within his camp near Tunis that the rebel leader was obliged to throw himself on his mercy. With nine of his brother leaders he sought an interview with Hamilcar. Hamilcar's demand was the surrender of ten of the rebels, whom he was to name himself. This being agreed, he seized Spendius and his nine companions, a proceeding which the mutineers furiously resented. But they were soon surrounded and cut off to a man, to the number, it is said, of 40,000. The war, which had lasted three years and four months, was now over in the year 238 B.C.

One would have supposed that Hamilcar would be at once recognized as the right man to direct the future policy of the state. But it was not so. Hanno's party, the peace party, was as shortsighted as ever, and actually dared to say that Hamilcar had been the cause of the late war by having made promises which he was not able to fulfil. But by this folly they injured and weakened themselves. The patriotic party, the "Barcine faction," as it was called by its opponents, prevailed so far as to raise their leader to a position answering as nearly as possible to a dictatorship among the Romans. Hamilcar was made commander-in-chief of the Carthaginian army in Africa, and invested with a power which could be taken from him only by the popular assembly. He was still a young man, under thirty years of age. For a short time he employed himself in overawing the Numidian tribes bordering on Carthaginian territory, but his main object was to form the nucleus of an efficient army out of his Libyan mercenaries. Meanwhile he was maturing a great plan which soon afterwards on his own responsibility he carried into execution. Spain was a country the coasts of which at least were well known to the Carthaginians. Spaniards too had served among Hamilcar's troops. To Spain he decided to go; there, he felt sure, he could find material for an army and abundant means of providing pay. He had now three sons, the "lion's brood," as he called them, Hannibal, Hasdrubal, Mago. Wishing with all his heart that they should be like minded with himself, he made the eldest, Hannibal, then a little boy of nine, swear on the altar of the supreme Carthaginian deity eternal hatred and enmity to Rome. This was just before he left Carthage, probably in the spring of 236 B.C. Suddenly there came tidings to the home Government that their commander-in-chief was, without their orders, carrying on war in Spain. He had, however, done his work so thoroughly in Africa that the troublesome Numidian tribes were now submissive to Carthage, and for the most part paid tribute. He never returned. The last eight years of his life he devoted to the great work of reducing Spain to a Carthaginian province. He penetrated into the interior of the country, subduing some of the tribes by force of arms and drawing others into friendly relations by negotiation. It was not to mere conquest that he aspired; he did his best to win the good-will of the Spaniards and to attach them to Carthage. Spain was to be a compensation to Carthage for the loss of Sicily and Sardinia. But, above all, its possession was to be subordinate to Hamilcar's great design of some day renewing the war with Rome. For this he would have felt himself prepared when, in addition to his Numidian cavalry, he had organized a force of Spanish infantry. Had his life been prolonged, he would doubtless, as Livy says (xxi. 2), have invaded Italy at the head of a Carthaginian army. What he accomplished in Spain so much impressed the elder Cato, who less than half a century afterwards saw the traces of his work, that he declared that there was no king like Hamilcar Barca. In the prime of his years he fell in battle in 228 B.C., fighting, it would seem, somewhere between the Tagus and the Douro. Spain was now left in the hands of his son-in-law Hasdrubal. (W. J. B.)

HAMILTON, a municipal and parliamentary borough and market town of Scotland, county of Lanark, is situated about a mile from the junction of the Avon with the Clyde and 10 miles S.E. of Glasgow. It occupies a rising ground commanding fine views of a rich and highly picturesque country, and consists of several streets of well-built houses somewhat irregularly dispersed, and surrounded by a number of villas belonging chiefly to persons engaged in business in Glasgow. The principal buildings are the town hall, the county buildings in the Grecian style of architecture, the academy, the St John's grammar school, and the infantry barracks. Among the subjects of antiquarian interest are Queenzie Neuk, the spot where Queen Mary rested on her journey to Langside; the old steeple and pillory built in the reign of Charles I.; the Moat Hill, the old Runic cross, and the carved gateway in the palace park. In the churchyard there is a monument, with four heads in basso rilievo, to four covenanters who suffered at Edinburgh, December 7, 1666, their heads being interred below. Among the industries of the town are weaving and the tambouring of muslin; and there are also large market gardens, the district being famed especially for its apples; but the prosperity of the town depends chiefly upon the coal and ironstone which are extensively worked in the neighbourhood. Hamilton originated in the 15th century under the protecting influence of the lords of Hamilton. It unites with Airdrie, Falkirk, Lanark, and Linlithgow to form the Falkirk district of boroughs, which returns one member to parliament. The population in 1871 was 11,498.

Immediately east of the town is Hamilton palace, the seat of the duke of Hamilton and Brandon, premier peer of Scotland. The present palace was commenced in 1822. Its front is a specimen of the enriched Corinthian architecture, with a projecting pillared portico after the style of the temple of Jupiter Stator at Rome, 264 feet in length and 60 feet in height. The interior is richly decorated and contains one of the most valuable collections of paintings in Scotland. Within the grounds, which comprise nearly 1500 acres, is the mausoleum erected by the tenth duke, a structure resembling in general design that of the emperor Hadrian at Rome, being a circular building springing from a square basement, and enclosing a decorated octagonal chapel. About 2 miles south-east of Hamilton, on the summit of a precipitous rock 200 feet in height, the foot of which is washed by the Avon, stand the ruins of Cadzow Castle, the original seat of the Hamilton family, conferred on the chief of that family immediately after the battle of Bannockburn, having been previously a royal residence for at least two centuries. The castle has been made the subject of a spirited ballad by Sir Walter Scott. Near it is the noble chase with its ancient oaks, the remains of the Caledonian Forest, where are still preserved some of the old Scotch breed of wild cattle. Opposite Cadzow Castle on the other side of the Avon is Chatelherault, consisting of stables and offices, and imitating in outline the palace of that name in France. A magnificent double avenue stretches between it and Hamilton palace.

HAMILTON, a city of Canada, the chief town in the county of Wentworth, province of Ontario, is advantageously situated on the south side of Burlington Bay, a large and beautiful basin of water connected with Lake Ontario by a short canal, which forms one of the safest and most commodious harbours on the lake. It is also connected with the town of Dundas by the Desjardins Canal, about 4 miles in length. Hamilton holds an important position at the head of the navigation on Lake Ontario, and in the centre of one of the finest agricultural districts of the Dominion. It is the headquarters of the Great Western Railroad, and is connected by other lines of railway with Lake Erie, Lake Huron, and the Georgian Bay. The site on which it is built rises gradually from the bay to the foot of a lofty bluff called "The Mountain," the summit of which commands an extensive and beautiful view. The streets are well laid out, and planted with shade trees, and the houses and public buildings are substantially constructed of stone and brick. The court house and county buildings, recently completed, are the finest in Canada. Among the other public buildings are the provincial lunatic asylum, the Anglican and Roman Catholic cathedrals, and handsome places of worship of other denominations, the collegiate institute, the Wesleyan female college, the mechanics' institute, the banks, the city hospital, and other charitable institutions. The city water-works, by means of which a constant supply of pure water is brought from Lake Ontario, have been completed on a scale amply providing for the future growth of the city, at a cost of about $1,000,000. The industries include iron rolling mills, iron foundries, the manufacture of agricultural implements, sewing machines, musical instruments, carriages, glass, pottery, &c., tobacco manufacture, and brushmaking. The total value of imports at the port of Hamilton for the fiscal year 1878-9 was $3,992,123; and the duty collected amounted to $839,153. The total tonnage entered at the port was 160,666 tons; but this is exclusive of a much larger amount of goods brought by railway, including foreign importations, on which the duty has already been paid at Quebec or Montreal, and of which therefore no entry is made. Daily lines of steamers run in the summer months between Hamilton, Toronto, Kingston, and Montreal; and an extensive trade is carried on with the maritime provinces. Hamilton was founded in 1813, and incorporated in 1833. The population in 1836 was 2846; in 1851, 10,248; in 1861, 19,096; in 1871, 26,716; and in 1879 it is estimated at 35,000. It is the seat of the Anglican bishop of Niagara, and of a Roman Catholic bishop. It returns one member to the provincial parliament of Ontario, and two members to the Dominion parliament, or House of Commons.

HAMILTON, a township and post village of Madison county, New York, U.S., is situated on the Chenango canal, and on the Utica branch of the New York and Oswego Midland Railway, 30 miles S.W. of Utica. The village is the seat of Madison university, chartered in 1846, in connexion with which there are a theological seminary of the Baptist denomination opened in 1820, and a preparatory academy opened in 1832 under the name of Colgate Academy, and chartered in 1853 as the grammar school of the university. The university has 10 professors, has both a scientific and a classical course, and is attended by upwards of 100 students. The other educational institutions are a female seminary and a union graded school. The village possesses a foundry, a tannery, and manufactories of sashes and blinds, doors, waggons, cigars, and cheese. The population of the village in 1870 was 1529, and of the township 3687.

HAMILTON, a city of the United States, capital of Butler county, Ohio, is situated on both sides of the Great Miami river, on the Miami and Erie canal, and at the junction of several railways, 23 miles N. of Cincinnati. The water-power for manufacturing purposes is obtained by an hydraulic canal which secures a fall of 30 feet; and the situation of the city in the heart of the Miami valley, a rich agricultural district, is very favourable to the development of commercial enterprise. It possesses two public parks, twelve churches, two national banks, a complete graded system of public schools, an orphans' home, and a free library. Its industries are of a varied kind, and are represented by paper and woollen factories, flour-mills, foundries, breweries, distilleries, bleaching works, machine shops, and manufactories of carriages and waggons, reaping machines, ploughs, and other agricultural implements, sashes and blinds, railroad supplies, and machinery. Hamilton received a municipal charter in 1853, at which time the portion on the west side of the river formerly called Rossville was incorporated with it. The population, which in 1860 was 7223, and in 1870 11,081, of whom 3062 were foreigners, was estimated in 1879 at 17,000.

HAMILTON, the principal town in the western district of Victoria, Australia, is situated on the Grange Burne Creek, in 37° 45′ S. lat. and 142° 1′ E. long. It was proclaimed a borough in 1859, the area of the municipality being 5280 acres. It has several elegant buildings—a hospital and benevolent asylum, a town-hall, a treasury and land office, and a public library. Its educational institutions include the Hamilton and western district college, the academy, and the Alexandra college for ladies, besides a state school with accommodation for 500 pupils. It possesses a fine race course covering 120 acres, and pastoral and agricultural exhibitions are held annually, the surrounding district being chiefly devoted to sheep-farming. The population of the town and suburbs on the 1st January 1879 was estimated at 4400. The railway from Melbourne to Portland passes through the town.

ALEXANDER HAMILTON

ALEXANDER HAMILTON was a native of the Island of Nevis, in the British West Indies. He was born Jan. 11, 1757. On his father's side he was connected with the great clan of the Scotch Hamiltons, famous in Scottish history. Hamilton's mother was of French extraction, and was directly descended from one of those noble old Huguenots, who, after the infamous revocation of the Edict of Nantes by Louis XIV. in 1685, had deserted his native land rather than betray his religion, and had sought a home on one of the western isles. The mother of Hamilton, whose maiden name was Faucette, was a woman of rare beauty and intelligence. Her first marriage had been to a man by the name of Levine, a Dane, but the union proving uncongenial, she sought and obtained a divorce, and afterward married James Hamilton, the father of Alexander. While the boy was very young, his mother died and he was left to the care of relatives, who educated him at Vera Cruz. His father failed in business, and remained impoverished till the time of his death in 1799. Hamilton's schooling did not continue long, but he secured some valuable educational help from a Presbyterian clergyman named Knox. In 1769 he had to relinquish his studies and enter the counting house of Nicholas Cruger at Vera Cruz. Here, when only 14, he was intrusted with the entire care of the establishment during Mr. Cruger's absence in the United States. In 1772 a fierce tornado swept the West Indies. A description of the hurricane and of its consequences appeared in the public journal of the Island of St. Christopher, by an anonymous writer. In this event originated the future greatness and celebrity of Hamilton. When it was discovered that a lad so young, so small, so friendless as Hamilton had penned that powerful article, interest was at once awakened in him. Many friends arose around him who made arrangements to send him to America to complete his education. He began his studies in the United States at the grammar school of Elizabethtown, N. J. From six in the morning till twelve at night he was at his books. In a year he visited Dr. Witherspoon, President of Princeton, and made application to enter the college, stipulating that he should be allowed to advance from class to class, not by the years, but as rapidly as his attainments permitted. This was contrary to the laws of the institution, so he proceeded to New York and entered Columbia college. At the early age of 17, while in Columbia college, he took his place prominently among American orators and patriots.

Resistance to the increasing tyranny of the British crown had already begun. On July 6, 1774, a great assembly of the people was held in the suburbs of the city of New York, determined to take decisive steps against the unjust duty of tax laid on tea. It was on this interesting occasion that Alexander Hamilton, then 17 years of age, ventured to come forward and address the people. His vigor of thought, clearness and precision of language, his force of reasoning, eloquence and pathos, his persuasive power, as well as the singular appropriateness of his delivery, commanded the most intense admiration. "This," says Samuel Schmucker, "gave him throughout New York, the name of the eloquent collegian." In 1774 he began his literary career, and won his second wreath of laurels. Dr. Cooper, President of King's or Columbia college, Dr. Ingles, Dr. Chandler, Dr. Wilkins and Dr. Seabury were on the side of the crown; while Governor Livingston, John Jay and Mr. Hamilton put forth anonymous articles of superior worth and conclusiveness on behalf of the people. The great ability displayed in these several pamphlets, their calm, sagacious spirit, and the conviction which they carried to every impartial mind, attracted universal attention. The authorship of all of these articles was at first attributed to John Jay and Livingston, which goes to show the maturity of Hamilton's mind. The announcement of the fact that Hamilton was one of the authors gave him his second honorable title, "Vindicator of the Congress."

The outbreak of the American war for independence attracted the attention of the whole civilized world. Washington had been chosen commander-in-chief of all the armies of the United Colonies, by the Continental Congress, and in January, 1776, he called a council of war, and a general assault on the British troops about Boston was decided upon. At the same time Hamilton joined an artillery company, and in a few weeks was raised to the rank of "Captain of the New Provincial Company of Artillery." He was at the battle of Brooklyn Heights, and covered the rear in the retreat of Harlem. While superintending the erection of earthworks at that place he met his commander-in-chief, which was the beginning of that faithful friendship between these remarkable men that continued unabated through so many dark years of uncertainty and vicissitude, and through the brighter ones of triumph and splendor which happily succeeded.

On March 1, 1777, Hamilton was justly rewarded for his military services at White Plains and Princeton by his appointment as aide de camp and private secretary to Washington, with the rank of lieutenant colonel. Such was the confidence Washington had in this youth of 21 years. In this position he assisted in arranging campaigns, increasing the support of the army and confirming the unity of the confederacy. Troup says of Hamilton at this time: "That the way he held the pen of our army and General Washington's correspondence is unrivaled in military annals." In the gloomy and wintry scenes of Valley Forge, Hamilton was sent by General Washington to General Gates to induce him to order a considerable detachment of his troops, then at Albany to the main army.

For Hamilton's services at Monmouth, Washington inserted a high eulogium upon him in his report to Congress, which was afterwards expunged at Hamilton's own request. The young *aide de camp* enjoyed the respect and friendship of the officers of the army. Among his intimate friends were Baron Steuben, Lafayette, Henry, La Luzerne and Du Portail.

In 1780 the American conflict had resolved itself chiefly into a rivalry in financial ability and resources between the mother country and the colonies. Under such circumstances the active and patriotic mind of Hamilton became engaged upon the elaboration of such financial schemes as he supposed would relieve the distress of the country and furnish new munitions of war. He wrote an anonymous letter in which he proposed the plan to establish an American bank, to be chartered by Congress for ten years and to be called the Bank of the United States. The basis of this institution was to be a foreign loan at £2,000,000 as a portion of the bank's stock; a subscription for $200,000,000 more, guaranteed by $10,000,000 of specie, or by a [illegible] equivalent currency. The bank notes were to be made payable to the bearer in three months at ten per cent. An annual loan of £10,000,000 was to be furnished to Congress by the bank at 4 per cent. When the authorship of this scheme became known, Hamilton received his third title, that of "Founder of the Public Credit of the United States." These letters, addressed mainly to Robert Morris, were not without their effect. A bank, founded on private contributions [illegible]

000 was organized. Soon after, Congress established, with little variation from Hamilton's plans, the executive departments in the federal government. Hamilton was moved by a generous sympathy for Andre, when he heard of his arrest, and exerted his utmost efforts to discover some legal and honorable means to save him. When all proved unavailing he wrote and published the facts in the case in a letter to his friend Laurens, which reflects equal credit both upon his great mind and the womanly tenderness of his heart. In 1780, while yet the most sagacious of American patriots were content to dwell on present crises, the superior intellect of Hamilton was already traveling forward to the future, and brooding over those great national measures which would become essential to the establishment of the national unity, harmony and prosperity. In a letter to the distinguished patriot, James Duane, he discussed in a masterly manner the nature and history of republican governments and the confederacy of states. He describes the proposed distribution of the executive departments, the officers of the Federal government; how to proportion taxes, collect them; and how a national bank might be established, which would prove a permanent source of individual and national wealth. In 1780 Colonel Hamilton was selected by Washington and Lafayette as an envoy extraordinary to France, to procure more extensive and efficient aid, but he declined in favor of his friend, Mr. Laurens, who was going abroad. Hamilton, however, drew up for him the letter of instructions, a difficult task, which was executed with his usual ability.

December 14, 1780, Hamilton was united in marriage with Miss Elizabeth Schuyler, the second daughter of the revolutionary soldier, General Philip Schuyler. This event took place at Albany, in the 24th year of Hamilton's life. They lived together for twenty four years, when the bloody hand of one who has not inappropriately been called his assassin ended a career of unsurpassed usefulness and honor, by a violent death. Shortly after his marriage, Hamilton withdrew from the personal service of Washington on account of a slight rupture between these two friends. In April, 1781 in another letter to Robert Morris, Hamilton boldly asserts the principle that "*it is in a national bank alone, we can find the ingredients to constitute a wholesome, solid and beneficial paper credit.*" The plans suggested by Mr. Hamilton were submitted by Mr. Morris to Congress, and adopted on the 26th of May, 1781. In order to secure a convention of states, Hamilton devoted himself to the composition of a series of elaborate essays, under the title of the "*Continentalists.*" They were the foreshadowing of those articles of unrivaled power which afterward appeared in the *Federalist*, under the name of "Publius." In 1781, Hamilton received a separate command in the army of the United Colonies, and led a gallant charge at Yorktown, where the war for independence was terminated. He then returned to his wife in Albany toward the close of the year 1781, and began the study of law.

The legislature of New York elected Hamilton a representative in Congress, July 22, 1782. He now moved in a sphere signally adapted to his great abilities and was able to incorporate his broad and lofty ideas into that masterpiece of modern statesmanship, the Federal Constitution. He took his seat in Congress on the 25th of November, 1782, of which Elias Budinot was president. Thirty members composed the body, which held its session in Philadelphia. Madison, Lee, Elsworth, Clymer, Witherspoon and Sullivan were among the number. At this period Hamilton proposed a resolution in Congress which was honorable both to himself and to its subject. He moved, and it was carried, that "the commander-in-chief be informed that Congress would be always happy to receive his sentiments on political and military affairs of these states, the utility of which they have on so many occasions experienced."

Hamilton acquired in a day what an ordinary student could scarcely compass in a week. It will not be surprising therefore to learn that he prepared himself for admission to the bar in the short period of four months, and was licensed as an attorney at the end of that time. Aaron Burr, Hamilton's great and unscrupulous antagonist, is perhaps the only other instance of such rapid admission to the bar. At the time of his preparation for the law, Robert Morris, as a mark of his esteem and confidence, offered Hamilton the responsible office of receiver of the continental taxes in the state of New York. Through Hamilton's exertions the legislature of New York revised and established a system for raising such a fund within the state as should best suit its purposes and those of the United States; and a system for the more effectual collection of taxes. On the same day of the passage of these resolutions Hamilton was the chairman of the committee on peace arrangements between the states and the mother country, and in this position he reported regarding the department of foreign affairs. The report provided that the secretary of that department should occupy the position of chief of the diplomatic corps, and that it should be his duty to lay before Congress such plans for conducting the political and commercial intercourse of the United States with foreign powers as might appear to him to be best adapted to promote their interests. After the adjournment of Congress, Hamilton retired in October, 1783, to Albany. Thus at the age of 26 he had been the leading spirit of the great American Continental Congress. In November, 1783, he removed to New York and entered upon a large and lucrative practice in the legal profession. Yet he found time while engaged in his professional pursuits to direct his attention to the financial interests of his own state.

The operation of the Bank of North America proving unsatisfactory, the establishment of a Bank of New York was proposed. The plans were submitted to Hamilton, and he drew up a constitution for it, which was adopted. Half a million dollars were subscribed at a single meeting, and he was chosen one of its directors. In Hamilton's relation to negro slavery, which at that early period in American history had not attracted a great degree of attention, a single instance is recorded in the life of Hamilton where he came personally in contact with the subject. In a letter to a friend he says: "I find in one of your Gazettes an association against the slavery of negroes, which seems to be worded in such a way as to give no offense to moderate men in the southern states. As I have ever been partial to my brethren of that color, I wish, if you are in the society, you would move in your own name for my being admitted on the list."

Hamilton took a prominent part in the establishment of the celebrated Society of the Cincinnati. Its membership was composed, not only of the American officers then living, of all grades, but was extended to the eldest male posterity. On this account it incurred violent popular prejudice, as seemingly intended to create a race of hereditary patricians. Jefferson and Adams denounced the association, but Hamilton delivered an oration in which he strongly upheld it, recommending a few minor changes, and a distinction to be made between honorary and regular members. The society remains to this day an honorable memento of the most glorious era of American history, and her medals bear the maxim *Omnia reliquit servare republicam;* Esto perpetua. Happily for the fame of Hamilton at that time, the project for the establishment of the Society of the Cincinnati did not originate with him, but, according to Marshall, with Gen. Knox.

In 1787 he was again in the legislature of New York, taking a prominent part in the discussion which arose in regard to excluding from seats in the legislature all persons who were either pensioners or officers of the federal government, earnestly advocating such exclusion. He devised a plan to build up a great system of public instruction upon comprehensive principles, to incorporate that system into the public policy of the state, and to render it by use an indispensable want of the community. He proposed an institution for public instruction under the form and title of a university, to be known as the "University of the State of New York," and to his energy and enlightened patriotism the city of New York is indebted for the establishment of several of the most useful academies throughout the state.

Hamilton now reached the point, in his remarkable career, where he performed his most important service to his country and erected a monument to his own fame more honorable and more permanent than fell to the lot of any other American patriot, save Washington alone: the formation and adoption of the Federal Constitution which now unites, governs and protects the Union. The state had been governed by the Articles of Confederation which no longer furnished a solid foundation for the establishment and perpetuity of the government. As delegates to the convention, to draw up a new constitution Chief Justice Yates, Hamilton and Lansing were sent from New York state. Two parties existed in the convention. Hamilton, the federalist, at the head of one Madison, the radical or democrat, at the head of the other. Neither party seemed able to harmonize with the other. While discussions on the plan which Edmund Randolph, of Virginia, were going on, Hamilton drew up an elaborate plan of ten articles. This Federal Constitution, drawn up by Alexander Hamilton, as finally adopted and recommended by the convention, secured the approbation of all the states, and went into operation on the first Wednesday in March, 1789. With great truth the profound statesman, Guizot, declares that, "Hamilton must be classed among the men who have best known the vital principles and fundamental conditions of a government . . . There is not in the Constitution of the United States an element of order, of force, or of duration, which he has not powerfully contributed to introduce into it and to give it a predominance."

On the 6th of April 1789, George Washington was *unanimously* elected president of the United States. He at once appointed Hamilton to fill the most important post at that time in the cabinet, the office of secretary of the treasury.

On the 13th of December, 1790 Hamilton submitted to Congress his views in reference to the establishment of a national bank, and from the moment of their incorporation and the formation of the Bank of the United States, parties assumed their perfect forms and principles, and an irreconcilable rupture occurred between Mr Jefferson and Mr. Hamilton.

The *Federalist* is in reality the production of Hamilton. It is the American classic in political science. The first publication began in the daily journals in November, 1787, and it continued till June, 1788. Mr Hamilton retired from office after 20 years of public service, during which he had accumulated nothing of a fortune, and again took up the practice of law. Burr and Hamilton were political opponents, and when the former was candidate for governor of the state of New York in 1804, he was defeated through the efforts of Hamilton. This so irritated Burr that he sought and found an excuse for a quarrel, which resulted in a duel on Wednesday, July 11th, 1804, at Weehawken, New Jersey. Hamilton declined to fire at his adversary, but was mortally wounded by Burr's first shot and died the following day. His remains were buried in New York city.

The premature death of Hamilton was a national calamity. The chief qualities of the mind of Alexander Hamilton were a clear and vigorous reasoning faculty, and a chaste and prolific imagination. In the discussion of any subject he seized hold of the main points with the vigor of an intellectual giant, and handled them skilfully, gracefully and with ease. His essays, pamphlets and reports are masterpieces, each perfect, symmetrical and finished in itself. The eloquence of Hamilton was a model of perfection, whether it was displayed in a deliberative assembly, in the courts of justice or in the halls of the academy. He was possessed of a retentive memory and clear discrimination, and was gifted with indomitable industry. His integrity and honesty were unimpeachable. As a soldier Hamilton was eminently brave, chivalrous and prudent. The personal appearance of Mr Hamilton was pleasing and attractive. He was under the middle size, thin in person, and very erect, courtly and dignified in his bearing. His hair was combed back from his forehead, powdered and collected in a cue behind. His complexion was very delicate and fair, and his cheeks rosy. His whole expression was pleasing and cheerful. His forehead was high, capacious and prominent. His voice was musical, his manner frank and impulsive. His appearance and carriage betokened a man of great intellect and one fully conscious of his powers.

See *Ingersoll on Hamilton*; *Hamilton* in "*The Statesman's Series*"; *Life* by John Church Hamilton; *Life*, by Morse; Bancroft's *History of the United States*, 7th Vol.; Shea's *Life and Epoch of Hamilton*; Schmucker's *Life of Alexander Hamilton*; Ruthmuller's *Hamilton and His Contemporaries*, Curtis' *History of the Constitution of the United States*. (E. C. H.)

HAMILTON, Anthony or Antoine (1646–1720), a French classical author, who is especially noteworthy from the fact that, though by birth he was a foreigner, his literary characteristics are more decidedly French than those of many of the most indubitable Frenchmen. His father was George Hamilton, younger brother of James, second earl of Abercorn and head of the family of Hamilton in the peerage of Scotland, and sixth duke of Châtelherault in the peerage of France; and his mother was Mary Butler, sister of the duke of Ormonde. He was born in 1646, but the place of his birth has not been ascertained. According to some authorities it was Drogheda, but according to the London edition of his works in 1811 it was Roscrea in Tipperary county. From the age of four till he was fourteen the boy was brought up in France, whither his family had removed after the execution of Charles I. The fact that, like his father, he was a Roman Catholic, prevented his receiving the political promotion he might otherwise have expected on the Restoration, but he became a distinguished member of that brilliant band of courtiers whose most fitting portraiture was destined to be the product of his pen. His connexion with France was always maintained, and the marriage of his sister to the Comte de Gramont rendered it more intimate if possible than before. On the accession of James he found his religious disabilities transformed into advantages. He obtained an infantry regiment in Ireland, and was appointed governor of Limerick. But the battle of the Boyne, at which he was present, brought disaster on all who were attached to the cause of the Stewarts, and before long he was again in France—an exile, but at home. The rest of his life was spent for the most part in the châteaux of his friends. With the duchess Ludovise of Maine he became an especial favourite, and it was at her seat at Sceaux that he wrote the *Mémoires* that made him famous. The ill advised expedition of 1708 was the last political enterprise in which he shared, and he died at St Germain-en-Laye, August 6, 1720.

It is mainly, as has already been indicated, by the *Mémoires du Comte de Grammont* that Hamilton takes rank with the most classical writers of France. The work was first published anonymously in 1713 under the rubric of Cologne, but it was really printed in Holland, at that time the great patroness of all questionable authors. An English translation by Boyer appeared in 1714. Upwards of thirty editions have since appeared, the best of the French being Renouard's (1812) and Gustave Brunet's (1859), and the best of the English Edwards's (1793), with 78 engravings, and Malleville's (1811), with 64 portraits by Scriven and others. The original edition was reprinted by Pifteau in 1876. In imitation and satiric parody of the romantic tales which Galland's translation of *The Thousand and One Nights* had brought into favour in France, Hamilton wrote *Le Bélier*, *Fleur d'Épine*, *Zeneyde*, and *Les Quatre Facardins*, which are characterized by the graceful ease of their style and the successful extravagance of their incidents. The first three tales appeared at Paris in 1730, ten years after the death of the author, and a collection of his *Œuvres Diverses* in 1731 contained the unfinished "Zéneyde." A collected edition of Hamilton's works was published in six volumes in 1749, and was reprinted in 1762, 1770, 1776, and 1777. A translation of Pope's *Essay on Criticism*, which procured the author a complimentary acknowledgment from the poet, is still in MSS., with the exception of a fragment printed in the 1812 edition of the works. In the name of his niece, the countess of Stafford, Hamilton maintained a witty correspondence with Lady Mary Wortley Montagu. See Notices of Hamilton in the 1862 edition of his works; and in Lescure's edition of the *Contes*, Sainte-Beuve's *Causeries du Lundi* (tom. i.), and Sayous's *Histoire de la littérature française à l'étranger*, 1853.

HAMILTON, Elizabeth (1758–1816), novelist and miscellaneous writer, was born at Belfast, of Scotch extraction, 25th July 1758. Her father's death in 1759 left his wife so embarrassed that Elizabeth was adopted in 1762 by her paternal aunt, Mrs Marshall, who lived in Scotland, near Stirling. There Elizabeth spent her youth and received a good education,—at first at school, afterwards in private, and latterly for some months under masters at Edinburgh and Glasgow. In her 15th year she made a tour in the Highlands with some friends, and wrote a journal of it for her aunt's perusal, which was inserted, unknown to the authoress, in a provincial magazine. In 1780 Mrs Marshall died, and Miss Hamilton was prevented by household cares from using her pen; but in 1785 she made her first voluntary contribution to the press in the shape of a letter to the *Lounger*, of which paper it forms the 46th number. On the death of Mr Marshall in 1788, Miss Hamilton lived for a time with her brother, Captain Charles Hamilton, who was engaged on his translation of the *Hedaya*. Prompted by her brother's associations, she produced her *Letters of a Hindoo Rajah* in 1796, and soon after, with her sister Mrs Blake, settled at Bath, where she published in 1800 the *Memoirs of Modern Philosophers*, a kind of satire on the admirers of the French Revolution. In 1801-2 the *Letters on Education* appeared, her most valuable though not her most popular work. After travelling though Wales and Scotland for nearly two years, the sisters took up their abode in 1803 at Edinburgh. In 1804 Mrs Hamilton, as she then preferred to be called, published her *Life of Agrippina, wife of Germanicus*; and in the same year she received a pension from Government. About this time she consented to take charge for six months of a widowed Scotch nobleman's family, and to his eldest daughter were addressed her *Letters on the Formation of Religious Principle*, published in 1806. Her next publication of importance, *The Cottagers of Glenburnie*, appeared in 1808. This work, to which the authoress owes most of her fame, is an admirable description of the failings of the Scotch peasantry in their home life, and, while graphic and telling, is "saved from caricature and absurdity." Sir Walter Scott describes it as "a picture of the rural habits of Scotland, of striking and impressive fidelity;" and Lord Jeffrey reviewed it very favourably in the *Edinburgh Review* (vol. xii.). Her subsequent works were a supplement to her *Letters on Education*, under the name of *Popular Essays on the Elementary Principles of the Human Mind* (1812), and *Hints addressed to the Patrons and Directors of Public Schools* (1815). She died at Harrogate, July 23, 1816.

Memoirs of Mrs Elizabeth Hamilton, by Miss Benger, were published in 1818. A notice of her literary life and labours, attributed to Miss Edgeworth, appeared in the *Monthly Magazine* for September 1816.

HAMILTON, James (1769–1831), the author of the Hamiltonian system of teaching languages, was born in 1769 and died October 31, 1831. The first part of his life was spent in mercantile pursuits. Having settled in Hamburg and become free of the city, he was anxious to become acquainted with German and accepted the tuition of a French emigré, General D'Angelis. In twelve lessons he found himself able to read an easy German book, his master having discarded the use of a grammar and translated to him short stories word for word into French. As a citizen of Hamburg Hamilton started a business in Paris, and during the peace of Amiens maintained a lucrative trade with England; but at the rupture of the treaty he was made a prisoner of war, and though the protection of Hamburg was enough to get the words *effacé de la liste des prisonniers de guerre* inscribed upon his passport, he was detained in custody till the close of hostilities. His business being thus ruined, he went in 1814 to America, intending to become a farmer and manufacturer of potash; but, changing his plan before he reached his "location," he started as a teacher in New York. Adopting his old tutor's method, he attained remarkable success in New York, Baltimore, Washington, Boston, Montreal, and Quebec. Returning to England in July 1823, he was equally fortunate in Manchester and elsewhere. His system attracted general attention, and was vigorously attacked and defended. In 1826 Sydney Smith devoted an article to its elucidation in the *Edinburgh Review*:—"We are strongly persuaded," he said, "that, the time being given, this system will make better scholars, and, the degree of scholarship being given, a much shorter time will be needed" than in the ordinary system. As text-books for his pupils Hamilton printed interlinear translations of the Gospel of John, of an *Epitome historiæ sacræ*, of Æsop's *Fables*, Eutropius, Aurelius Victor, Phædrus, &c., and many books were issued as Hamiltonian with which he had nothing personally to do. The two master principles of his method, which has left its traces on our modern linguistic discipline, are that the language is to be presented to the scholar as a living organism, and that its laws are to be learned from observation and not by rules.

See Hamilton's own account—*The Principles, Practice, and Results of the Hamiltonian System for the last Twelve Years*, Manchester, 1829; Alberte, *Ueber die Hamilton'sche Methode*; C. F. Wurm, *Hamilton und Jacotot*, 1831.

HAMILTON, Patrick (1504–1528), son of Sir Patrick Hamilton, well known in Scottish chivalry, and of Catherine Stewart, daughter of Alexander duke of Albany, second son of James II. of Scotland, was born in the diocese of Glasgow, probably at his father's estate at Stonehouse in Lanarkshire. Of his early boyhood and education nothing is known. In 1517 he was appointed titular abbot of Ferne, Ross-shire; and it was probably about the same year that he went to study at Paris, for his name is found in an ancient list of those who graduated there in 1520. It was doubtless during this period that he received the germs of the doctrines he was afterwards so nobly to uphold. From Ales we learn that Hamilton subsequently went to Louvain, attracted probably by the fame of Erasmus, who in 1521 had his headquarters there. Returning to Scotland, the young scholar naturally selected St Andrews, the capital of the church and of learning, as his residence. On the 9th June 1523 he became a member of the university of St Andrews, and on the 3d October 1524 he was admitted to its faculty of arts. There Hamilton attained such influence that he was permitted to conduct in the cathedral a musical mass of his own composition. But the Reformed doctrines had now obtained a firm hold on the young abbot, and he was eager to communicate them to his fellow-countrymen. Early in 1527 the archbishop Beatoun's attention was directed to the heretical preaching of the young priest, whereupon he ordered that Hamilton should be formally summoned and accused. Hamilton fled to Germany, first visiting Luther at Wittenberg, and afterwards enrolling himself as a student, under Francis Lambert of Avignon, in the new university of Marburg, opened May 30, 1527, by Philip, landgrave of Hesse. Frith and Tyndale were among those whom he met there. Late in the autumn of 1527 Hamilton returned to Scotland, bold in the truth of his principles. He went first to his brother's house at Kincavel, near Linlithgow, in which town he preached frequently, and soon afterwards he married a young lady of noble rank, whose name has not come down to us. Beatoun, avoiding open violence through fear of Hamilton's high connexions, invited him to a conference at St Andrews. The reformer resolutely accepted the invitation, and for nearly a month was permitted to preach freely. At length, however, he was summoned before a council of bishops and clergy presided over by the archbishop; and though he clearly and calmly answered all the written charges brought against him, his replies gave ground for new accusations of heresy. The council eagerly convicted him, and handed him over to the secular power. The sentence was carried out on the same day (February 29, 1528) lest he should be rescued by his friends, and he was burned at the stake as a heretic. His courageous bearing attracted more attention than ever to the doctrines for which he suffered, and greatly helped to spread the Reformation in Scotland.

Hamilton left a short treatise showing the antithesis between the law and the gospel. Frith's translation of it, under the name of "Patrick's Places," is to be found in Foxe's *Acts and Monuments*. *Patrick Hamilton, the first Preacher and Martyr of the Scottish Reformation*, by the Rev. Peter Lorimer, was published at Edinburgh in 1857.

HAMILTON, Robert (1743–1829), an able writer on political economy and finance, was born at Pilrig, Edinburgh, on the 11th June 1743. He was of good family, his grandfather, William Hamilton, professor of divinity and afterwards principal of Edinburgh University, having been a cadet of the family of Preston. He received an excellent education, and specially distinguished himself in the classes of mathematics at the university of Edinburgh, then under Professor Matthew Stewart. Although desirous of following a literary life, he was induced to enter the banking-house of Messrs Hogg in order to acquire a practical knowledge of business. In 1766 he was disappointed in his effort to obtain the mathematical chair at Aberdeen university, but three years later he gave up business pursuits and accepted the rectorship of Perth academy. In 1779 he was presented to the chair of natural philosophy at Aberdeen university. For many years, however, by private arrangement with his colleague Professor Copland, Hamilton taught the class of mathematics. In 1817 he was presented to the latter chair. For some years before his death in July 1829 he had retired from the active business of his chair, and quitted his privacy only at rare intervals to take part in important affairs concerning the college.

Hamilton's most important work is the *Essay on the National Debt*, which appeared in 1813 and was undoubtedly the first to expose the economic fallacies involved in Pitt's policy of a sinking fund. It is still of value. A posthumous volume published in 1830, *The Progress of Society*, is also of great ability, and is a very effective treatment of economical principles by tracing their natural origin and position in the development of social life. Some minor works of a practical character (*Introduction to Merchandise*, 1778; *Essays on War and Peace*, 1790) are now forgotten.

HAMILTON, THOMAS (1789–1842), the author of *Cyril Thornton*, was the younger brother of Professor Sir William Hamilton, Bart., and was born in 1789. In his early years he acquired a thorough mastery of the classics, and notwithstanding that he entered the artillery and was engaged in active service throughout the Peninsular and American campaigns, he continued to cultivate his literary tastes. On the conclusion of peace he withdrew, with the rank of captain, from active professional duties, and amused his leisure hours with the congenial pastime of literature. He was a frequent contributor to *Blackwood's Magazine* from its commencement, his papers manifesting great variety and versatility of talent, and embracing both prose and poetry. The most important and popular of his contributions to that periodical was the military novel *Cyril Thornton*, whose deficiency of plot is sufficiently compensated for by the interest of its details, its vivacity of movement, its truthful and clever delineation of character, and its easy, fresh, and graceful style. His *Annals of the Peninsular Campaign*, published originally in 1829, and republished in 1849 with additions by Frederick Hardman, though too condensed to leave room for graphic description, is written with great clearness and impartiality. His only other work, *Men and Manners in America*, published originally in 1832, is the result of much careful observation, and its criticisms, though frank and outspoken, and somewhat coloured by British prejudices, are always expressed with courtesy and good taste. He died at Pisa, December 7, 1842.

HAMILTON, SIR WILLIAM, BART. (1788–1856), one of the most eminent of Scottish metaphysicians, was born in Glasgow, on the 8th March 1788. His father, Dr William Hamilton, had in 1781, on the strong recommendation of the celebrated William Hunter, been appointed to succeed his father, Dr Thomas Hamilton, as professor of anatomy in the university of Glasgow, and when he died in 1790 in his thirty-second year, he had already gained a reputation that caused his early death to be widely and deeply regretted. William Hamilton and a younger brother (afterwards Captain Thomas Hamilton, noticed above) were thus brought up under the sole care of their mother, a woman, fortunately, of considerable ability and force of character. William received his early education in Scotland, except during two years which he spent in a private school near London, and went in 1807, as a Snell exhibitioner, to Balliol College, Oxford. There he pursued his studies zealously, though for the most part independently, devoting himself chiefly to Aristotle, but in other directions also laying the foundations of that wide and profound scholarship with which his name is associated. In November 1810 he took the degree of B.A. with first-class honours, after an examination so much above the usual standard in the number and difficulty of the works which it embraced that the memory of it was long preserved at Oxford. He had been intended for the medical profession, but, soon after leaving Oxford, gave up this idea, and in 1813 became a member of the Scottish bar. Henceforward Edinburgh was his place of residence, and, except on occasion of two short visits to Germany in 1817 and 1821, he never again quitted Scotland. Neither his ambition nor his success was such as to absorb his time in professional pursuits. His life was mainly that of a student; and the following years, marked by little of outward incident, were filled by researches of all kinds, through which he daily added to his stores of learning, while at the same time he was gradually forming his philosophic system. The outward and visible traces of these researches remain in his common-place books, especially in one which, having been in constant use, is a valuable record of his studies from this time onwards to the close of his life. He did not withdraw himself from society, but his favourite companions were the books of his own and of every library within his reach. Among these he lived in a sort of seclusion, from which only now and then, when stirred by some event of the world around, did he come forth, in vigorous pamphlets, to denounce, or protest, or remonstrate, as the case might be.

His own investigations enabled him to make good his claim to represent the ancient family of Hamilton of Preston, and in 1816 he took up the baronetcy, which had lain dormant since the death (in 1701) of Sir Robert Hamilton, well known in his day as a Covenanting leader.

In 1820 he was an unsuccessful candidate for the chair of moral philosophy in the university of Edinburgh. Soon afterwards he was appointed professor of civil history, and as such delivered several courses of lectures on the history of modern Europe and the history of literature. In 1829 his career of authorship began with the appearance of the well-known essay on the *Philosophy of the Unconditioned*,—the first of a series of articles contributed by him to the *Edinburgh Review*. He was elected in 1836 to the Edinburgh chair of logic and metaphysics, and from this time dates the influence which, during the next twenty years, he exerted over the thought of the younger generation in Scotland. Much about the same time he began the preparation of an annotated edition of Reid's works, intending to annex to it a number of dissertations. Before, however, this design had been carried out, he was struck with paralysis of the right side, which seriously crippled his bodily powers, though it left his mind wholly unimpaired. The edition of Reid appeared in 1846, but with only seven of the intended dissertations,—the last, too, unfinished. It was Sir William's distinct purpose to complete the work, but this purpose remained at his death unfulfilled, and all that could be done afterwards was to print such materials for the remainder, or such notes on the subjects to be discussed, as were found among his MSS. Considerably before this time he had formed his theory of logic, the leading principles of which were indicated in the prospectus of "an essay on a new analytic of logical forms" prefixed to his edition of Reid. But the elaboration of the scheme in its details and applications continued during the next few years to occupy much of his leisure. Out of this arose in 1847 a sharp controversy with the late Professor De Morgan of University College, London. The essay did not appear, but the results of the labour gone through are contained in the valuable appendices to his *Lectures on Logic*. Another occupation of these years was the preparation of extensive materials for a publication which he designed on the personal history, influence, and opinions of Luther. Here he advanced so far as to have planned and partly carried out the arrangement of the work, but it did not go farther, and still remains in MS. In 1852-53 appeared the first and second editions of his *Discussions in Philosophy, Literature, and Education*, a reprint, with large additions, of his contributions to the *Edinburgh Review*. Soon after, his general health began to fail. Still, however, aided now as ever by his courageous and devoted wife—he had married in 1829—he persevered in literary labour; and during 1854-55 he brought out nine volumes of a new edition of Stewart's works. The only remaining volume was to have contained a memoir of Mr Stewart from his pen; but this he did not live to write. He taught his class for the last time in the winter of 1855-56. Shortly after the close of the session he was taken ill, and on the 6th May 1856 he died at his house in Edinburgh.

Sir W. Hamilton's philosophy is presented in writings either more or less fragmentary in form and occasional in purpose, or else, in whole or in part, prepared for publication by others, not by himself. Hence, not only do some points receive what seems almost a superfluity of attention, while others of equal importance are treated with barely enough of detail, but there is no complete statement of the latest results of his thinking in their mutual relations. It may be that this imperfection of the outward form has tended to obscure the real harmony of his system, and in part led to its being pronounced—as it has too often been—an assemblage of contradictory doctrines. How far this is from being the case, and how closely the various parts are connected, becomes apparent when it is seen how they are all developed from the central conception of consciousness. In the following sketch that conception will be used as a point from which briefly to view the system as a whole, and to trace the bearing on one another of its leading doctrines.

Consciousness is regarded by Hamilton under three chief aspects:—(1) as it is in itself; (2) as realized under actual conditions; (3) as a source of truth.

1. Consciousness in itself is to Hamilton but another name for immediate or intuitive knowledge. For such knowledge is a relation between a subject (knowing) and an object (known), which, as it is viewed from the side of the one or the other term, is properly called consciousness or knowledge: there are two aspects, but the thing itself is one. Immediate knowledge or consciousness involves the existence of both subject and object,—it is the affirmation by the subject implicitly of its own existence, explicitly of that of the object. In this relation as realized in the primary judgment, that which knows is conceived as the ego or self,—that which is known, either as a mode of the ego or self, or as a mode of the non-ego or not-self. Thus we have, in the *terms* of the relation, a division of *existence* into the noumenon self and the contrasted phenomena of mind and of matter; while the *relation* itself yields a division of *knowledge* into philosophy, corresponding to its subjective, and science, corresponding to its objective, phase,—the latter being further subdivided into the sciences of mental and those of material phenomena.[1]

2. Hamilton adopted the division of mental phenomena (not as states but as elements) into the three groups or classes of *cognition*, *feeling*, and *conation*. Cognitions he classified according to the different relations between subject and object, calling these relations,—as subjective, powers or faculties,—as objective, forms or stages, of knowledge. Under these, cognition is either immediate or mediate, *i.e.*, either consciousness itself or the datum of consciousness. The first of the faculties, therefore, is of immediate knowledge,—the acquisitive or presentative power, which yields perception (external and internal). The second is of that form of mediate knowledge which is representative of an individual object. Here Hamilton distinguished three moments or phases, which he termed the retentive, the reproductive, and the representative powers,—distinguished them perhaps too widely, but at the same time indicated their essential unity. The third is of that form of mediate knowledge in which a number of objects receive a factitious unity from being thought under a common relation. This he named the elaborative or discursive faculty.[2] Here, where he had to deal with consciousness in the form of experience, realized under actual conditions and comprehending every variety of mental life, Hamilton showed, in the first place, how the mutual action and reaction of the several elements produces the complexity which the phenomena present. Reminiscence, imagination, and judgment are all aspects of which we are conscious, and which imply a prior immediate knowledge, contained in self-perception. But, on the other hand, our knowledge or perception even of self could not be what it is, did processes of reminiscence, imagination, and judgment not enter into its composition. Consciousness includes all the particular forms of knowledge; yet its development into a whole is the effect of the agencies which make up its content.[3] In the next place, he showed the laws of mental action in the conditions under which consciousness is exercised. From the variety and the limitation of consciousness, under the relation of time, arises the successive variation of its units,—in other words, the train of thought. By the limitation of consciousness is meant the limited number of objects to which it can at one time be directed, but this issues in a farther limitation, consisting in the disproportion between consciousness and the whole sum of mental modifications. Sir W. Hamilton held that consciousness is the mental modes or "movements, rising above a certain degree of intensity," and that "the movements beyond the conscious range are still properties—and effective properties—of the mental ego." This doctrine he used to explain not only the phenomena of ordinarily latent knowledge and of forgetfulness but also those of the abnormal recovery of apparently lost knowledge and of the formation of habits and dexterities.[4] The units (or rather groups of units) of the train—partly former thoughts again present, partly thoughts for the first time present to the mind—follow one another according to what Hamilton called the law of integration, *i.e.*, "only as they stand together as relative parts of the same common whole." Of this supreme law subordinate phases determine more special consecutions of thought. The reappearance of former thoughts (reminiscence voluntary or involuntary) is governed by the laws of (1) redintegration and (2) repetition. "Thoughts tend to suggest one another which are coidentical (1) in time or (2) in mode." New wholes of thought are framed by successive analyses and syntheses. Under the law of integration these analyses are effected by means of attention and abstraction, *i.e.*, by consciousness being continuously and repeatedly concentrated on certain parts or aspects of objects and withdrawn from others. The syntheses of thought are infinitely diverse in character, yet possess in common an invariable form. This process of forming new wholes, by discrimination and comparison, out of the materials supplied by perception and recollection, is the one kind of mental activity recognized by Hamilton in the various products of thought, from the simplest to the most complex. In other words, he regards judgment as the fundamental act of mind, the proposition, or expressed judgment, as its primary product.[5]

3. Hamilton's theory of consciousness in its third aspect, *i.e.*, as a source of principles, is embodied in his doctrines of *the conditioned* and of *common sense*. The former is so called because it professes to be a demonstration that "the conditionally limited (what we may briefly call the conditioned) is the only possible object of knowledge and of positive thought." The name of the latter was adopted by Hamilton, not as in itself a good one, but as sanctioned by the usage of philosophers in general and of Scottish philosophers in particular. The doctrine itself is that the primary data of consciousness are, as such, *i.e.*, as facts, and solely on the authority of consciousness, to be accepted as true. The two doctrines are complements of each other, as severally explications of the principle of the relativity of human knowledge, which, common to both, is manifested in the one through that which we cannot know,—in the other through the inexplicable character of our fundamental cognitions.

The primary data of consciousness Hamilton held to be of two orders, otherwise diverse, but in this the same, that they are known merely as facts. These are—(1) truths of perception—the conviction of the reality as modes of self of our own thoughts and feelings, and the allied conviction that in sense-perception we come into contact with a reality external to the mind; and (2) truths of reason—the fundamental laws of logic, the necessary forms of thought or relations of existence (*i.e.*, quality, and quantity in its threefold aspect as time, space, degree), the causal judgment, the principle of substance and phenomenon, &c.[6]

Now here it was Hamilton's peculiar contribution to philosophy that he placed the data of perception along with the data of thought, and affirmed that both classes alike are inexplicable, yet as facts clear; that both rest on the same authority; and that, if the one be accepted as true, so also should be the other. He was a realist, because he held realism to be the dictate of consciousness. Evidently here the ground of the view is of even more importance than the view itself, and so to Hamilton the question of realism *versus* idealism was momentous chiefly from its connexion with that of the authority of consciousness. He was fully aware that, since he claimed so high an authority for the primary data of consciousness, it was necessary to supply the means of deciding whether any given cognition is or is not entitled to be placed among such; and to this end he laid down certain criteria of alleged primary facts of consciousness. These criteria are (1) simplicity, (2) universality and (subjective) necessity, (3) comparative evidence and certainty, (4) incomprehensibility. In other words, no cognition is an original datum of consciousness which is not simple (*i.e.*, incapable of being resolved into another), not held by all men as a self-evident and necessary truth, and not in itself inexplicable. Now the doctrine of the immediate knowledge of the non-ego will, Hamilton affirmed, stand all these tests. It is the simple residuum of truth in the crude and erroneous beliefs of men as to what they perceive through their senses; it is the spontaneous conviction of all, as to this he cited as witnesses philosophers who regarded the belief as a mistake and a delusion; and it does not admit of being made comprehensible.[1] That this is so can hardly be denied. Practically, indeed, all acknowledge that consciousness does intuitively affirm what he alleges it to affirm; and, the question being one of fact, a practical acknowledgment is quite as good as a theoretical one.

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[1] *Reid's Works*, pp. 804-810, 878, 929 *sq*; *Lectures*, i. 193, 202-204, ii. 279; *Discussions*, pp. 47, 603.

[2] *Lectures*, i. 183-189, ii. 1-17.

[3] *Reid's Works*, 932; *Lects.*, i. 205, ii. 523.

[4] *Reid's Works*, 940, 942, 938; *Lects.*, i. 338-371, ii. 209-218.

[5] *Reid's Works*, 911-913; *Lects.*, i. 225-263, ii. 227-295, iii. 117-140, 275.

[6] *Reid's Works*, pp. xviii., 743.

Here let it be remarked in passing that Hamilton's doctrine of common sense is wholly misrepresented when held up as an appeal to the belief of the unthinking multitude versus the judgment of philosophers. Rather it carries the appeal into a sphere where the philosopher and the vulgar have ceased to be distinguished; it shows that not the mind of the philosopher, and not the mind of the vulgar, but the mind of man, is what philosophy has to deal with, and that its office is to resolve current beliefs into their elements, not satisfied till it has reached the final and absolutely pure deliverance of consciousness.

But it may be said, as it often has been said, that consciousness is not competent to affirm immediate knowledge of the non-ego, because to discriminate the non-ego from the ego is beyond its power. Hamilton's answer is that, if knowledge be, as he holds, essentially relative, self cannot be known except with and through not-self, and that natural realism is but a corollary of the general principle of the relativity of knowledge. On that principle he held that "we think one thing only as we think two things mutually and together," and that, self being inherently a relative notion, we should never interpret by it facts of our experience, if experience did not come before us under a relation that needs both terms (self and not-self) for its expression. Hamilton certainly implies, if he does not expressly say, that, had we no knowledge of a not-self, we could never objectify self so as to know it as such at all. To him a knowledge of the ego alone would be absolute, not relative—such a knowledge, that is, as he held to be impossible. But, viewing knowledge as a relation between an existing subject and an existing object, he saw no reason why the object should not *be* what it is *known as*—sometimes a mode of self, sometimes a mode of not-self,—and why consciousness of the ego should not include also that which stands in relation with it.[2]

But that there has been so amazing an amount of misconception on the point, it might seem hardly needful to say that Hamilton did *not* hold that in perception we know the thing-in-itself. His doctrine of relativity included phenomenalism, though it was more than phenomenalism; and not only his oft-repeated assertions that there can be no such object of knowledge, but the whole tenor of his philosophy, are directly against this interpretation. In passages where he speaks of "the thing" as directly known, the word is obviously used, not for noumenon or the thing in itself, but for the real as opposed to the ideal in phenomena. There can be no doubt that he held the object in sense-perception to be a phenomenon of the non-ego, and arguments that proceed upon a different supposition are of no effect against his theory.

The relativity of perception on that theory is, indeed, not open to doubt. According to him, we perceive phenomena alone,—such alone as we have faculties to apprehend,—such alone as stand in relation to our organs of sense; and we perceive only under the contrast of self and not-self. There is thus in every act of perception a twofold relation,—(1) between the thing and the organ, manifested in sensation being a condition of perception, and (2) between self and not-self, manifested in consciousness and perception being different aspects of the same thing. This of itself should show that he cannot be expected to state definitely what is the object in perception,—[illegible] that he does not do, or does differently in different passages. The object of intuition in perception does not [illegible]. External objects cannot [illegible] has risen above the [illegible]. On this, as on all points relating to perception, Hamilton's mature and carefully expressed view is to be found in his dissertations appended to Reid's works. There he divides the qualities of body into three classes,—primary, secundo-primary, and secondary qualities. He shows that sensation and perception proper, [illegible], are not only not proportional, but always in the inverse ratio of one another; that sensation proper is connected with the secondary qualities [illegible], and affords no knowledge of external reality; that in perception proper the [illegible] external reality, is perceived under those relations which constitute its extension, *i.e.*, we know its primary qualities; and that in sensation and perception together we know the secundo-primary qualities, *i.e.*, objects external to the body become known, as directly related, through various modes of resistance, to the organism in motion. The object in perception is, then, according to him, a primary quality of the organism, or the quasi-primary phase of a secundo-primary quality. It is a fundamental point of Hamilton's doctrine that the organism is differently related to the ego in perception proper and in sensation proper. In his own words—"the organism is the field of apprehension to both, but with this distinction, that the former views it as of the ego, the latter as of the non-ego,—that the one draws it within, the other shuts it out from, the sphere of self." On this distinction is partly founded his doctrine of the twofold character of space, as at once an *a priori* conception and an *a posteriori* perception. He held with Kant that space is a necessary condition of thought, and as such not derived from experience, but he at the same time held that through sense we have a perception of something extended, *i.e.*, of extension. Now the cognition of extension is a cognition of *relations*,—properly therefore realized by a simple energy of *thought*; but the facts that sensation is an essential condition of this cognition, and that what is known as extended is the *organism*, which is as much external to the ego as any other part of the material world, seemed to him to justify these relations being regarded not as subjective but as objective.[3]

Hamilton's doctrine of the conditioned relates to the second group of primary truths or original data of consciousness. Relativity, as a general condition of the thinkable, he asserts, is brought to bear under three principal and necessary relations:—the first (subjective) ***the contrast of self and not-self***, the second (objective) *quality*, and the third (objective) *quantity*. Quality is realized under the twofold aspect of substance and phenomenon. Quantity has three phases:—time (protensive), space (extensive), degree (intensive). Now the doctrine of the conditioned is (1) that under these relations—specially those of quality and time—we must think everything; (2) that the unconditioned as such is either the unconditionally limited—the absolute, or the unconditionally unlimited—the infinite; (3) that, under the necessary relations of thought, we are unable positively to conceive either unconditional limitation or unconditional illimitation; *e.g.*, an absolute whole or part of existence in time or in space or in degree is inconceivable, so is infinite increase or division; absolute quality is inconceivable, quality infinitely undetermined is so equally.[4] Thus this doctrine claims to demonstrate the limited range of positive thought, by showing that the mind is tossed from the one to the other of two contradictory extremes, unable to conceive either, yet compelled to believe that one or other is actual. The kind of inconceivability of the two extremes is indeed different, and it may be regretted that, in his expositions of this part of his philosophy, Hamilton did not more explicitly recognize that fact. It seems true that to combine the absolute with existence regarded quantitatively, *i.e.*, in time or in space or in degree, or the infinite with existence regarded qualitatively, is impossible, not only as beyond but as against thought, *i.e.*, as involving a contradiction; and therefore that, in respect of one of the two extremes, the mind is not simply impotent, seeing it rejects it as that to which there can be nothing answering in actual existence. But then it does so only to find itself face to face with an alternative which, while it must be inferred to be actual, can by no effort be realized in thought. So that, even if this objection be allowed, the doctrine still remains intact as a demonstration how limited is the sphere of human thought as compared with that of existence, and how little human powers of conception are to be made the measure of truth.

Its significance becomes still more apparent in the original and ingenious application made of it by Hamilton to the solution of such philosophic problems as the origin of the principles of cause and effect, substance and phenomenon, &c. That the sum of existence of one set of modes has passed into another mode is, according to him, what we mean by saying that an event had causes. Consciousness is a knowledge of existence only as conditioned in time, and we are impotent—it matters not how—to conceive the forms of existence within our experience as having had an absolute commencement; therefore we conceive them as having existed in other forms, in other words, as caused. Thus it is in order to escape from the necessity of thinking an absolute beginning for existence in time that we view all things as a series of causes and effects. In like manner it is because we can think neither that which exists in and for itself nor that which exists merely in and through something else that we recognize all objects under the double aspect of substance and phenomenon,—knowing nothing but the latter, yet always supposing the former.[5]

Having showed that the original data of consciousness, however different in other respects, are alike in this, that they are as facts—but only as facts—clear and certain, and as cognitions relative, more properly indeed, beliefs than cognitions,—Hamilton claims for all that, on the sole authority of consciousness, these be accepted as truths. This is the point to which the whole of his philosophy leads up; hence he offers no arguments in its support. He only asks—If the authority of consciousness be disallowed, what other warrant of truth remains? Where else will a criterion of certainty be found? He saw no alternative between absolute scepticism and implicit reliance on consciousness. But his reliance was no absolute and blind belief. He claimed implicit credence for consciousness only after having investigated and laid down the conditions of its credibility. The inexplicability that is to him a mark of truth must be proved to be that which springs from the fundamental character of the cognition. While the establishment of principles on which belief may be sure, rational, and consistent is the ultimate aim of his philosophy, groundless or inconsistent belief he sweeps away wherever he meets with it. Thus he will not allow the validity of belief in an external reality which, *ex hypothesi*, is not known.[1] Be it noted too, that it is consciousness, not reason, for which he claims supreme authority.[2] His position is best understood through the mutual relation (already referred to) of his doctrines of the conditioned and of common sense. The former extends the bounds of existence as much as it narrows those of thought, and so makes room for belief; while the latter shows belief to be the condition on which alone even primary and fundamental truths can be apprehended. Thus, for example, on the ground of both, he held that freedom of will and necessity are alike inconceivable, but that we are not entitled to reject the testimony of consciousness to the fact that as moral agents we are free, on account of the speculative difficulties with which it is surrounded.[3] These two doctrines Sir W. Hamilton did not himself apply to theology, and in themselves they have no direct theological bearing, since the one is concerned with the infinite and the absolute merely as notions, and the other with simple forms of thought long prior to those of theology. But his references to this subject indicate clearly what he considered to be the true relation of theology to philosophy, and show that, in the one as in the other, he held wisdom to lie in such a conviction of human ignorance as disposes the mind to accept harmony with the facts of consciousness as evidence of truth.[4]

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[1] Reid's Works, [illegible]; *Lects.*, i. 267-[illegible]; *Disc.*, 54, 85, 86, [illegible].

[2] *Lects.*, ii. [illegible]; *Disc.*, 61, [illegible].

[3] Reid's Works, [illegible]; *Lects.*, i. 136-138, ii. 129 [illegible]. *Disc.*, [illegible].

[4] Reid's Works, 743, [illegible]; *Lects.*, [illegible], 533-538; iii. 98-103; *Disc.*, 12-13, [illegible].

[5] *Reid's Works* 935-937; *Lects.*, ii. 376-413, 536-541; *Disc.*, 604-617.

Of the three classes into which, as we have seen, Hamilton divided mental phenomena, the third—the phenomena of conation—is not treated of in his *Lectures*, and his other works contain only fragmentary discussions of particular ethical points. Several lectures, however, are devoted to the consideration of the phenomena of feeling and the development of a theory of pleasure, founded chiefly on that of Aristotle, which is in substance that pleasure is the reflex in consciousness of the spontaneous and unimpeded exercise of power or energy,—pain being, on the other hand, the consciousness of overstrained or repressed exertion.[5]

The logic with which Sir W. Hamilton's name is associated is a purely formal science. Nothing else indeed did he consider properly to be called logic. For it seemed to him an unscientific mixing together of heterogeneous elements to treat as parts of the same science the formal and the material conditions of knowledge. He was quite ready to allow that on this view logic cannot be used as a means of discovering or guaranteeing facts, even the most general, and expressly asserted that it has to do, not with the objective validity, but only with the mutual relations, of judgments. He further held that induction and deduction are correlative processes of formal logic, each resting on the necessities of thought, and deriving thence its several laws. In establishing the distinction between logical and scientific induction, he showed that deduction no more than induction is self-sufficient, since it also must have a prior process to start from before it can be applied to nature. He also held that no other than formal logic can be distinguished from the body of the sciences. Perhaps he may have too much overlooked the fact that the search for causes (a problem common to all the sciences) and the presumable uniformity of nature (a principle capable of guaranteeing general inferences) yield the conditions of a logic entitled to the name of a science of science, and possessing all the importance of the knowledge whose organon it is. Yet it is well to be reminded by a difference of name that a science such as this, consisting of inferences from the actual order of things, is quite distinct from the body of truths developed from the conditions of thought as such.

The only logical laws recognized by Hamilton were the three axioms of identity, non-contradiction, and excluded middle, which he regarded as severally phases of one general condition of the possibility of existence and, therefore, of thought. The law of reason and consequent he considered not as different, but merely as expressing metaphysically what these express logically. He added as a postulate—which in his theory was of importance—"that logic be allowed to state explicitly what is thought implicitly."

The changes by which he to a great extent remodelled formal logic were the result (1) of applying to propositions and syllogisms the two aspects of notions as wholes,—*extension*, answering to the objects denoted, and *intension*, answering to the attributes connoted,—and (2) of assigning quantity to the predicate as well as to the subject in judgments of extension. These judgments receive the form of an equation. Only simple conversion is allowed, but, all propositions being shown to be capable of simple conversion, the class of immediate inferences is greatly increased. Categorical syllogisms (inductive and deductive) may be either unfigured or figured, according as the distinction of subject and predicate and the distinctions included in that are or are not recognized. Unfigured syllogism has but one form; figured syllogisms are of three forms, according to the position of the middle term in the premises. Of these the first corresponds to the first and fourth figures of ordinary logic,—the moods of the latter being shown to be merely indirect intensive moods of the first. The laws of categorical syllogism are reduced to one. On the other hand, one of the results of the quantification of the predicate being to increase the number of propositional forms, a number of new moods are added, and each figure contains twelve. Hypothetical and disjunctive inferences, whether regarded as mediate or as immediate,—(as to this Hamilton varied in opinion, *cf.*, *Lects.*, iv. 369, 371, 373, 374),—form a separate class of syllogisms,—the conditional, properly subdivided into conjunctive and disjunctive; for, according to Hamilton, as all inference is hypothetical, this term ought not to be used as the name of one particular group. The quantities allowed by him in logic were but two—the definite, including the universal and singular, and the indefinite. The latter also he considered to be twofold,—partiality as such, from which the universal, both affirmative and negative, is excluded, and partiality which excludes only one universal extreme, while possibly admitting the other. All these improvements were embodied in a notation that clearly and compendiously presents to the eye the whole logical scheme.[6]

Even from this imperfect outline of Hamilton's system of psychology, metaphysics, and logic it appears how extensive and original were his labours in the various departments of philosophy, how powerful an impetus he gave to speculation, and how much he himself contributed to the elucidation of the ultimate problems of thought. By his thorough-going analysis of consciousness and of the relation of consciousness to mind he did much to promote the scientific study of psychology in his own country and in America,—in particular to give it at once a sound method and a well-defined sphere. He did not himself trace the growth of consciousness; but, by showing that it is both simple and complex, both involving and evolved, he implied that it had grown, and suggested the problem of the conditions of its development. On the other hand, to him there was a wide gulf between mental and material phenomena, and the acceptance of innate ideas was attended with no difficulty; thus his point of view is so far removed from that of most of the psychologists of the present day that probably his influence now is much less either than it was in his own lifetime or than it may be hereafter.

In metaphysics his place is plainly marked. Taking his stand at once on the exclusive authority and on the limited sphere of human consciousness, he comes into direct antagonism with all schools of philosophy that find in the *Unconditioned* a field for speculation. At the same time he is divided from scepticism by his assertion that, as the realm of existence transcends that of thought, so belief is wider than knowledge, and from empiricism by his admission of *a priori* and inexplicable cognitions. He ranked himself among the Scottish school of philosophers; yet there he stands by himself, since even those doctrines which he held in common with his predecessors he held after a fashion widely different as to both grounds and results. The doctrine of common sense, in particular, he set in a new light, rescued from misapprehension, and showed, on the testimony of every school of thought, to be one of the most widely recognized of philosophic tenets. In Reid he found a philosopher to whom by many ties of intellectual affinity he was bound, and who seemed to him to have so unskilfully used the right clue to a solution of the problems with which he dealt as to justify the doubt whether he really had it. Hence he made Reid's writings, as it were, his own, corrected his errors, and gave a solid basis to the theory which he had himself failed even to make plain.

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[1] *Lects.*, ii. 139–141; *Disc.*, 91 *sq.*

[2] *Reid's Works*, 755–770; *Disc.*, 63.

[3] *Reid's Works*, 599*n*, 602*n*, 975–981; *Lects.*, ii. 541–543; *Disc.*, 98, 618–620.

[4] *Disc.*, 620 *sq.*; *Lects.*, ii. 530–535.

[5] *Lects.*, ii. 414–520.

[6] See *Lectures on Logic*, vols. iii. and iv., and Appendices, iv. 229–474; also *Discussions* 117–173, 646–706.

The philosopher to whom above all others he professed allegiance was Aristotle. His works were the object of his profound and constant study, and supplied in fact the mould in which his whole philosophy was cast. With the commentators on the Aristotelian writings, ancient, mediæval, and modern, he was also familiar; and the scholastic philosophy he studied with care and appreciation at a time when it had hardly yet begun to attract attention in his country. His wide reading enabled him to trace many a doctrine to the writings of forgotten thinkers; and nothing gave him greater pleasure than to draw forth such from their obscurity, and to give due acknowledgment, even if it chanced to be of the prior possession of a view or argument that he had thought out for himself. Of modern German philosophy he was a diligent, if not always a sympathetic, student. How profoundly his thinking was modified by that of Kant is evident from the tenor of his speculations, nor was this less the case because, on fundamental points, he came to widely different conclusions. There is a closer likeness as to results between his system and that of Jacobi,—from which, however, his is distinguished by its more scientific character, especially by intuition being more clearly identified with the voice of reason, and more rigidly required to prove its authority as such.

His labours in logic coincided in time with a general movement by which formal logic was effectually advanced and improved. But as to the originality of his contributions, especially in regard to the quantification of the predicate, there is no room for doubt. No evidence has ever been adduced that in the smallest degree weakens the force of the abundant evidence brought forward in its support.

Any account of Hamilton would be incomplete which regarded him only as a philosopher, for his knowledge and his interests embraced all subjects related to that of the human mind. Physical and mathematical science had, indeed, no attraction for him; but his study of anatomy and physiology was minute and experimental. In literature also, ancient and modern he was widely and deeply read; and, from his unusual powers of memory, the stores which he had acquired were always at command, every topic suggesting to him apt quotations or pertinent examples. If there was one period with the literature of which he was more particularly familiar, it was the 16th and 17th centuries. Here in every department he was at home. He had gathered a vast amount of its theological lore, had a critical knowledge especially of its Latin poetry, and was minutely acquainted with the history of the actors in its varied scenes, not only as narrated in professed records, but as revealed in the letters, table-talk, and casual effusions of themselves or their contemporaries. His article on the *Epistolæ Obscurorum Virorum*, and his pamphlet on the Disruption of the Church of Scotland in 1843, may be cited in confirmation and illustration of what has now been said. Among his literary projects were editions of the works of George Buchanan and Julius Cæsar Scaliger. His general scholarship found expression in his library, which, though mainly, was far from being exclusively, a philosophical collection. It now forms a distinct portion of the library of the university of Glasgow.

His chief practical interest was in education,—an interest which he manifested alike as a teacher and as a writer, and which had led him long before he was either to a study of the subject both theoretical and historical. He there adopted views as to the ends and methods of education that were afterwards carried out or advocated by others with general recognition; but he also expressed in one of his articles an unfavourable view of the study of mathematics as a mental gymnastic which excited much opposition, but which he never saw reason to alter. As himself a teacher, he was zealous and successful. He did not indeed deem it necessary to give to his lectures the elaboration and precision that he bestowed on his published writings. But he made them sufficient for the end which they had to accomplish, he supplemented them at times by other instruction, and he strove, not only by all academic means, but also by his personal influence, to develop the speculative energy and interest of his pupils. His writings on university organization and reform had, at the time of their appearance, a decisive practical effect, and contain much that is of permanent value.

Many of his moral as well as intellectual characteristics are expressed in his writings,—the intensity and force of his nature, his tendency to be carried away by polemical ardour, his freedom from anything like pettiness, his perfect sincerity and candour. Such a reflex is at best very imperfect, but here could hardly be bettered by description, which, therefore, is not attempted.

His posthumous works are his *Lectures on Metaphysics and Logic*, 4 vols., edited by the Rev. H. L. Mansel, Oxford, and Professor Veitch (*Metaphysics*, 1858; *Logic*, 1860); and *Additional Notes to Reid's Works, from Sir W. Hamilton's MSS.*, under the editorship of the Rev. H. L. Mansel, D.D., 1862. A *Memoir of Sir W. Hamilton*, by Professor Veitch, appeared in 1869. (E. H.)

HAMILTON, Sir William (1730–1803), antiquary and patron of the fine arts, was born in 1730 of a noble but needy Scottish family. Of his early life and education we know nothing beyond the fact that he was equerry to Prince George, afterwards George III., whose foster-brother he is said to have been; but in his twenty-fifth year he married a young and beautiful heiress, whose fortune placed him in affluence. In the first parliament of George III. Hamilton sat as member for Midhurst; and in 1764 he was accredited ambassador to Naples, an office which he retained till 1800. On proceeding to his post his attention and interest were at once awakened by the discoveries at Pompeii and Herculaneum, and he took up the study of antiquities with ardour. The Porcinari collection of Greek and Etruscan vases, purchased in 1765, was the nucleus of a valuable collection of his own, now for the most part in the British Museum. Engravings and descriptions of the most valuable pieces are given in the famous *Antiquités Etrusques, Grecques, et Romaines, tirées du Cabinet de M. Hamilton*, edited by D'Hancarville, and published at Naples in 1766–67. Hamilton also contributed liberally to the museum at Portici, and gave much attention to the MSS. and other valuable articles rescued from the buried cities; but his efforts were almost nullified by the inertness of the Neapolitan court, which was even suspicious of his zeal. Natural history and science also were not neglected by him. Between 1764 and 1767 Hamilton paid numerous visits to Vesuvius, Etna, and the Lipari Islands, accompanied by a young artist, Pietro Fabris, who made drawings of the noteworthy objects and appearances under Hamilton's directions. The result of these excursions, first sent as letters to the Royal Society, of which he became a member in 1766, was afterwards expanded into two works,—*Observations upon Mount Vesuvius, Mount Etna, and other Volcanoes of the Two Sicilies*, published at London in 1772, and *Campi Phlegræi*, a collection of plates illustrating the volcanic phenomena, accompanied by concise descriptions in English and French, published at Naples in 1776–77. A *Supplement* to the latter described the eruption of Mount Vesuvius in 1779. Hamilton's daughter died in 1775, and his first wife in 1782. In 1772 he was made K.C.B., and in 1791 privy councillor. His continued interest in art and antiquity is manifested by his contributions to the *Philosophical Transactions* of the Royal Society from 1767 to 1795, and to the *Archæologia* in 1777, as well as by his generosity to artists and antiquaries, such as Morghen, Winckelmann, and Poggi. Recalled in 1800, he died April 6, 1803.

Sir William Hamilton's second wife, Emma Lyon or Harte, whose name is so notoriously associated with that of Nelson, was born of very humble parents at Preston in Lancashire, about April 26, 1764. Her youth was spent in domestic service, and it was first as attendant on a lady of fashion that she learned to develop her talent for singing and mimicry. Having lost this situation she became waitress in a tavern frequented by actors, and soon entered upon a gay and dissolute career. Her beauty attracted among others the painter Romney, who depicted her in no fewer than twenty-three of his works. Sir William Hamilton married her in 1791; and, going with him the same year to Naples, she speedily acquired an ascendency over the mind of the queen, which at the instigation of Nelson she used for the advantage of the British fleet. On the death of Sir William she lived in a house at Merton Place, provided for her by Nelson, but on his death in 1805 she soon squandered the modest fortune left her by her husband, and after being imprisoned for debt, retired with Nelson's daughter Horatia to Calais, where she died, January 16, 1815. Her *Memoirs* appeared in the year of her death.

HAMILTON, William (1704-1754), a minor Scottish poet, the author of *The Braes of Yarrow*, was born in 1704, probably at Bangour in Linlithgowshire, the second son of James Hamilton of Bangour, a member of the Scottish bar. It is supposed that he studied at the university of Edinburgh; and it is certain that he received an education which enabled him to enjoy the classical writers of Greece and Rome, and to be a congenial associate in after years with such men as Allan Ramsay and Henry Home. As early as 1724 we find him contributing to Ramsay's *Tea Table Miscellany*. In 1745 Hamilton joined the cause of Prince Charles, and, though it is doubtful whether he actually bore arms, he certainly celebrated the battle of Prestonpans in an ode beginning—"As over Gladsmuir's blood-stained field." After the disaster of Culloden he lurked for several months in the Highlands, and at length escaped to France; but in 1749 the influence of his friends at home procured him permission to return to Scotland, and in the following year he obtained possession of the family estate of Bangour. In 1751 he married for the second time, but the state of his health was such that he soon afterwards went abroad, and he died at Lyons on 25th March 1754.

Hamilton has left behind him a considerable number of what are best described as poetical effusions, many of them pleasing and tasteful, but none, if we except the *Braes of Yarrow* of striking originality. The first collection of his pieces was published without his permission or even knowledge by Foulis (Glasgow, 1748), and introduced by a preface from the pen of Adam Smith. Another edition with corrections by himself was brought out by his friends in 1760, and to this was prefixed a portrait engraved by Sir Robert Strange. Though the poems have been since reprinted in Anderson's *British Poets*, vol. ix., in Sharpe's *Collection of the British Poets*, and in Chalmers's *English Poets*, vol. xv., there was no separate edition between 1760 and 1850, when James Paterson edited *The Poems and Songs of William Hamilton*. This volume contains several poems till then unpublished, and presents a bibliographical introduction and life of the author.

See also James Chalmers's "Notices of Life of William Hamilton" in *Transactions of Society of Scottish Antiquaries*, vol. iii., 1831; and Charles Mackay, *The Poetical Works of Allan Ramsay, with Selections from the Scottish Poets before Burns.*

HAMILTON, Sir William Rowan (1805–1865), one of the really great mathematicians of the present century, was born in Dublin, August 4, 1805. His father, who was a solicitor, and his uncle (curate of Trim), migrated from Scotland in youth. A branch of the Scottish family to which they belonged had settled in the north of Ireland in the time of James I., and this fact seems to have given rise to the common impression that Hamilton was an Irishman.

His genius displayed itself, even in his infancy, at first in the form of a wonderful power of acquiring languages. At the age of seven he had already made very considerable progress in Hebrew, and before he was thirteen he had acquired, under the care of his uncle, who was an extraordinary linguist, almost as many languages as he had years of age. Among these, besides the classical and the modern European languages, were included Persian, Arabic, Hindustani, Sanskrit, and even Malay. But though to the very end of his life he retained much of the singular learning of his childhood and youth, often reading Persian and Arabic in the intervals of sterner pursuits, he had long abandoned them as a study, and employed them merely as a relaxation.

His mathematical studies seem to have been undertaken and carried to their full development without any assistance whatever, and the result is that his writings belong to no particular "school," unless indeed we consider them to form, as they are well entitled to do, a school by themselves. As an arithmetical calculator he was not only wonderfully expert, but he seems to have occasionally found a positive delight in working out to an enormous number of places of decimals the result of some irksome calculation. At the age of twelve he engaged Colburn, the American "calculating boy," who was then being exhibited as a curiosity in Dublin, and he had not always the worst of the encounter. But, two years before, he had accidentally fallen in with a Latin copy of *Euclid*, which he eagerly devoured; and at twelve he attacked Newton's *Arithmetica Universalis.* This was his introduction to modern analysis. He soon commenced to read the *Principia*, and at sixteen he had mastered a great part of that work, besides some more modern works on analytical geometry and the differential calculus.

About this period he was also engaged in preparation for entrance at Trinity College, Dublin, and had therefore to devote a portion of his time to classics. In the summer of 1822, in his seventeenth year, he began a systematic study of Laplace's *Mécanique Céleste.* Nothing could be better fitted to call forth such mathematical powers as those of Hamilton; for Laplace's great work, rich to profusion in analytical processes alike novel and powerful, demands from the most gifted student careful and often laborious study. It was in the successful effort to open this treasure house that Hamilton's mind received its final temper. "Dès-lors il commença à marcher seul," to use the words of the biographer of another great mathematician. From that time he appears to have devoted himself almost wholly to original investigation (so far at least as regards mathematics), though he ever kept himself well acquainted with the progress of science both in Britain and abroad.

Having detected an important defect in one of Laplace's demonstrations, he was induced by a friend to write out his remarks, that they might be shown to Dr Brinkley, afterwards bishop of Cloyne, but who was then royal astronomer for Ireland, and an accomplished mathematician. Brinkley seems at once to have perceived the vast talents of young Hamilton, and to have encouraged him in the kindest manner. He is said to have remarked in 1823 of this lad of eighteen,—"This young man, I do not say *will be*, but *is*, the first mathematician of his age."

Hamilton's career at college was perhaps unexampled. Amongst a number of competitors of more than ordinary merit, he was first in every subject, and at every examination. His is said to be the only recent case in which a student obtained the honour of an *optime* in more than one subject. This distinction had then become very rare, not being given unless the candidate displayed a thorough mastery over his subject. Hamilton received it for Greek and for physics. How many more such honours he might have attained it is impossible to say; but he was expected to win both the gold medals at the degree examination, had his career as a student not been cut short by an unprecedented event. This was his appointment to the Andrews professorship of astronomy in the university of Dublin, vacated by Dr Brinkley in 1827. The chair was not exactly offered to him, as has been sometimes asserted, but the electors, having met and talked over the subject, authorized one of their number, who was Hamilton's personal friend, to urge him to become a candidate, a step which his modesty had prevented him from taking. Thus, when barely twenty-two, he was established at the Dublin Observatory. He was not specially fitted for the post, for although he had a profound acquaintance with theoretical astronomy, he had paid but little attention to the regular work of the practical astronomer. And it must be said that his time was better employed in grand original investigations than it would have been had he spent it in meridian observations made even with the best of instruments,—infinitely better than if he had spent it on those of the observatory, which, however good originally, were then totally unfit for the delicate requirements of modern astronomy. Indeed there can be little doubt that Hamilton was intended by the university authorities who elected him to the professorship of astronomy to spend his time as he best could for the advancement of science, without being tied down to any particular branch. Had he devoted himself to practical astronomy they would assuredly have furnished him with modern instrumenst and an adequate staff of assistants.

In 1835, being secretary to the meeting of the British Association which was held that year in Dublin, he was knighted by the lord-lieutenant. But far higher honours rapidly succeeded, among which we may merely mention his election in 1837 to the president's chair in the Royal Irish Academy, and the rare and coveted distinction of being made corresponding member of the academy of St Petersburg. These are the few salient points (other, of course, than the epochs of his more important discoveries and inventions presently to be considered) in the uneventful life of this great man. He retained his wonderful faculties unimpaired to the very last, and steadily continued till within a day or two of his death (September 2, 1865) the task (his *Elements of Quaternions*) which had occupied the last six years of his life.

The germ of his first great discovery was contained in one of those early papers which in 1823 he communicated to Dr Brinkley, by whom, under the title of *Caustics*, it was presented in 1824 to the Royal Irish Academy. It was referred as usual to a committee. Their report, while acknowledging the novelty and value of its contents, and the great mathematical skill of its author, recommended that, before being published, it should be still further developed and simplified. During the next three years the paper grew to an immense bulk, principally by the additional details which had been inserted at the desire of the committee. But it also assumed a much more intelligible form, and the grand features of the new method were now easily to be seen. Hamilton himself seems not till this period to have fully understood either the nature or the importance of his discovery, for it is only now that we find him announcing his intention of applying his method to dynamics. The paper was finally entitled "Theory of Systems of Rays," and the first part was printed in 1828 in the *Transactions of the Royal Irish Academy*. The second and third parts have not yet been printed; but it is understood that their more important contents have appeared in the three voluminous supplements (to the first part) which have been published in the same *Transactions*, and in the two papers "On a General Method in Dynamics," which appeared in the *Philosophical Transactions* in 1834-5. The principle of "Varying Action" is the great feature of these papers; and it is strange, indeed, that the one particular result of this theory which, perhaps more than anything else that Hamilton has done, has rendered his name known beyond the little world of true philosophers, should have been easily within the reach of Fresnel and others for many years before, and in no way required Hamilton's new conceptions or methods, although it was by them that he was led to its discovery. This singular result is still known by the name "Conical Refraction," which he proposed for it when he first predicted its existence in the third supplement to his *Systems of Rays*, read in 1832.

The step from optics to dynamics in the application of the method of "Varying Action" was made in 1827, and communicated to the Royal Society, in whose *Philosophical Transactions* for 1834 and 1835 there are two papers on the subject. These display, like the "Systems of Rays," a mastery over symbols and a flow of mathematical language almost unequalled. But they contain what is far more valuable still, the greatest addition which dynamical science had received since the grand strides made by Newton and Lagrange. Jacobi and other mathematicians have developed to a great extent, and as a question of pure mathematics only, Hamilton's processes, and have thus made extensive additions to our knowledge of differential equations. But there can be little doubt that we have as yet obtained only a mere glimpse of the vast physical results of which they contain the germ. And though this is of course by far the more valuable aspect in which any such contribution to science can be looked at, the other must not be despised. It is characteristic of most of Hamilton's, as of nearly all great discoveries, that even their indirect consequences are of high value.

The other great contribution made by Hamilton to mathematical science, the invention of QUATERNIONS, is fully treated under that heading. It is not necessary to say here more than this, that quaternions form as great an advance relatively to the Cartesian methods as the latter, when first propounded, formed relatively to Euclidian geometry. The following characteristic extract from a letter shows Hamilton's own opinion of his mathematical work, and also gives a hint of the devices which he employed to render written language as expressive as actual speech. His first great work, *Lectures on Quaternions* (Dublin, 1852), is almost painful to read in consequence of the frequent use of italics and capitals.

"I hope that it may not be considered as unpardonable vanity or presumption on my part, if, as my own taste has always led me to feel a greater interest in *methods* than in *results*, so it is by METHODS, rather than by *any* THEOREMS, which *can* be separately *quoted*, that I desire and hope to be remembered. Nevertheless it is only human nature, to derive *some* pleasure from being cited, now and then, even about a 'Theorem;' especially where . . . . . the quoter can enrich the subject, by combining it with researches of *his own*."

The discoveries, papers, and treatises we have mentioned might well have formed the whole work of a long and laborious life. But, not to speak of his enormous collection of MS. books, full to overflowing with new and original matter, which have been handed over to Trinity College, Dublin, and of whose contents it is to be hoped a large portion may yet be published, the works we have already called attention to barely form the greater portion of what he has published. His extraordinary investigations connected with the solution of algebraic equations of the fifth degree, and his examination of the results arrived at by Abel, Jerrard, and Badano, in their researches on this subject, form another grand contribution to science. There is next his great paper on *Fluctuating Functions*, a subject which, since the time of Fourier, has been of immense and ever increasing value in physical applications of mathematics. There is also the extremely ingenious invention of the HODOGRAPH (*q.v.*). Of his extensive investigations into the solution (especially by numerical approximation) of certain classes of differential equations which constantly occur in the treatment of physical questions, only a few items have been published, at intervals, in the *Philosophical Magazine*. Besides all this, Hamilton was a voluminous correspondent. Often a single letter of his occupied from fifty to a hundred or more closely written pages, all devoted to the minute consideration of every feature of some particular problem: for it was one of the peculiar characteristics of his mind never to be satisfied with a general understanding of a question; he pursued it until he knew it in all its details. He was ever courteous and kind in answering applications for assistance in the study of his works, even when his compliance must have cost him much valuable time. He was excessively precise and hard to please with reference to the final polish of his own works for publication; and it was probably for this reason that he published so little compared with the extent of his investigations.

Like most men of great originality, Hamilton generally matured his ideas before putting pen to paper. "He used to carry on," says his elder son, "long trains of algebraical and arithmetical calculations in his mind, during which he was unconscious of the earthly necessity of eating; we used to bring in a 'snack' and leave it in his study, but a brief nod of recognition of the intrusion of the chop or cutlet was often the only result, and his thoughts went on soaring upwards."

For further details about Hamilton (his poetry and his association with poets, for instance), the reader is referred to the *Dublin University Magazine* (Jan. 1842), the *Gentleman's Magazine* (Jan. 1866), and the *Monthly Notices of the Royal Astronomical Society* (Feb. 1866), and also to an article by the present writer in the *North British Review* (Sept. 1866), from which much of the above sketch has been taken.

(P. G. T.)

HAMÍRPUR, or **Humeerpoor**, a British district in the lieutenant governorship of the North Western Provinces, India, lying between 25° 5′ and 26° 10′ N. lat., and between 79° 22′ 45″ and 80° 25′ 15″ E. long. It forms the south western district of the Allahabad division, and is bounded on the N. by the Jumna (Jamuna); on the N.W. by the native state of Baoni and Betwa river; on the W. by the Dhasán river; on the S. by Alipura, Chhatarpur, and Charkhari states; and on the E. by the Banda district. It encloses the native states of Sarila, Jigni, and Bihat, besides portions of Charkhari and Garrauli.

Hamírpur forms part of the great plain of Bundelkhand, which stretches between the banks of the Jumna and the central Vindhyán plateau. The district is in shape an irregular parallelogram, with a general slope northward from the low hills on the southern boundary. The scenery is rendered picturesque by the artificial lakes of Mahoba. These magnificent reservoirs were constructed by the Chandel rajas about 800 years ago, for purposes of irrigation and as sheets of ornamental water. Many of them enclose craggy islets or peninsulas, crowned by the ruins of granite temples, exquisitely carved and decorated. From the base of this hill and lake country the general plain of the district spreads northward in an arid and treeless level towards the broken banks of the rivers. Of these the principal are the Betwa and its tributary the Dhasán, both of which are unnavigable. There is little waste land, except in the ravines by the river sides. The deep black soil of Bundelkhand, known as *már*, retains the moisture under a dried and rifted surface, and renders the district fertile.

The census of 1872 gives a population of 529,137—276,196 males and 252,941 females. The Hindus numbered 493,877, and the Mahometans 33,658. The Chandels and Bundelas, the old dominant classes, have now sunk to 545 and 612 respectively; most of these still cling to the neighbourhood of Mahoba, the seat of their former supremacy. The district contains 6 towns with a population of more than 5000 souls—namely, Rath, Hamírpur, Mahoba, Maudha, Sumerpur, and Jaitpur. The staple produce of the district is grain of various sorts, the most important being gram. Cotton is also a valuable crop, whose cultivation is on the increase. Out of a total area of 1,464,641 acres, 762,212 are under cultivation. Irrigation is practised on only 16,000 acres, chiefly in the south, where water can be obtained from the artificial lakes. Agriculturists suffer much from the spread of the *kans* grass, a noxious weed which overruns the fields and is found to be almost ineradicable, wherever it has once obtained a footing. The district is little subject to blight or flood; but droughts and famine are unhappily common. The scarcity of 1837 and 1868-69 was severely felt in Hamírpur. Commerce is chiefly carried on by means of its great river highway, the Jumna. Cotton and grain, the main exports, are carried downwards; while rice, sugar, tobacco, and Manchester goods constitute the principal imports upwards. The manufactures consist of coarse cotton cloth and soapstone ornaments. There is only one metalled road, that between Hamirpur and Naugaon, 70 miles in length. The gross revenue in 1870-71 was £184,646; expenditure, £116,416. In 1871 the police force numbered 534 men, supplemented by 1953 village watchmen (*chaukidárs*), maintained at a cost of £8958. The district contains only one jail: the average number of prisoners in 1850 was 400; 1860, 72; and 1870, 129. In 1870 the number of schools was 112, with 3066 pupils; the cost, £1354. The district is divided into 8 fiscal divisions (*parganás*). The climate is dry and hot, owing to the absence of shade and the bareness of soil, except in the neighbourhood of the Mahoba lakes, which cool and moisten the atmosphere. The rainfall in 1869-70 was 37·1, and in 1870-71 38·1 inches.

History.—From the 9th to the 14th century this district was the centre of the Chandel kingdom, with its capital at Mahoba. The rájás adorned the town with many splendid edifices, remains of which still exist, besides constructing the noble artificial lakes already described. At the end of the 12th century Mahoba fell into the hands of the Musalmans, who retained possession of it for 500 years. In 1680 the district was conquered by Chhatar Sál, the hero of the Bundelas, who assigned at his death one-third to his ally the peshwa of the Marhattás. Until Bundelkhand was constituted a British district in 1803, there was constant warfare between the Bundela princes and the Marhattá chieftains. The land had been impoverished by the long war carried on under Chhatar Sál, overrun and ravaged during the Marhattá aggression, and devastated by robber chiefs, so that in 1842 it was reported to be utterly valueless. On the outbreak of the mutiny, Hamirpur was the scene of a fierce rebellion. All the principal towns were plundered by the surrounding native chiefs. Since then the condition of the district seems to have improved; but it has not yet recovered from the long anarchy of Marhattá rule.

Hamírpur, the administrative headquarters of the above district, in 25° 58′ N. lat. and 80° 11′ 50″ E. long., is situated on a tongue of land at the confluence of the Betwa and the Jumna, on the right bank of the latter river. It was founded, according to tradition, by Hamír Deo, a Karchuli Rájput expelled from Ulwar (Alwar) by the Mahometans. The town possesses little importance; there are no manufactures, and quite a limited trade in grain. Population in 1872, 7007.

HAMLET, the hero of Shakespeare's drama, is according to some interpreters an historical or quasi-historical personage, but according to others his story is a mere development or "precipitation" of the great Scandinavian system of mythology. The decision of this point is rendered all the more difficult as the only original authority for the facts (historical or mythological) is the Danish historian Saxo Grammaticus (d. 1204). Though Dr Vigfusson (prolegomena to the *Sturlunga Saga*, Oxford, 1878) concludes that the Hamlet legend was contained in the Skjöldunga Saga now lost, it is of course matter of question whether Saxo based this portion of his narrative on previous writings or collected his material from oral tradition.

According to Saxo, whose account is excerpted in Simrock's *Quellen des Shakspeare* (Bonn, 1870), and summarized in Latham's *Dissertations on Hamlet* (Lond., 1872, reprinted from *Transactions of the Roy. Soc. of Literature*, vol. x., new series), Hamlet's history is briefly as follows. In the days of Rörik, king of Denmark, Gervendill was governor of Jutland, and in this office he was succeeded by his sons Horvendill and Fengo. The former, returning with glory from a viking expedition in which he had defeated Koller, king of Norway, obtained the hand of Gerutha, Rörik's daughter, who in due course bore him a son Amleth. But Fengo, out of jealousy, murdered Horvendill with his own hand, and then persuaded Gerutha to become his wife, on the plea that he had committed the crime for no other reason than to avenge her of a husband by whom she had been hated. Amleth, afraid of sharing his father's fate, pretends to be imbecile, but the suspicion of Fengo puts him to various tests, which are related with all the inconsequent simplicity of the ordinary *Märchen.* Despatched to England in company with two attendants, who bear a letter instructing the king of that country to put him to death, he surmises the purport of their instructions, and secretly modifies the inscription on their "tablets" so that the king is requested to put them to death and to treat him with honour. By his wisdom he makes a deep impression on the king, and obtains the hand of the royal princess; but instead of settling in England he returns at the end of a year to Denmark, where he is supposed to be dead, just as the people are celebrating his obsequies. During the feast that follows he makes the courtiers all drink freely, and then, when they are heavy with wine and sleep, he pulls down over them the hangings of the hall, fixes these with pegs which he had sharpened and prepared in the early stage of his folly, and then setting fire to the building leaves the revellers to their fate. He next proceeds to the royal chamber to take vengeance on Fengo himself, who falls beneath the stroke of his own sword, for which Hamlet had substituted his own scabbard-fastened weapon. Returning to England for his wife, the hero finds that his father-in-law and Fengo had been under pledge to each other that the survivor should avenge the other's death if it resulted from violence; and his father-in-law, unwilling to make a direct attack on his life, sends him to Scotland as proxy-suitor for the hand of a terrible queen Hermuthruda, who has put all previous wooers to death. But Hermuthruda happens to fall in love with Hamlet, and he returns to England to upbraid his father-in-law with his treachery. As king of Jutland he has to endure the grievous hostility of Vikletus, Rörik's successor, but at last determines, though well aware that he is doomed to death in the attempt, to engage with him in a decisive battle. He perishes, and his widow marries Vikletus.

According to Latham, who may be taken as the representative of the historical theory, there are really two Hamlets,—the Hamlet of Saxo's third book and the Hamlet of his fourth book, who have been confounded together. The former, who is the Shakespearean hero, he would identify with Olaf Kyrre, the Anlaf Cwiran of the Saxon Chronicle and the Amlaf Cuaran of the Irish Annals, whose name, having passed through England and Ireland, he supposes to have returned to Denmark in a form which is Latinized by Saxo as Amlethus; the latter he considers as the Hygelac of Beowulf, the Chochilaicus of Gregory of Tours, the Hugleik of the Heimskringla, and even the Havelok of English legend. "By a confusion between them as man and man, the bearers," he says, "of names as different as Olaf and Hig take a form out of which Amlethus is a probable effect." But this theory, which is expounded with more learning than lucidity, is hardly so much in favour as that of the mythological school.

That, in spite of the links by which Saxo has sought to connect its different portions with the authentic history of Denmark, the whole story was destitute of historical basis was maintained by P. E. Müller (*Critisk Undersøgelse af Danmarks og Norges Sagnhistorie, eller om Troværdigheden af Saxos og Snorros Kilder*, Copenhagen, 1823), and his conclusions in regard to the matter have been very generally accepted. Though Hamlet or Amleth himself is not mentioned in the earlier documents of the Scandinavian mythology,—the only allusion to his existence being the phrase *Amlóða kvern*, or Hamlet's mill, applied to the sea in the Skaldskaparmal,—his father, Horvendill or Orvandill [illegible], the star, and [illegible], appears in the great Scandinavian mythus in connexion with Thor's contest with Hrungnir, and is further to be identified with the Orendel of German legend, whose seamless coat was afterwards christened the seamless coat of our Saviour at Treves, and whose name, which occurs also as Erenthelle, may possibly be the source of the more famous name of Tell. Hamlet's own name finds its explanation in the Norse *amr* or *aml*, toil (still used colloquially in Icelandic, *amla*, to toil), and *lóði*, devoted to, and probably has reference to his mythic impersonation of the ceaseless toil and travail of the sea. The various details of the story—not only improbable and impossible, but sometimes stupid and trivial—lend themselves with remarkable readiness to the theory which explains them as versions of the tale, a thousand times retold, of the contest between summer and winter, sea and land, light and darkness. An elaborate exposition of the whole will be found in Zinzow's *Die Hamletsage an und mit verwandten Sagen erläutert*, Halle, 1877. It has been already stated that Saxo is the only original authority; but proof of the popularity of the legend is found in the presence in Jutland of such names as [illegible], Hamlet's Heath near Randers, Fenge's Sand (that is, Fenge's Strand), and [illegible], that is, Fenge's Cliff, and in the fact that in modern Icelandic the word *amlóði* is a regular equivalent for an idiot or stupid man. Nor are literary elaborations of the story wanting. The Icelanders have their Amlóða Saga, which is a free translation of Saxo, and their Ambales Saga, in which the matter is treated in a more romantic style. The story of Brjám, given in Jón Árnason's *Íslenzkar Þjóðsögur* (Leipsic, 1864), has the same main features; and Dr Vigfusson, by whom it was discovered, is disposed to surmise that the legend may actually be of Celtic origin,—a supposition quite in keeping with other well-known facts in Icelandic history. It was taken down from the lips of Lady Hildur Arngrimsdotter, whose father was born in 1568. As Niels of Sorö in the 15th century made Hamlet more familiar to the Danes by his *Danske Riimkronike*, so the French story-teller Belleforest introduced him to a wider company in his *Cent Histoires tragiques*. That as early as 1587 or 1589 he had been represented on the English stage is shown by the well-known passage from Nash's preface to Greene's *Menaphon*, "He will afford you whole *Hamlets*. I should say, handfuls of tragical speeches."

HAMM, a town of Prussia, capital of a circle in the government district of Arnsberg, province of Westphalia, is situated at the junction of several railways, on the Lippe at its confluence with the Ahse, 22 miles N.W. of Arnsberg. It is enclosed by walls, but the ditches which formerly surrounded it have been filled up and converted into promenades. The principal buildings are two Catholic and two Evangelical churches, a gymnasium, a poorhouse, an orphanage, and an infirmary. The town is flourishing and rapidly increasing, and possesses very extensive wire factories (in connexion with which there are puddling and rolling works), foundries, machine works, and manufactories of gloves, baskets, wadding, leather, sausages, sago, starch, chemicals, sugar of lead, gum, lac, varnish, oil, and beer. The population in 1875 was 18,877.

Hamm, which became a town about the end of the 12th century, was originally the capital of the county of Mark, and was fortified in 1226. It [illegible] the Hanseatic League. In 1614 it was [illegible] by the Dutch, and in 1622 it was taken by Tilly, after which during the Thirty Years' War it was alternately in the hands of the Imperial and the Hessian forces. In [illegible] it [illegible] Brandenburg. In 1761 and 1762 it was bombarded by the French, and in 1763 its fortifications were dismantled.

HAMMARSKÖLD, LORENZO (1785–1827), Swedish author, was born at Tuna, near Wimmerby, on the 7th of April 1785. He became a student at Upsala in 1801, but failed to take his degree in 1806. He therefore accepted a humble post at the royal library at Stockholm, with which institution he remained connected for many years. In 1804 he published an article on Tieck and Novalis which attracted much attention, and was the means of founding the "Phosphoric School," as it was called, of poetry in Sweden. Hammarsköld became the friend of Atterbom and antagonist of Wallmark, and in due time, by the bitterness of his tone, brought down on himself the scathing anger of Tegnér. In 1806 he published *Translations and Imitations of Poets, Old and New*, in the preface of which he denounced the classic Swedish writers with much force and wit, commending Goethe and Tieck to the young poets of the day. In 1808 appeared his trenchant *Critique of Schiller*, and in 1810 a volume of essays of a polemical kind. In 1813 Hammarsköld published a collection of his poems, and in 1815 had to endure the ridicule of Tegnér in his brilliant satire of *Hammarspik*. In 1818 appeared the first part of Hammarsköld's chief contribution to literature, his famous *Svenska Vitterheten*, a history of polite letters in Sweden, a book that was revised and republished after his death by Sondén, in 1833. He is chiefly remembered as a critic; his lyrics and his juvenile tragedy of *Prins Gustaf*, 1812, are of little value.

HAMME, a town of Belgium, in the province of East Flanders and the arrondissement of Termonde or Dendermonde, is situated on the right bank of the Durme, near its junction with the Scheldt, and 18 miles E.N.E. of Ghent. It contains grain and oil mills, has manufactures of lace, ribbons, linen, starch, ropes, and cordage, and carries on trade in flax. Population (1876), 10,778.

HAMMER. This well-known tool stands quite without rival for producing the numberless effects which are due to the remarkable force of "impact." Of all the array of hand tools in use in the industrial arts it is undoubtedly the one that could least be dispensed with, and so it must have been from the very earliest days of handicraft. A hammer of some rude kind must have been as essential to the shaping of an arrow-head out of a flint, as is its modern representative to the forging of a bayonet out of a bar of steel.

Hammers to be used by hand are made of an endless variety of shapes, and of weights varying from a small fraction of an ounce to 28 or 30 lb. Of the various types now in use the differences are mainly due to the special requirements of the particular trades for which they are intended, but partly also to individual fancy. A few examples are given in fig. 1—*a* being the ordinary carpenter's hammer with a cross pane, *b* a claw hammer, *c* an engineer's, and *d* a shoemaker's hammer, which last has apparently retained its form for many generations. The same may also be said of the two others in the woodcut, which are good examples of the roughness of the instruments with which results of almost incredible delicacy can be produced. Of these *e* is a favourite hammer used in the workshops of a London firm of goldbeaters, with which, together with others not less rude in appearance, gold is hammered out into leaves of such exceeding thinness that 250,000 are required to make up the thickness of an inch. Extraordinarily ill-shaped as *f*, the file-cutter's hammer, looks, yet with this and a simple chisel the teeth of files are cut by hand with a precision with which no machinery has as yet been able to compete, at least in England.

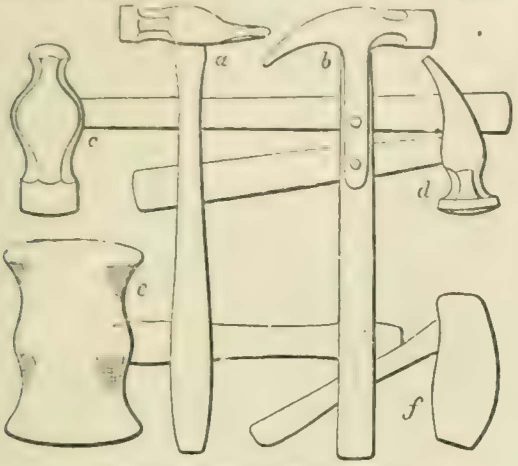


Fig. 1.—Varieties of Hand Hammer.

Hand-hammers and sledge-hammers being rigidly limited as to weight by the trifling power which one man—or at most two men—can bring to bear upon them, it long ago became obviously desirable to obtain the force of impact from some more powerful source than human muscles, so that the weight of hammer heads might be largely increased and their blows made proportionately more effective. The first step taken in this direction seems to have been the introduction of the "Hercules," a ponderous mass of iron attached to a vertical guide rod, which was lifted originally by a gang of men with ropes, but afterwards by steam power, and allowed to fall by its own weight. This was a fairly efficient tool for forging large anchors and for similar purposes, the strength of the blow and the point at which it was delivered being easily regulated. But as the demand for wrought iron increased, the necessity for more rapid as well as more powerful hammers to aid in its manufacture increased also. The lift or helve hammer (fig. 2) and the tilt hammer (fig. 3) thus came into use, and under these forms hammers may be said to have ranked for the first time as true machine tools. Each of these consists of a heavy head attached to a beam mounted on gudgeons, which is lifted at regular intervals by suitable cams or pins carried by a revolving shaft driven by steam or other power, their chief points of difference being the relative position of the gudgeons and the portion of the beam at which the power is applied, as shown in the diagrams. Heavy blows are thus obtained with the one, and lighter but much more rapid blows with the other, both, however, invariable in their intensity, the lift being always to one fixed height.

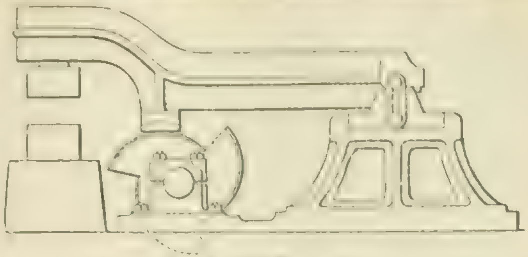


Fig. 2.—Lift Hammer.

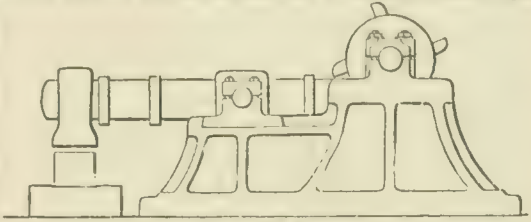


Fig. 3.—Tilt Hammer.

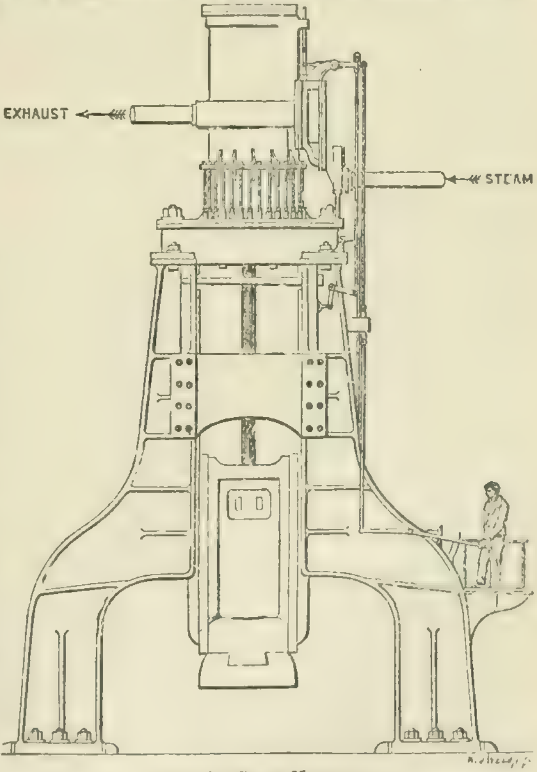


Fig. 4.—Steam Hammer.

In the steam hammer (fig. 4), which was first patented by Nasmyth in the year 1842, this objection is completely obviated. By the simple device of attaching the hammer head to the lower end of the rod of a piston working in an inverted steam cylinder, he produced a machine capable of being made to deliver its blows with a force to which no limit has yet been found, and yet so perfectly under control as to be able to crack a hazel nut without injuring the kernel. To the introduction of this invaluable tool is due more than to any other single cause the power which we now possess of producing the forgings in iron and steel which are demanded by the arts of modern times; and in one or other of its many forms it is now to be met with in every workshop in which heavy work is carried on. Many modifications of the Nasmyth steam hammer have been introduced. In one of these steam pressure has been applied above the piston to intensify the blow, it being only used in the original form for lifting the "tup" and piston and for regulating their descent. In another the piston and piston-rod have been attached to the framing and the cylinder made movable, its weight being thus added to that of the hammer.

Duplex hammers differ materially from the ordinary steam hammer, inasmuch as no anvil is necessary,—two hammer heads of equal weight (and for some purposes they weigh only a few pounds, for others as much as 30 tons) being made to deliver horizontal blows of equal force simultaneously on opposite sides of the forging, which thus receive perfectly equal treatment. The importance of this may be gathered from the fact that every increase in the weight of the vertical steam hammer necessitates a very much larger increase in the weight and solidity of the anvil which is necessary to afford the requisite inertia for resisting the blow. For instance, the anvil of a 40-ton hammer now in use at Woolwich Arsenal weighs upwards of 160 tons, and has nearly 500 tons of iron in its foundation, whereas the anvil of an 80-ton hammer of which a full-sized model was amongst the most striking objects at the Paris Exhibition of 1878, is of no less than 720 tons weight.

The recent growth of steam hammers to the enormous size just mentioned is due chiefly to the large dimensions, independently of the mere weight, of the forgings which have now to be made for heavy ordnance and for other purposes. As long as the thickness of a forging is moderate, the resistance of the anvil acting upon its under side has an effect not greatly inferior to that of the hammer on the upper side. But with every increase in thickness some of this advantage is lost and the effect of the blow is more and more confined to the outer portions of the mass, which thus receive more than their share of treatment at the expense of the central portions. On this account the difficulty of obtaining thick forgings thoroughly sound throughout their substance is very great, and it seems as if we had now reached the limit beyond which the hammer cannot be advantageously applied to these purposes. It has been found that in the case of large shafts that dispensing altogether with the central portion, thus making them hollow instead of solid, is accompanied by an increase in their strength owing to the possibility of thus forging the metal uniformly throughout. But a much more widely applicable remedy, and one which will doubtless come into general use for heavy work, is the substitution of hydraulic or other pressure for the force of impact, a system which has lately been employed by Sir Joseph Whitworth with wonderfully good results. The reason of the superiority of hydraulic presses for this work is simply this, that a certain amount of time is required for transmitting the "flow" of the metal which is the essence of forging to the [illegible] [illegible], and it is only by continued pressure that this can take place uniformly throughout the mass, whereas the instantaneous blow of the hammer, though it acts violently on the surface particles, and to a decreasing extent on the adjacent ones, is entirely expended before the action has had time to reach those at the centre, so that unequal density and consequent weakness is the result. For massive forgings therefore the old saying can be no longer accepted that "there is no machine like a hammer." (C. P. B. S.)

HAMMERFEST, the most northern town in Europe, is situated in the department of Hammerfest in the province of Finmark, on the western side of the island of Kvalö (*i.e.*, "Whale Island"), which lies off the north-western coast of Norway. Its latitude is 70° 39′ 15″, and the sun stays for two months above its horizon. Though a small place of about 2100 inhabitants, it is the seat of a considerable trade, in which not only Norwegian and Danish but English, German, and particularly Russian vessels are engaged. About thirty small ships are sent out from Hammerfest every spring to Spitzbergen to take part in the fisheries and walrus hunting. Train oil from the liver of the *Squalus microcephalus* and cod-liver oil are manufactured in the town. The exports, among which salted fish occupies the principal place, amounted in 1876 to the value of 1,629,500 crowns (£90,528), and the imports, chiefly salt and coal, to 721,700 (£40,094). On the Fuglenaes or Birds' Cape, which protects the harbour on the north, there stands a column with an inscription in Norse and Latin, stating that Hammerfest was one of the stations of the expedition for the measurement of the arc of the meridian. Nor is this its only association with science; for it was one of the spots chosen by Captain Sabine for his series of pendulum experiments. The ascent of the Tyven or Diebsberg in the neighbourhood is usually undertaken by travellers.

HAMMER-HEAD. See SHARK.

HAMMER-PURGSTALL, JOSEPH VON (1774-1856), was born at Gratz in 1774, and after some training in the Oriental academy of Vienna entered the Austrian diplomatic service. He was the son of Joseph Johann von Hammer, and it was not till 1835, when he had inherited the estates of the countess of Purgstall in Styria, that he received the title Baron von Hammer-Purgstall, by which he is generally known. His youth and early manhood were passed in the Levant, where he bent all his energies to the task of improving his acquaintance with Oriental literature, in which as early as 1796 he proved his interest by the translation of a Turkish poem. He did not again come forward as an author till 1804, when his *Encyclopædia of Oriental Learning* appeared, a work whose ambitious character was so diffidently felt by its author that he feared to put his name to it. From that time there was little pause in his literary productiveness. For fifty years he wrote incessantly on the most diverse subjects, and his works were composed in most of the languages of Europe. He published numerous texts and translations of Arabic, Persian, and Turkish authors, compiled histories of Persian poetry, Turkish poetry, and Arabic literature; brought the poems of Hafiz, Mutanebbi, Baki, and Ibn el Faridh within the reach of European readers; published travels in Turkey and Austria, wrote the history of the Tatar races, the Krim Khans, the Golden Horde, the Ilkhans, and the Ottoman Turks, formed a biographical gallery of Eastern celebrities, put forth theories about every possible subject in the wide range of Oriental learning, discussing the *Arabian Nights*, Arab music, Mohammedan theology, Egyptian papyri, gnostic relics, Arabic grammar, Eastern antiquities, the sect of the Assassins, the sieges of Vienna, the Knights Templars, and Shakespeare's sonnets, which he translated into German. Von Hammer did for Germany the same work that Sir William

Jones did for England. He showed that Oriental subjects were not to be studied merely so far as they were connected with biblical theology, but were a worthy object of research for their own sake. For more than fifty years he persisted in introducing Eastern authors and Eastern topics to the general reader, and there was a time when no Orientalist was more widely known and admired. As Jules Mohl said—"C'était le doyen de la littérature orientale, le premier associé que la Société Asiatique de Paris ait tenu à l'honneur d'inscrire sur sa liste, et le plus actif, le plus fertile, et le plus célèbre des hommes qui se sont voués, de notres temps, à la culture des lettres orientales."

It was natural that a scholar who traversed so large a field and wrote so rapidly should lay himself open to the criticism of specialists, and no man was more severely handled by his critics than Von Hammer, to whom Diez, for example (in *Unfug und Betrug*, 1815), devotes nearly three pages of heavy abuse. Von Hammer was undoubtedly inaccurate and superficial at times; he attempted more than he could possibly achieve with thoroughness, and was in the habit of giving his own whimsical view of matters about which he knew next to nothing; and he used to offend his critics as much by his Oriental florid style and want of method as by the occasional inaccuracy of his facts and the inconsequence of his deductions. But in spite of his faults he did more for Oriental studies than most of his critics put together.

When he was seventy-six years of age he planned a second edition of his *Encyclopädie of Oriental Learning*, and designed a "preliminary" series of twelve volumes which should clear the ground by expounding the history of Arabic literature, and for the last seven years of his life he regularly put forth his annual volume. Jules Mohl, going to see him, found the old man hard at work, helped by no colleague, and disdaining the aid of an amanuensis. His early travels in the Levant, and then his busy life at Vienna, where he held the post of court-interpreter, saved him from the crushing influence of solitary study; and to the last he maintained his singular buoyancy of mind. "C'était un homme généreux, franc jusqu'à l'imprudence, hardi, bouillonnant d'esprit, aimable jusqu'à la coquetterie, doué d'une faculté de travail rare, ambitieux dans les grandes et les petites choses, et d'une vivacité inconcevable—vivacité qui fut la source de sa bonne et de sa mauvaise fortune." So Mohl pictured him in his address to the Société Asiatique in 1857, when he recorded the death of Von Hammer on November 23, 1856, at the age of eighty-two, a hard worker to the last, like his younger but greater English contemporary Lane, with whom he came into collision in a friendly way on the subject of the origin of *The Thousand and One Nights*.

Von Hammer's principal works are his *Geschichte des osmanischen Reiches*, 10 vols., 1827 (2d ed., 1834-6), translated into French (1835 and 184[illegible]); *Geschichte der osmanischen Dichtkunst*, 4 vols., 1836; *Literatur-Geschichte der Araber* (unfinished), 7 vols., 1850-6; *Les Origines Russes*, 1827; *Geschichte der Goldenen Horde*, 1840; *Geschichte der Ilchane*, 1842; *Geschichte der Chane der Krim*, 1856; *Geschichte der Assassinen*, 1818; *Constantinopolis und der Bosporos*, 1822; *Encyklopädische Uebersicht der Wissenschaften des Orients*, 1804. Texts and translations of—*Eth-Tha'alibi*, Arab. and Germ., 1829; *Ibn Wahshiyah*, *History of the* [illegible], Arab. and Engl., 1806; *El-Wassaf*, Pers. and Germ., 1856; *Esh Schebistari's Rosenflor des Geheimnisses*, Pers. and Germ., 1838; *Ez-Zamakhshari*, *Goldene Halsbänder*, Arab. and Germ., 1835; *El-Ghazzali's*, *H*[illegible]*-l-Islam*, Arab. and Germ., 1838; *El-H*[illegible], *Das arab. Hohe Lied der Liebe*, Arab. and Germ., 1854. Translations of—*El-Motanabbi's Poems*; *Evliya's Account of his Embassy*, 1809; *Contes inédits des 1001 Nuits*, 1825. Besides these and smaller works, Von Hammer contributed [illegible] and criticisms to the *Fundgruben des Orients*, which he edited; to the *Journal Asiatique*; and to many other learned journals; above all to the *Transactions* of the Akademie der Wissenschaften of Vienna, [illegible]; and he translated Evliya Effendi's *Travels in Europe*, for the English Oriental Translation Fund. For a fuller list of his works, which amount in all to nearly 100 volumes, see *Comptes Rendus* of the Acad. des Inscr. et des Belles Lettres, 1857. (S. L. P.)

HAMMERSMITH, a town and parish in the county of Middlesex, situated on the north bank of the Thames, 3½ miles S.W. of Hyde Park corner, and now connected with London by continuous lines of streets. The bridge across the Thames at Hammersmith, completed in 1827 at a cost of £80,000, was the earliest suspension bridge erected near London. Formerly Hammersmith was celebrated for its nurseries and market gardens, but these have almost entirely given place to buildings. In the neighbourhood there are a number of fine residences. The principal public buildings are the parish church of St Paul, consecrated in 1631 and restored in 1864, containing a number of interesting monuments; the Latymer schools, founded by Edward Latymer in 1624; the Godolphin school, founded in the 16th century, and rebuilt as a grammar school in 1862, with accommodation for 200 boys; the Roman Catholic theological institute, founded originally as a school for ladies in 1669; the convent of the Good Shepherd, with an asylum for penitent women; the convent of Little Daughters of Nazareth; the Roman Catholic reformatory, the town-hall, the office of the board of works, and the West London hospital. In the district there are distilleries, lead-mills, oil-mills, coach factories, boat-building yards, and the works of the West Middlesex Water Company. The population of the parish in 1861 was 24,519, and in 1871 42,691. Hammersmith falls within the limits of the metropolitan district, and forms part of the parliamentary borough of Chelsea.

HAMMOND, HENRY (1605-1660), a learned royalist divine of the Church of England, was born at Chertsey in Surrey, August 18, 1605. He was educated at Eton, whence in his fourteenth year he passed to Magdalen College, Oxford, becoming demy or scholar in 1619, and fellow in 1625. After graduating in arts he turned his attention to divinity; in 1629 he entered holy orders, and in 1631 became bachelor of divinity. Two years afterwards, in preaching before the court, he won the approval of the earl of Leicester, who in the same year presented him to the living of Penshurst in Kent. Hammond received his doctor's degree in 1639, and in 1643 was promoted to the dignity of archdeacon of Chichester. He was a member of the convocation of 1640, and also, but nominally only, of the Westminster Assembly of divines, which began its sittings in 1643. In the latter year Dr Hammond was concerned in the unsuccessful rising at Tunbridge in favour of King Charles I., and was obliged to flee in disguise to Oxford, then the royal headquarters. There he spent much of his time in writing, though he accompanied the king's commissioners to London, and afterwards to the ineffectual convention at Uxbridge in 1645, where he disputed with the Presbyterian Vines. In his absence he was appointed canon of Christ Church and public orator of the university. These dignities he relinquished for a time in order to attend the king as chaplain during his captivity in the hands of the parliament. When Charles was deprived of all his loyal attendants at Christmas 1647, Hammond returned to Oxford and was made subdean of Christ Church, only, however, to be removed from all his offices in 1648 by the parliamentary visitors, who imprisoned him for ten weeks. Afterwards he was permitted, though still under quasi-confinement, to retire to the house of Sir Philip Warwick at Clapham in Bedfordshire. In 1650, having regained his full liberty, Hammond betook himself to the friendly mansion of Sir John Pakington, at Westwood, in Worcestershire, where he died on April 25, 1660, just on the eve of his preferment to the see of Worcester.

Independently of his works, Hammond possessed qualities entitling him to be remembered long after the former are forgotten. He was an excellent preacher. Charles I. pronounced him the most natural orator he had ever heard. His range of reading was extensive. A diligent scholar and a copious writer, he left no time for idleness, which he regarded as the heaviest burden and most dangerous temptation of man.

His writings, published in 4 vols. fol., 1674–84, consist for the most part of controversial sermons and tracts. The best of them are his *Practical Catechism*, first published in 1644; his *Paraphrase and Annotations on the New Testament*; and an incomplete work of a similar nature on the Old Testament. His *Life*, written by Bishop Fell, and prefixed to the collected *Works*, has been reprinted in vol. iv. of Wordsworth's *Ecclesiastical Biography*. See also Lloyd's *Memoires*, 1668, and *Life of Henry Hammond*, by the Rev. G. G. Perry.

HAMON, Jean Louis (1821–1874), one of the best known of French painters under the second empire, was born at Plouha on 5th May 1821. At an early age he was destined to the priesthood, and placed under the care of the brothers Lamennais, but his strong desire to become a painter finally triumphed over family opposition, and in 1840 he courageously left Plouha for Paris,—his sole resources being a pension of five hundred francs, granted him for one year only by the municipality of his native town. At Paris Hamon received valuable counsels and encouragement from Delaroche and Gleyre, and in 1848 he made his appearance at the Salon with Le tombeau du Christ (Musée de Marseille), and a decorative work, Dessus de Porte. The works which he exhibited in 1849—Une Affiche Romaine, L'Égalité au Sérail, and Perroquet jasant avec deux jeunes Filles—obtained no marked success. Hamon was therefore content to accept a place in the manufactory of Sèvres, but an enamelled casket by his hand having attracted notice at the London International Exhibition of 1851, he received a medal, and, reinspired by success, left his post to try his chances again at the Salon of 1852. La Comédie Humaine, which he then exhibited, turned the tide of his fortune, and Ma sœur n'y est pas (purchased by the emperor) obtained for its author a third class medal in 1853. At the Paris International Exhibition of 1855, when Hamon re-exhibited the casket of 1851, together with several vases and pictures of which L'Amour et son Troupeau, Ce n'est pas moi, and Une Gardeuse d'Enfants were the chief, he received a medal of the second class, and the ribbon of the legion of honour. In the following year he was absent in the East, but in 1857 he reappeared with Boutique à quatre Sous, Papillon enchaîné, Cantharide esclave, Dévideuses, &c., in all ten pictures; L'Amour en visite was contributed to the Salon of 1859, and Vierge de Lesbos, Tutelle, La Volière, L'Escamoteur, and La Sœur aînée were all seen in 1861. Hamon now spent some time in Italy, chiefly at Capri, whence in 1864 he sent to Paris L'Aurore and Un Jour de Fiançailles. The influence of Italy was also evident in Les Muses à Pompei, his sole contribution to the Salon of 1866, a work which enjoyed great popularity and was re-exhibited at the International Exhibition of 1867, together with La Promenade, and six other pictures of previous years. His last work, Le triste Rivage, appeared at the Salon of 1873. It was painted at St Raphael, where Hamon had finally settled in a little house on the shores of the Mediterranean, close by Alphonse Karr's famous garden. In this house he died on the 29th of May 1874, and the contents of his studio and portfolios were dispersed at an obscure sale—thinly attended—for an almost nominal sum. Hamon had made his own a quiet place amongst those workers who since the days of Vien and David have been trying to bring home to us something of the external aspect of classic time. He had neither the power nor the learning which might have enabled him to give to that aspect any very real shape, nor was the side of human life with which he was most concerned weighty or important. He especially loved the gestures of children and their little ways,—now comic, now cunning, but always naive, and always full of charms. Dressed in classic fashion they play on the canvas of Hamon, with endless fanciful alterations, the same nursery comedies of which Ma sœur n'y est pas is one of the best examples. The painter's very mannerisms, his pale colour, and the hazy atmosphere which pervades his often rather empty field, enhance the graceful unreality of these little creatures, who are not quite classic loves nor yet altogether human babies.

HAMPDEN, John (1594–1643), the eldest son of William Hampden of Great Hampden in Buckinghamshire, by Elizabeth, second daughter of Sir Henry Cromwell, and aunt of Oliver, the future Protector, was born in 1594. By his father's death, when he was but a child, he became the owner of a good estate, and a ward of the crown. He was educated at the grammar school at Thame, and in 1609 he became a commoner of Magdalen College at Oxford. In 1613 he was admitted a student of the Inner Temple, and in 1619 he married Elizabeth Symeon. He first sat in parliament for the borough of Grampound in 1621. From that time he was a member of every succeeding parliament till he died.

To the biographer who does not wish to become an historian under the pretence of narrating the incidents of his hero's life, Hampden's career must appear to give little scope for narrative. The letters which he left behind him are few. His speeches are scarcely more numerous and are extremely brief. In the early days of his parliamentary career he was content to be overshadowed by Eliot, as in its later days he was content to be overshadowed by Pym, and to be commanded by Essex. Yet it is Hampden, and not Eliot or Pym, who lives in the popular imagination as the central figure of the English revolution in its earlier stages. It is Hampden whose statue rather than that of Eliot or Pym has been selected to take its place in St Stephen's Hall as the noblest type of the parliamentary opposition, as Falkland's has been selected as the noblest type of parliamentary royalism.

Something of Hampden's fame no doubt is owing to the position which he took up as the opponent of ship money. But it is hardly possible that even resistance to ship-money would have so distinguished him but for the mingled massiveness and modesty of his character, his dislike of all pretences in himself or others, his brave contempt of danger, and his charitable readiness to shield others as far as possible from the evil consequences of their actions. Nor was he wanting in that skill which enabled him to influence men towards the ends at which he aimed, and which was spoken of as subtlety by those who disliked his ends.

During the last two parliaments of James and the first three parliaments of Charles, Hampden did not, so far as we know, open his lips in public debate, but he was increasingly employed in committee work, for which he seems to have had a special aptitude. In 1626 he took an active part in the preparation of the charges against Buckingham. In January 1627 he was bound over to answer at the council board for his refusal to pay the forced loan. Later in the year he was committed to the gate house, and then sent into confinement in Hampshire, from which he was liberated just before the meeting of the third parliament of the reign, in which he once more rendered useful but unobtrusive assistance to his leaders.

When the breach came in 1629 Hampden is found in epistolary correspondence with the imprisoned Eliot, discussing with him the prospects of the Massachusetts colony, or rendering hospitality and giving counsel to the patriot's sons now that they were deprived of a father's personal care.

It was not till 1637, however, that his resistance to the payment of ship-money gained for his name the lustre which it has never since lost. Seven out of the twelve judges decided against him, but the connexion between the rights of property and the parliamentary system was firmly established in the popular mind.

In the Short Parliament of 1640 Hampden stood forth amongst the leaders. During the eventful months which followed, when Strafford was striving in vain to force England, in spite of its visible reluctance, to support the king in his Scottish war, tradition has much to tell of Hampden's activity in rousing opposition. It is likely enough that the tradition is in the main true, but we are not possessed of any satisfactory evidence on the subject.

In the Long Parliament, though Hampden was by no means a frequent speaker, it is possible to trace his course with sufficient distinctness. Unwearied in attendance upon committees, he was in all things ready to second Pym, whom he plainly regarded as his leader. In the earlier proceedings of the Commons there was practically unanimity in the House, though a difference afterwards arose as to the form in which the attack upon Strafford should be conducted. All were agreed in desiring that the constitution should rest upon a combination between the king and the two Houses, and that legal questions in which the king was concerned should be decided only by the judges of the ordinary courts.

There was another point on which there was no agreement. A large minority wished to retain Episcopacy, and to keep the Common Prayer Book unaltered, whilst the majority were at least willing to consider the question of abolishing the one and modifying the other. On this subject the parties which ultimately divided the House and the country itself were fully formed as early as February 8, 1641. The details of the contest between Episcopacy and Presbyterianism will be more fitly told in connexion with the life of Pym. It is enough to say that Hampden fully shared in the counsels of the opponents of Episcopacy. It is not that he was a theoretical Presbyterian, but the bishops had been in his days so fully engaged in the imposition of obnoxious ceremonies that it was difficult if not impossible to dissociate them from the cause in which they were embarked. Closely connected with Hampden's distrust of the bishops was his distrust of monarchy as it then existed. The dispute about the church therefore soon attained the form of an attack upon monarchy, and, when the majority of the House of Lords arrayed itself on the side of Episcopacy and the Prayer Book, of an attack upon the House of Lords as well.

No serious importance therefore can be attached to the offers of advancement made from time to time to Hampden and his friends. Charles would gladly have given them office if they had been ready to desert their principles. Every day Hampden's conviction grew stronger that Charles would never abandon the position which he had taken up. He was therefore a warm supporter of the Grand Remonstrance, and was chosen out to be one of the five impeached members whose attempted arrest brought at last the opposing parties into open collision. In the angry scene which arose on the proposal to print the Grand Remonstrance it was Hampden's personal intervention which prevented an actual conflict, and it was after the impeachment had been attempted that Hampden laid down the two conditions under which resistance to the king became the duty of a good subject. Those conditions were an attack upon religion, and an attack upon the fundamental laws. There can be no doubt that Hampden fully believed that both those conditions were fulfilled at the opening of 1642.

When the civil war began Hampden levied a regiment of Buckinghamshire men for the parliamentary cause. In the earlier operations of the war, and in the undecided fight of Edgehill, he bore himself gallantly and well. But it is not on his skill as a regimental officer that Hampden's fame rests. In war as in peace his distinction lay in his power of disentangling the essential part from the non-essential. In the previous constitutional struggle he had seen that the one thing necessary was to establish the supremacy of the House of Commons. In the military struggle which followed he saw, as Cromwell saw afterwards, that the one thing necessary was to beat the enemy. He protested at once against Essex's hesitations and compromises. In the formation of the confederacy of the six associated counties, which was to supply a basis for Cromwell's operations, he took an active part. His influence was felt alike in parliament and in the field. But he was not in supreme command, and he had none of that impatience which often leads able men to fail in the execution of orders of which they disapprove. His precious life was a sacrifice to his unselfish devotion to the call of discipline and duty. On June 18, 1643, when he was holding out on Chalgrove Field against the superior numbers of Rupert till reinforcements arrived, he received two carbine balls in the shoulder. Leaving the field he reached Thame, and after nearly six days he died on the 24th praying for his country and his king. (S. R. G.)

HAMPDEN, Renn Dickson (1793-1868), bishop of Hereford, was born at Barbados, where his father was colonel of the local militia, in 1793, and after receiving a private school education under Dr Rowlandson, vicar of Warminster, Wiltshire, entered as a commoner at Oriel College, Oxford, in 1810. Having taken his B.A. degree with first-class honours in both the classical and mathematical schools in 1813, he in the following year obtained the chancellor's prize for a Latin essay "On the Office of the Ephors at Sparta," and shortly afterwards he was elected to a fellowship in his college, Keble, Newman, and Arnold being among the number of his contemporaries. Having left the university in 1816 he held successively the curacies of Newton, Faringdon, and Hackney, and in 1827 he published *An Essay on the Philosophical Evidence of Christianity*, followed by a volume of *Parochial Sermons illustrative of the importance of the Revelation of God in Jesus Christ* (1828). In 1828 he returned to Oxford as tutor of Oriel, and after having twice acted as public examiner in classics, he was selected to preach the Bampton lectures in 1832, when he chose for his subject *The Scholastic Philosophy considered in its Relation to Christian Theology* (1833; 3d ed. 1848). Notwithstanding a charge of Arianism now brought against him by the Tractarian party, he in 1833 obtained the principalship of St Mary's Hall, and in 1834 the chair of moral philosophy; nor did a university statute of censure against him on the ground of the supposed heterodoxy of the Bampton lectures avail to check his promotion to the regius professorship of divinity in 1836. There resulted a widespread and violent though ephemeral controversy, after the subsidence of which he published a *Lecture on Tradition*, which has passed through several editions, and a volume on *The Thirty-nine Articles of the Church of England*. His nomination by Lord John Russell to the vacant see of Hereford in December 1847 was again the signal for a violent and organized opposition; and his consecration in March 1848 took place in spite of a remonstrance by many of the bishops and the resistance of Dr Merewether, the dean of Hereford, who went so far as to vote against the election when the *congé d'élire* reached the cathedral. As bishop of Hereford Dr Hampden made no change in his long-formed habits of studious seclusion, and his episcopate was not characterized in a special degree by any form of churchly activity or zeal. Among the more important of his later literary performances were the articles on Aristotle, Plato, and Socrates, contributed to the eighth edition of the *Encyclopædia Britannica*, and afterwards reprinted with additions under the title of *The Fathers of the Greek Philosophy* (Edinburgh, 1862). In 1866 he had a paralytic seizure which unfitted him for severe mental exertion, and he died at London on the 23d of April 1868.

HAMPSHIRE, HANTS, or SOUTHAMPTON (most anciently *Hamtunscire*, in Domesday book *Hantescire*, and in the documents of the Middle Ages *Sudhantescire*, *Sudhamtunsire*, and *Sudenhamptonsire*), a maritime county in the south of England, is situated between 50° 34′ and 51° 22′ N. lat. and 0° 43′ and 1° 54′ W. long., and is bounded on the N. by Berkshire, on the E. by the counties of Surrey and Sussex, on the S. by the English Channel, and on the W. by Wiltshire and Dorsetshire. It is of an irregular quadrilateral form, and its greatest breadth from north to south, not including the Isle of Wight, is 46 miles, and its greatest breadth from east to west 41 miles. The total area comprises 1,032,105 imperial acres (mainland portion 938,764 acres, Isle of Wight 93,341), or nearly 1613 square miles. Hampshire in its general aspect presents a beautiful variety of gently rising hills and fruitful valleys, adorned with numerous mansions and pleasant villages, and interspersed with extensive woodland. Two ranges of low chalk hills, known as the North and South Downs, enter the county from Surrey and Sussex respectively, and traverse it in a north-westerly direction into Wiltshire and Berkshire, forming in the north-western corner of the county several picturesque eminences, from which some fine views are obtained. The highest of these summits is Sidown Hill, Highclere, 940 feet. The northern and north-eastern portion of the county, comprising more than [illegible] acres, is in the basin of the Thames; a large portion of the southern district is in the Southampton or Isle of Wight basin; and a portion to the west is in the basin of Wilts and Dorset. The south-western corner from Southampton Water is almost wholly occupied by the New Forest. The coast on the whole is low and irregular. The most easterly part forms a large bay containing Hayling Island and Portsea Island, which divide it into Chichester harbour, Langston harbour, and Portsmouth harbour. From the south-western extremity of Portsmouth harbour it runs about 18 miles inland in a north-west direction, and forms Southampton Water, which has a western shore about 10 miles in length, and an average breadth of nearly 2 miles at high water. From Southampton Water its line is continued irregularly in a south-western direction—for nearly one-half of its extent fronting the Isle of Wight, and in its western half forming Christchurch Bay and part of Poole Bay.

Rivers and Canals.—The principal rivers are the Avon, the Boldre, the Exe, the Test with its tributary the Anton, the Itchen, and the Hamble. The Avon in the south-west of the county has its source in Wiltshire, and passing Fordingbridge and Ringwood empties itself into Christchurch Bay, where it is joined by the Stour, which rising in Dorset crosses the south-west corner of Hampshire. The Boldre takes its rise in the New Forest, and after collecting the water of several brooks falls into Lymington creek. The Exe near the eastern extremity of the New Forest falls into the Solent at Beaulieu. The Test rises near Overton, and after its junction with the Anton at Fullerton passes Stockbridge and Romsey, and forms the head of Southampton Water. The Itchen rises near Alresford, and flowing by Kingsworthy, Winchester, and Twyford falls into the Southampton Water to the north of Southampton. The Hamble rises near Bishop's Waltham, and after a course of about 10 miles falls into the Southampton Water. The Wey, the Enbourne, the Loddon, and the Blackwater have their rise in the north part of the county, but soon pass into Berkshire.

There is one canal, Basingstoke, begun in 1778 and completed in 1794 at a cost of £100,000. It is 37 miles in length and terminates in the river Wey, in Surrey, near its junction with the Thames. Andover canal, begun in 1789, was filled up in 1858 and converted into a railway, forming a junction with the London and Exeter at Andover.

Geology and Soil.—With the exception of the northern and north-eastern corner occupied by the basin of the Thames, another portion about 8 miles in breadth extending along the eastern side, and the New Forest in the south-west, with a small portion to the north of it, Hampshire is occupied by the Chalk formation which runs from Sussex and Surrey north-east into Wilts and Berks. This middle district has a length from north to south of about 22 miles and a breadth from east to west of between 20 and 30 miles. Its soil is in some places of considerable depth, and produces good crops of all kinds, but a great part of it is so thin as to be unfitted for the plough, and is used as sheep pasture. The basin of the Thames to the north of this district is principally strong brown and grey loam, with a considerable number of marshes. The eastern portion forming the Vale of Petersfield, and comprising only about 50,000 acres, rests on the Wealdean formation, and is a grey sandy loam provincially called "malmy" land, lying on a soft sand rock. The southern portion, which includes the ancient Forest of Bere, Waltham Chase, and the New Forest, consists principally of light sandy and gravelly loams intermixed with clay and brick earth, resting chiefly on argillaceous and calcareous marl.

Agriculture.—According to the Agricultural Statistics for 1879, the total area of arable land was 706,927 imperial acres, of which 247,958 were under corn crops, 135,982 under green crop, 112,813 under rotation grasses, 184,141 permanent pasture, and 22,967 fallow. The acreage under woods was 87,229. The principal grain crop is wheat, for which Hampshire enjoys a great celebrity. Its acreage has been gradually increasing, and in 1879 was 100,090. The acreage of barley and oats was 66,228, and 64,957 respectively. Barley is usually sown after turnips, and is more grown in the uplands than in the lower levels. Beans and pease are only grown to a small extent, the acreage in 1879 being respectively [illegible] and 10,992. On account of the number of sheep pastured on the uplands a large breadth of turnips is grown, their acreage in 1879 being 81,472. Potatoes are not cultivated beyond what is necessary for home supplies, and had an acreage of only [illegible]. Rotation grasses are grown chiefly in the uplands, and their acreage is greater than in any other of the southern counties of England. [illegible] is the grass most largely grown, as it is best adapted to land with a [illegible] subsoil. In the lowlands [illegible] and scarcely any clover is grown, the hay being supplied from the rich water meadows, which are managed with great skill and attention, and are the best meadow-land in the county. [illegible] traces of vegetation appear in the neighbouring fields. Hops are extensively grown in the eastern part of the county bordering on Surrey. Their acreage in 1879 was [illegible]. Farming is generally conducted on the best modern principles, but [illegible] forests is still covered with wood. [illegible] New Forest [illegible] Forest of Bere [illegible] Waltham Chase [illegible] Isle of Wight [illegible] in the forest. It also contains an abundance of deer, and at one time it was famed for its pigs. The honey of the county enjoys a special celebrity.

The number of cattle has increased with the improved facilities for railway transport, and in 1879 was 66,059, or an average of 9·3 to every 100 acres under cultivation, as compared with 16·9 for England and [illegible] for the United Kingdom. Of these the number of cows and heifers in milk or in calf was 35,128. The cattle are of no distinctive breed. The number of horses, to the breeding and rearing of which much attention is paid, was 29,247 in 1879, or an average of 4·1 to every 100 acres under cultivation, as compared with 4·5 for England and 4·1 for the United Kingdom. The number of sheep in 1879 was [illegible], or an average of 78·2 to every 100 acres under cultivation, as compared with 75·3 for England and 68·0 for the United Kingdom. The original breed was white-faced with horns, but most of the flocks now are of a Southdown variety which have acquired certain distinct peculiarities, and are known as "short wools" or "Hampshire downs." The number of pigs in 1879 was [illegible], or an average of 8·0 to every 100 acres, as compared with 7·2 for England and 6·7 for the United Kingdom. The breeding and fattening of pigs has long been a most important part of Hampshire industry. The original breed of pigs has been improved by crossing with Berkshire, Essex, and Chinese pigs. In the vicinity of the forests the pigs are fed on acorns and beechmast, and the pork of those so reared is considered the best, although the reputation of the Hampshire bacon depends chiefly on the skilful manner in which it is cured.

According to the Landowners' Return of 1872-73, the land was divided between 27,472 proprietors, holding land the gross annual value of which was £2,169,124. Of the owners 77 per cent. possessed less than one acre, and the average all over was £2, 10s. 2½d. There were no fewer than 35 proprietors holding upwards of 5000 acres, viz.—Earl of Portsmouth, 16,401; Duke of Wellington, 15,847; Lord Ashburton, 15,350; Sir William Heathcote, Bart., 14,189; Lord Bolton, 13,808; Melville Portal, 10,566; Earl of Carnarvon, [illegible]; Lord Northbrook, 9236; Earl of Normanton, [illegible]; Lord Henry Scott, 8922; executors of John B. W. Fleming, [illegible]; Sir J. B. Simeon, 8724; Thomas Chamberlayne 8535; Thomas Thistlethwayte, 8084; Thomas Baring, 8058; Sir J. C. Jervoise, [illegible]; College of Winchester, 7269; Sir H. A. Tichborne, [illegible]; Sir Henry Mildmay, 6762; Crown Property, 6554; H. P. Delme, [illegible]; Rev. Thomas Best, 6184; F. J. E. Jervoise, 6183; W. W. B. Beach, [illegible]; Dean and Chapter of Westminster, 5837; W. F. Cowper-Temple, [illegible]; John Bonham Carter 5621; John Morant, [illegible]; W. H. Kingsmill, 5361; Lord Heytesbury, 5195; Edgar A. Drummond, 5155; W. H. S. Stanley, 5150; William H. Iremonger, [illegible]; Edward Knight, 5044; Lady Jane Mill, 5040.

Manufactures and Trade.—The manufactures are unimportant except those carried on at Portsmouth and Gosport in connexion with the royal navy. There are large steam docks and an extensive shipping trade at Southampton. In many of the towns there are breweries and tanneries, and paper is manufactured at several places. Fancy pottery and terra cotta are made at Fareham and Bishop's Waltham; and Ringwood is celebrated for its knitted gloves. At most of the coast towns fishing is prosecuted, and there are oyster beds at Hayling Island. Cowes in the Isle of Wight is the station of the royal yacht squadron and has building yards for yachts and large steamers. The principal bathing-places, besides those in the Isle of Wight, are Southsea, Southhayling, Bournemouth, and Anglesea, a suburb of Gosport. At Portsmouth there is a convict prison, at Parkhurst a prison for convict boys, and at Aldershot a large military camp.

Railways.—The London and South-Western Railway enters the county at Farnborough, passing by Winchester and from thence to Southampton, a branch diverging from Bishopstoke to Gosport, and another to Portsmouth, Havant, and Emsworth, *via* the South Coast Railway, by a branch from Fareham. A branch of the Great Western from Reading joins the South Western at Basingstoke, about a mile south-west from which a line diverges to Whitchurch, Andover, and Salisbury. The Guildford and Reigate branch of the South Coast Railway communicates with Alton and New Alresford, 6 miles west of which it joins the South Western. Southampton communicates with Dorchester by the Dorchester Railway which, after branching to Lymington, passes Ringwood, from which there is another branch to Christchurch and Bournemouth. Another line connects Southampton with Salisbury, and from this line a branch 4 miles north of Romsey communicates with Andover.

Administration.—Hampshire, including the Isle of Wight, comprises 38 "hundreds," 10 "liberties," 1 city, that of Winchester ([illegible]), which is also a municipal and parliamentary borough; 5 other boroughs which are both municipal and parliamentary, viz., Andover ([illegible]), Lymington ([illegible]), Newport (8522), Portsmouth ([illegible]), and Southampton ([illegible]); 2 parliamentary boroughs, viz., Christchurch (15,415) and Petersfield ([illegible]); and 3 municipal boroughs, Basingstoke ([illegible]), Romsey (2056), and Ryde (11,260).

For parliamentary purposes Hants is formed into three divisions, viz., North Hants, South Hants, and the Isle of Wight. Winchester which returns 2 members, and Andover and Petersfield which return 1 member each are in the northern division, which returns in all 6 members; in the southern division are included the boroughs of Christchurch and Lymington returning 1 member each, and the boroughs of Portsmouth and Southampton returning 2 each, and it returns in all 8 members; the Isle of Wight returns 1 member, and also contains the borough of Newport returning 1 member. The total representation of the county is thus 16 members.

The county has one court of quarter sessions, and is divided into 14 petty sessional divisions. The city of Winchester, and the boroughs of Andover, Portsmouth, and Southampton (a county of itself), have commissioners of the peace and separate courts of quarter sessions; and the boroughs of Basingstoke, Newport, Romsey, and Ryde have commissions of the peace. In the borough of Lymington the mayor and ex-mayor are magistrates, and the county justices have concurrent jurisdiction. The county is included in the western circuit, and ecclesiastically is almost entirely in the diocese of Winchester.

Population.—The total population of the county amounted in 1841 to 354,682, in 1851 to 405,370, in 1861 to 481,815, and in 1871 to 544,684 (males, 275,393; females, 269,291). The increase in 30 years from 1841 has been 54 per cent., and since 1801 it has been 97 per cent. The excess of males over females is accounted for by the naval and military establishments situated in the county. In 1871 the mainland portion contained a population of 478,465, and the Isle of Wight 66,219.

History and Antiquities.—Before the Roman invasion the Welsh Celts of Hampshire had been driven out or subdued by incursions of Gauls, who first took possession of the country round Winchester to the west of the great forest of Andresweald, stretching into Hampshire from Sussex, and gradually occupied the greater part of the southern shires from Surrey and Sussex to Devon. It was probably during this prolonged contest that the intrenched camps were formed at Beacon Hill, Bury Hill, Danebury, Quarley Mount, and Worldbury Mount. The Gauls whom the Romans found in South Britain were divided into three tribes—the *Regni* on the coast, the *Belgæ* in the middle, and the *Atrebates* in the north. Their chief town occupied the site of the modern Winchester, and was known as *Venta Belgarum* by the Romans, who made it one of their principal stations. From it roads, traces of which may yet be seen, were constructed to Sorbiodunum (Old Sarum), Silchester, and Southampton, and to Porchester (Portsmouth) and Chichester. Next to *Venta Belgarum* the most important Roman station in Hampshire was *Calleva* (probably Silchester), where there are yet very extensive remains; traces of a large station (*Clausentum*) are still to be seen at Southampton; at Portsmouth portions of an old Roman fort are incorporated in the castle of Porchester; at Broughton, near Stockbridge, slight traces of a station are still visible; and an intrenchment at Egbury Hill, near Whitchurch, is regarded by some as the remains of the ancient *Vindomis*, although others place the site of that town at Silchester. Even before the Roman conquest of Britain the southern shores of England had been frequently attacked by Saxon pirates, and afterwards, in 475, the warriors Hengist and Horsa had succeeded ultimately and with great difficulty in establishing themselves in Kent; but the real conquest of southern Britain was accomplished by a Saxon tribe called *Gewissa* or *Gewissi*, who about the year 495, under Cerdic and his son Cynric, landed from five ships on the shores of Southampton Water, and concluded a stubborn contest by defeating the Britons at Charford in 519, from which period is generally dated the origin of the kingdom of Wessex, which had for its capital Winchester, then known as Wintanceaster or Winteceaster. The establishment of the bishop's see at Winchester, after the conversion of King Kynegils of Wessex about 635, falls more appropriately to be noticed in the article on that city. In 755, according to the Saxon chronicle, Sigebert, king of Wessex, was deprived by the witan of the whole of his kingdom, with the exception of *Hamtanscire*, the first time that the name occurs. Hampshire played a prominent part in the contest with the Danes or Northmen, who about 860 stormed Winchester, but were afterwards worsted, in 871 defeated Ethelbert at Basing, and in 878 compelled King Alfred to retreat to the woods and fastnesses. The devastation of the Isle of Wight by the Danes in the reign of Ethelred II., and the other historical events connected with that island, will be noticed in the article WIGHT, ISLE OF. Under Edward the Confessor and Harold II. the seat of government had been transferred from Winchester to Westminster, but the honour was again restored to Hampshire by William the Conqueror, who made Winchester his principal residence, and for the purposes of sport devastated a large part of the county to form the New Forest. The superstitious fancies of the time traced a necessary connexion between this violent exercise of his prerogatives and the sudden death of his sons and grandson within the boundaries of the scene of his ruthless devastations: his son Richard was smitten with sudden death in the New Forest while hunting; a second Richard, a natural son of Robert his eldest son, met his death there accidentally; and William Rufus, his eldest son and his successor, while hunting within it was shot by an arrow in 1100. The loss which the [illegible] sustained by the final transference of the seat of government to London was partially compensated for by the rise of the ports of Southampton and Portsmouth, which have been an important element in its prosperity down to the present time. The principal other historical events of the shire are connected either with these two towns or with Winchester or the Isle of Wight, the only exception of importance being the siege and capture of Basing House by the troops of Cromwell in 1645.

The principal monastic institutions in Hampshire, dissolved by Henry VIII., were the priory of St Swithin, who was bishop of Winchester from 852 to 862; the monastery of Hyde, outside the walls of Winchester, founded by King Alfred; the nunnery of St Mary's, Winchester; St Elizabeth's College, Winchester; the nunnery of Wherwell, founded by Elfrida; the Augustinian priory of [illegible], founded by William of Wykeham; the Premonstratensian abbey of Tichfield, founded in the time of Henry III.; the Augustinian priory of Twynham, Christchurch, founded according to some authorities by King Athelstan; the Augustinian priory of Breamore, founded by Baldwin de Redvers; the nunnery of Romsey, founded by Edward the Elder about [illegible]; the Augustinian priory of [illegible], endowed soon after the Conquest, but by [illegible]; the Cistercian abbey of Beaulieu, founded by King John in 1204; the Cistercian abbey of Netley, founded in the time of Henry III.; the Augustinian priory of St Denis, near Southampton, founded by Henry I.; the abbey of Quarr, Isle of Wight; and the preceptory of [illegible]. The most important monastic remains are those at Winchester; the priory church at Christchurch, in the Norman and Perpendicular style; the Norman church at Romsey; the remains of Netley Abbey, with a church in the Early English style; the ruins of Beaulieu Abbey, of which a gateway is in good preservation (the abbot's house has been converted into a private residence, and the great hall or refectory, in the plain Early English style, is now used as a parish church); the ruins of the priory of St Denis, and the Norman church at Portchester, near Portsmouth. Corhampton church, near Exton, is the only Saxon church in Hampshire which is entire, but Saxon masonry is found in Headbourne Worthy church, which also contains an old brass of the 15th century. The principal other old churches not mentioned under Winchester, Southampton, and other towns, nor already referred to in connexion with monastic remains, are in the Norman style, Chilcombe, Hamble, Kingsclere, and [illegible]; in the Norman style, with Early English additions, Alton, [illegible], Bishops Sutton, Brockenhurst, [illegible], Hambledon, Milton, and Warnford; in the Early English, Boldre, [illegible], Grateley, [illegible], which is partly Perpendicular, and Thruxton, which contains a brass to Sir John Lisle (died 1407), affording the earliest example of complete plate armour in England; and in the Perpendicular, Basingstoke, Fordingbridge, which is also partly Decorated, Tichfield, Selborne, and Warblington.

The principal old castles are Calshot Castle, built in the time of Henry VIII., and used by the coast guard; Carisbrook Castle, Isle of Wight, [illegible]; Hurst Castle, near Southampton, where [illegible] was for a short time [illegible], now transformed into a fortress, and Porchester Castle near Portsmouth. The modern residences of the gentry are more than usually numerous.

Among the celebrated persons connected with Hampshire may be mentioned Young, author of the *Night Thoughts*; Warton, author of the *History of English Poetry*, Dibdin, Bishop Wykeham, Izaak Walton the angler, Sir William Petty, Jonas Hanway, Brunel, Gilbert White, John Keble, and Charles Dickens.

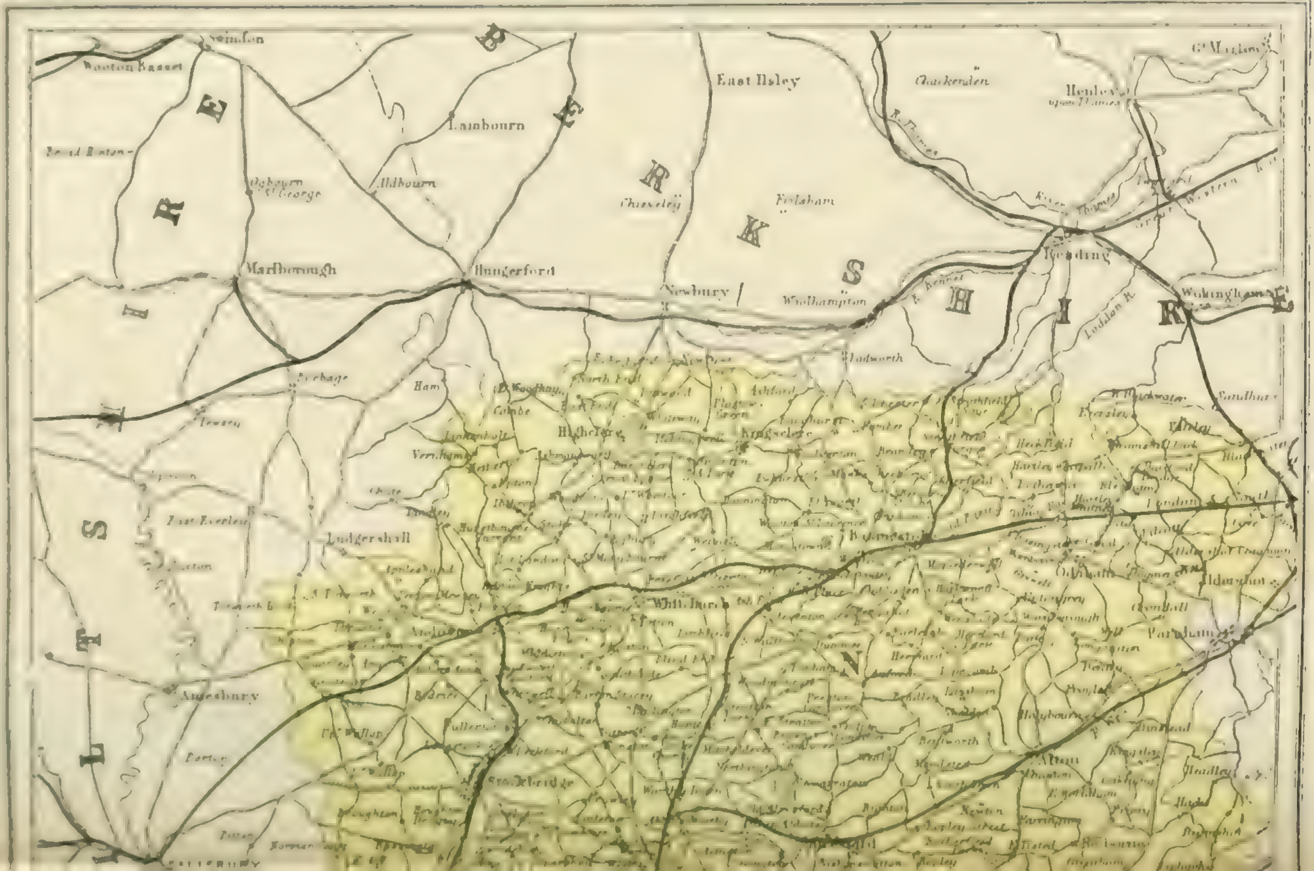
See the general works on the county history of South Britain by Dr [illegible]; and in the *Transactions of the Archaeological Institute*, [illegible]; *Hampshire, extracted from Domesday Book*, by Richard Warner, [illegible]; Moody, *Hampshire in 1086* (1862), and the same author's *Antiquarian and Topographical Sketches*, 1846; [illegible] *of Hants and Wilts*, [illegible]; R. Warner, [illegible], 2 vols., [illegible]; J. Duthie, [illegible]; P. J. Martin, *Geology of Hampshire*, [illegible]; [illegible], 1867; Woodward's important *History of Hampshire*, [illegible], and White's *History and Directory of Hampshire and the Isle of Wight*, 1879.

HAMPSTEAD, a suburb of London, is situated in the county of Middlesex, on the slope of Hampstead Hill, 4 miles N.W. of the city. The village is irregularly built, and the streets are narrow and tortuous, but it has preserved more than any other London suburb its sylvan appearance, and is still noted for its fine groves and avenues. From the side of the hill there issue chalybeate springs, whose virtue was first discovered in the 16th century, and which at the beginning of last century rivalled those of Tunbridge Wells and Epsom in popularity. Their reputation, however, gradually declined after the middle of the century, and now the supply of mineral water has been greatly diminished by the cutting of deep drains and of railway tunnels. Hampstead Heath, an irregular sandy tract occupying the summit and northern slope of the hill, and extending to 240 acres, is much frequented by excursionists and picnic parties. The hill is the highest in the vicinity of the metropolis, being 443 feet above the level of the Thames, or 65 feet higher than the cross of St Paul's. At one time the village was a favourite resort of poets and other men of letters; and among the more famous of its old taverns was the Flask Inn, now converted into a private residence, the meeting place of the Kit Cat club, of which the more celebrated members were Addison, Steele, Richardson, Marlborough, and Walpole. The parish church of St John, consecrated in 1747 and enlarged in 1844, is a plain brick structure in the Italian style with a picturesque tower. The graveyard contains a number of monuments of eminent persons, including those of Sir James Mackintosh, Joanna Baillie, and Constable the artist. Near the village a large militia barracks was erected in 1863, and there are a number of charitable institutions, including a soldiers' daughters' home, a sailors' daughters' home, an orphan working school, and the North London Consumptive Hospital. The population of the parish in 1871 was 32,281.

HAMPTON, a village in the county of Middlesex, England, is situated on the north bank of the Thames, 12 miles W.S.W. from Hyde Park Corner. The parish church erected in 1830, with a square tower at its western end, is without architectural merit, but the churchyard contains a number of interesting old monuments. Among the many fine residences in the vicinity is Garrick Villa, formerly, under the name of Hampton House, the residence of Garrick the famous actor. In the neighbourhood there are a number of large pumping works for supplying London with water. The free grammar school founded in 1556 was reopened in 1878 as a middle-class school, for which the usual fees are charged. The population of the village in 1871 was 2207.

About a mile from Hampton village and close to the river stands Hampton Court Palace, one of the finest extant specimens of the Tudor style of architecture, and formerly a royal residence. It was originally erected by Cardinal Wolsey, who in 1515 received a lease of the old mansion and grounds for 99 years. As the splendour of the building seemed to awaken the cupidity of Henry VIII., Wolsey in 1526 thought it prudent to make him a present of it. It became Henry's favourite residence, and he made several additions to the building, including the great hall and chapel in the Gothic style. Of the original five quadrangles only two now remain, but a third was erected by Sir Christopher Wren for William III. The fine gardens, extending to 44 acres, were laid out at the desire of William III. in the Dutch style, with elevated terraces, long shady walks, and a labyrinth called the "Maze," which is the source of great amusement to visitors. Bushy Park, opposite the palace gardens, is open to the public, and contains a celebrated avenue of chestnut trees. The palace was sold by the parliament in 1641, but afterwards came into the hands of Cromwell, and it continued to be one of the principal residences of the English sovereigns until the time of George II. It was the birthplace of Edward VI., and the meeting place of the conference held in the reign of James I. to settle the dispute between the Presbyterians and the state clergy. It is now partly occupied by persons of rank in reduced circumstances, but its state apartments, picture gallery, and gardens are open to the public free of charge. The celebrated cartoons of Raphael which it formerly possessed have lately been removed to the South Kensington

HAMPSHIRE


BERKSHIRE
WILTSHIRE
Swindon
Wootton Basset
Lambourn
Aldbourn
Ogbourn St George
Marlborough
Hungerford
Chaveley
East Ilsley
Frilsham
Newbury
Woolhampton
Chackenden
Henley upon Thames
Gt Marlow
R. Thames
Reading
R. Kennet
Loddon R.
Wokingham
Great Western Ry
Sandhurst
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Whitchurch
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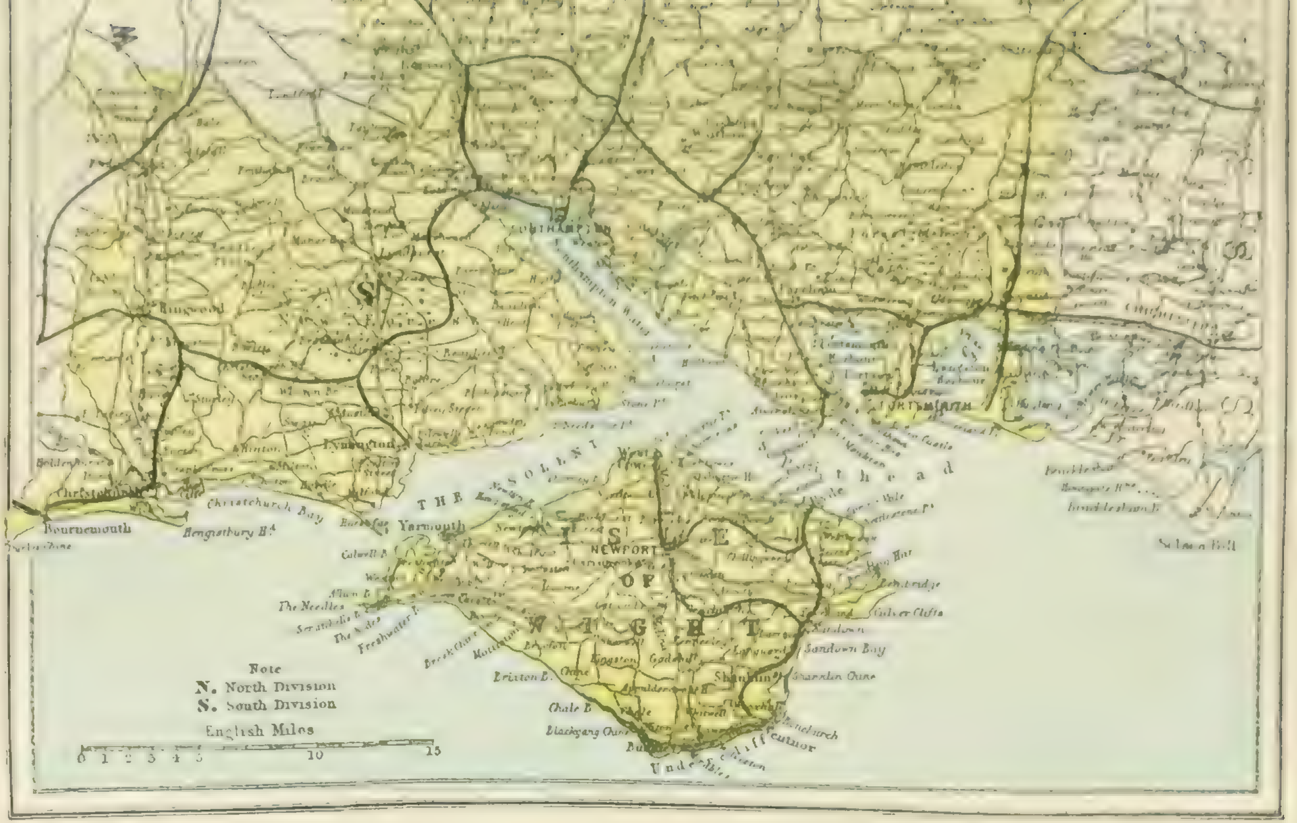
Ringwood
Southampton Water
Portsmouth
Bournemouth
Christchurch
Christchurch Bay
Hengistbury Hd.
Lymington
Yarmouth
THE SOLENT
Spithead
Newport
ISLE OF WIGHT
The Needles
Freshwater
Brixton B.
Chale B.
Blackgang Chine
Shanklin
Sandown Bay
Culver Cliffs
Ventnor
Undercliff
Selsea Bill
Note
N. North Division
S. South Division
English Miles
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Museum, but it still contains a valuable collection of pictures, including a number of fine specimens of the old masters, and a large collection of portraits of persons famous in English history.

HAMSTER (*Cricetus*), a genus of rodent mammals belonging to the *Muridæ* or mouse family, and characterized by the possession of large cheek pouches. The common hamster (*Cricetus vulgaris*) is somewhat larger and stouter than the Norway rat, but with a much shorter tail. Its fur, which varies somewhat in colour, is generally of a reddish-brown above and black beneath, with several white spots on the sides. It is found throughout the dry regions of central Europe and Asia, from the Rhine eastward to the river Obi and southward to Persia and the Caucasus. It is a burrowing animal, its subterranean dwelling consisting of several vaults, most of which are used as storehouses for the grain and seeds which the hamster lays up in autumn for consumption during winter and spring. In collecting this store it makes use of its cheek pouches, which are said to be large enough to contain a quarter of an English pint, while the hoard of a single individual will sometimes contain about two bushels of grain. It is thus specially obnoxious to the farmer, who loses no opportunity of destroying the creature and of ransacking its stores. Like many other rodents, the hamster is exceedingly prolific, the female producing several broods in the year, each consisting of over a dozen young, and these when not more than three weeks old are turned out of the parental burrow to form underground homes for themselves. The burrow of the young hamster is only about a foot in depth, while that of the adult descends 4 or 5 feet beneath the surface. On the approach of winter the hamster retires to its subterranean abode, the various entrances to which it carefully closes, and there it remains until the advent of milder conditions, feeding for a while on its well-garnered store, but becoming torpid during the coldest period of winter. Although feeding chiefly on roots, fruits, and grain, it is also to some extent carnivorous, attacking and feeding upon small quadrupeds, lizards, and birds. It is exceedingly fierce and pugnacious, the males especially fighting with each other for possession of the females. The numbers of those destructive vermin are kept in check by their many natural enemies, the foxes, dogs, cats, and polecats, which feed upon them. The skin of the hamster is of some value, and its flesh is used as food. Its burrows are sought after in the countries where it abounds, both for capturing the animal and for rifling its store.

HANAU, a town of Prussia, capital of a circle in the government district of Cassel, province of Hesse-Nassau, is situated at the confluence of the rivers Kinzig and Main, 12 miles E. of Frankfort. It consists of what are called an old and a new town. The streets of the former are narrow and irregular, but the latter, founded at the end of the 16th century by refugee Walloons and Netherlanders, is built in the form of a pentagon with broad streets crossing at right angles, and possesses several fine squares, among which may be mentioned the market-place, adorned with handsome fountains at the four corners. The town is the seat of a circle court, a head tax-office, a chamber of commerce, and a branch of the imperial bank. Among the principal buildings are the ancient castle, formerly the residence of the counts of Hanau; the church of St John, dating from the 17th century, with a rather imposing tower; the old church of St Mary, formerly a collegiate church, and containing the tomb of the counts of Hanau; the church of the new town, built in the beginning of the 17th century, whose ground plan is in the form of two circles intersecting each other; the beautiful new Catholic church, the synagogue, the theatre, the barracks, the arsenal, the orphanage, and the infirmary. Its educational establishments include a gymnasium, a school of design, a real school, and a higher girls' school. There is a Wetteravian society of natural history and an historical society, both of which possess considerable libraries and collections connected with their respective branches of knowledge. Hanau is the birthplace of the brothers Grimm, and the house in which they were born is now adorned with a medallion. In the neighbourhood of the town are the electoral palace, with an extensive park and large orangeries, and the watering-place of Wilhelmsbad. Hanau is the principal commercial and manufacturing town in the province, and stands next to Cassel in point of population. Its staples are ornaments of various kinds, cigars, leather, paper, playing cards, silver and platina wares, chocolate, soap, woollen cloth, hats, silk gloves, stockings, ropes, and matches. It has also three large foundries and a number of breweries, and in the neighbourhood there are extensive powder-mills. It carries on a large trade in wood, wine, and corn, in addition to its articles of manufacture. The population of the town in 1875 was 22,269.

From the number of urns, coins, and other antiquities found near Hanau it would appear that it owes its origin to a Roman settlement. It was raised to the rank of a town in 1393, and in 1528 it was fortified by Count Philip, who rebuilt the castle. At the end of the 16th century its prosperity received considerable impulse from the accession of the Walloons and Netherlanders. During the Thirty Years' War it was in 1631 taken by the Swedes, and in 1636 it was besieged by the imperial troops, but was relieved on the 13th June by Landgrave William V. of Cassel, on account of which the day is still commemorated by the inhabitants. Napoleon on his retreat from Leipsic defeated the Germans under Marshal Wrede at Hanau, October 30, 1813; and on the following day the allies vacated the town, when it was entered by the French. In 1429 Hanau became the capital of a province of the empire, which on the death of Count Reinhard II. was in 1451 partitioned between the Hanau-Munzenberg and Hanau-Lichtenberg lines, but was reunited in 1692 when the elder line became extinct. The younger line received princely rank in 1696, but, as it also became extinct, Hanau-Munzenberg in 1736 was joined to Hesse-Cassel and Hanau-Lichtenberg to Hesse-Darmstadt. In 1785 the whole province was united to Hesse-Cassel, and in 1803 it became an independent principality. In 1813 it again came into the possession of Hesse-Cassel, and in 1866 it was joined to Prussia.

HANCOCK, John (1737–1793), American revolutionary statesman, was born at Quincy, Massachusetts, January 12, 1737. Having taken his degree at Harvard university in 1754, he began a mercantile career, and on the death of an uncle in 1764 succeeded to a large fortune and a prosperous business. In 1768, two years after his election to the Massachusetts house of representatives by the city of Boston, his sloop "Liberty" was seized for contravention of the commercial laws, and in the riot which followed the royal customs commissioners barely escaped with their lives. After the "massacre" of Boston in 1770, Hancock inveighed with such spirit and bitterness against the troops and their officers, demanding their removal from the town, that he became obnoxious to the Government; and five years afterwards the attempt to seize his person led to the first revolutionary battle at Concord, Massachusetts. In 1774 Hancock was president of the provincial congress, and from 1775 to 1777 of the general congress at Philadelphia, where he was the first to sign the declaration of independence. Returning to Massachusetts he assisted in framing its constitution, and in 1780 was chosen first governor. He was annually elected to this dignity till 1785, and again from 1787 to 1793, sitting as an ordinary member of the legislature in the interval. He received the degree of LL.D. from Harvard university in 1792. He died at Quincy, 8th October 1793.

HANDEL, George Frederick (1685–1759), one of the greatest names in the history of music generally, is absolutely paramount in that of English music. His influence on the artistic development of England and his popularity, using that word in the most comprehensive sense, are perhaps unequalled. He has entered into the private and the political life as well as into the art life of Englishmen; without him they cannot bury their dead or elect their legislators; and never has a composer been more essentially national than the German Handel has become in England. It may on the other hand be said that but for his sojourn in that country Handel would never have been what he was. It was under the influence of English poetry, and of English national and religious life, that his artistic conception broadened and gained the dignity and grandeur which we see in his oratorios, and which was wanting, and, seeing the style of art, could not but be wanting, in his Italian operas. The day of Handel's arrival in London, late in the autumn of 1710, was indeed an eventful day in the life of Handel as well as in the annals of English music, and the facts of his biography preceding that date may be summed up with comparative brevity. George Frederick Handel (in German the name is always Händel) was born at Halle in Saxony on February 23, 1685, the same year which gave birth to his great fellow composer Johann Sebastian Bach.[1] He was the son of George Handel, who according to the custom of the time combined the occupations of barber and surgeon, and subsequently rose to be valet-de-chambre to the elector of Saxony. His second wife, Dorothea Taust, was the daughter of a clergyman, and to her the great composer remained attached with all the ties of filial affection. His father was sixty-three years old when Handel was born, and the musical talent shown by the youth at a very early age found little encouragement from the stern old gentleman, who looked upon art with contempt, and destined his son for the law. Many are the anecdotes relating to the surreptitious way in which the youth practised the forbidden art on a little spinet smuggled into his attic by the aid of a good-natured aunt, and fortunately of too feeble tone to be audible in the lower part of the house. At the age of eight the boy accompanied his father on a visit to Saxe-Weissenfels, and it was there that the proficiency acquired in the manner above described was turned to excellent account; for, having made acquaintance with the court musicians, and being allowed to practise on the organ, he was on one occasion overheard by the duke himself, who immediately recognizing his talent spoke seriously to the father on his behalf. To such a remonstrance coming from such a quarter the valet-de-chambre had of course to submit, and henceforth Handel was allowed to practise his art, and after his return to Halle even received musical instruction from Zachau, one of the best organists of the town. It was under his somewhat mechanical but thorough tuition that Handel acquired his knowledge of counterpoint; he also soon became an excellent performer on the organ. His first attempts at composition date from an equally early period, and in his twelfth year he made his début as a virtuoso at the court of Berlin with such success that the elector of Brandenburg, afterwards King Frederick I. of Prussia, offered to send him to Italy, a proposal declined by Handel's father for unknown reasons. In 1697 the latter died, and the young artist was henceforth thrown on his own resources. For some years he remained in Halle, where in 1702 he obtained a position as organist; but in the following year we find him at Hamburg, at that time one of the musical centres of Germany. There the only German opera worth the name had been founded by Reinhold Keiser, the author of innumerable operas and operettas, and was flourishing at the time under his direction. Handel entered the orchestra, and soon rose from his place amongst the second violins to the conductor's seat at the clavicembalo, which he occupied during Keiser's absence, necessitated by debt. It was at Hamburg that he became acquainted with Mattheson, a fertile composer and writer on musical subjects, whose *Vollkommener Kapellmeister* (1739) and *Ehrenpforte* (1740) are valuable sources for the history of music. The friendship of the two young men was not without some curious incidents. On one occasion they set out together on a journey to Lübeck, where the place of organist at one of the churches was vacant. Arrived at Lübeck, they discovered that one of the conditions for obtaining the place was the hand of the elderly daughter of the former organist, the celebrated Buxtehude, whereat the two candidates forthwith returned to Hamburg. Another adventure might have had still more serious consequences. At a performance of Mattheson's opera *Cleopatra* at Hamburg, Handel refused to give up the conductor's seat to the composer, who was also a singer, and was occupied on the stage during the early part of his work. The dispute led to an improvised duel outside the theatre, and but for a large button on Handel's coat which intercepted his adversary's sword, there would have been no *Messiah* or *Israel in Egypt*. In spite of all this the young men remained friends, and Mattheson's writings are full of the most valuable facts for Handel's biography. He relates in his *Ehrenpforte* amongst other things that his friend at that time used to compose "interminable cantatas" of no great merit, but of these no trace now remains, unless we assume that a "Passion" according to St John (German words by Postel), the MS. of which is at the Royal Library, Berlin, is amongst the works alluded to. It was composed in 1704. The year after this witnessed Handel's first dramatic attempt—a German opera, *Almira*, performed at Hamburg on January 8, 1705, with great success, and followed a few weeks later by another work of the same class, *Nero* by name. In 1706 he left Hamburg for Italy, at that time still the great school of music, to which indeed Handel himself owed his skill and experience in writing for the voice. He remained in Italy for three years, living at various times in Florence, Rome, Naples, and Venice. He is said to have made the acquaintance of Lotti, of Alessandro Scarlatti, and of the latter's son Domenico, the father of modern pianoforte playing. His compositions during his Italian period were two operas, two oratorios, *Resurrezione* and *Il Trionfo del Tempo e del Disinganno*, afterwards developed into the English oratorio *The Triumph of Time and Truth*, and numerous other choral works. It was during these years that the composer's earlier or Italian style reached its full maturity, and that his name became widely known in the musical world. In the chief cities of Italy "il Sassone," as Handel, like his countryman Hasse twenty years later, was nicknamed, was received with every mark of favour and esteem. But his own country also began to acknowledge his merits. At Venice in 1709 Handel received the offer of the post of capellmeister to the elector of Hanover, transmitted to him by his patron and staunch friend of later years Baron Kielmansegge. The composer at the time contemplated a visit to England, and he accepted the offer only on condition of leave of absence being granted to him for that purpose. To England accordingly Handel journeyed after a short stay at Hanover, arriving in London towards the close of 1710. Curiously enough he came as a composer of Italian opera, and in that capacity he earned his first success at the Haymarket with the opera *Rinaldo*, composed it is said in a fortnight, and first performed on February 24, 1711. The beautiful and still universally popular air "Lascia ch'io pianga" is from this opera. A similar air in the form of a *sarabande* occurs in *Almira*. After the close of the season in June of the same year Handel seems to have returned to Germany for a short time; but the temptation of English fame or English gold proved too powerful, and in January 1712 we find him back in London, evidently little inclined to return to Hanover in spite of his duties at the court there. Two Italian operas, the celebrated Utrecht *Te Deum* written by command of Queen Anne, and other works belong to this period. It was in such circumstances somewhat awkward for the composer when his deserted master came to London as George I. of England. Neither was the king slow in resenting the wrongs of the elector. For a considerable time Handel was not allowed to appear at court, and it was only through the intercession of his patron Baron Kielmansegge that his pardon was at last obtained. Commissioned by the latter, Handel wrote his celebrated *Water-Music*, which was performed at a great fête on the Thames, and so pleased the king that he at once received the composer to his good graces. A salary of £200 a year granted to Handel was the immediate result of this happy consummation. In 1716 he followed the king to Germany, where he wrote a second German "Passion," the words this time being supplied by Brockes, a well-known poet of the day. After his return to England he entered the service of the duke of Chandos as conductor of his private concerts. In this capacity he resided for three years at Cannons, the duke's splendid seat near Edgeware, and produced the two Te Deums and the twelve Anthems surnamed *Chandos*. The English pastoral *Acis and Galatea* (not to be mistaken for the Italian cantata of that name written at Naples, with which it has nothing in common), and his first oratorio to English words *Esther*, were written during his stay at Cannons. It was not till 1720 that he appeared again in a public capacity, viz., in that of impresario of an Italian opera at the Haymarket Theatre, which he managed for the so-called Royal Academy of Music. Senesino, a celebrated singer, to engage whom the composer specially journeyed to Dresden, was the mainstay of the enterprise, which opened with a highly successful performance of Handel's opera *Radamisto*. *Muzio Scevola*, written in conjunction with Buononcini and Ariosti, *Tamerlane*, *Rodelinda*, and other operas composed for the same theatre, are now forgotten, only detached songs being heard at concerts. To this time also belongs the celebrated rivalry of Handel and Buononcini, a gifted Italian composer, who by his clique was declared to be infinitely superior to the German master. The controversy raised a storm in the aristocratic teapot, and has been perpetuated in the lines generally but erroneously attributed to Swift, and in reality written by John Byrom:—

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[1] The date, 23d February 1684, given on his tombstone in Westminster Abbey is incorrect.

> Some say, compared to Buononcini,
> That Mynheer Handel's but a ninny;
> Others aver that he to Handel
> Is scarcely fit to hold a candle.
> Strange all this difference should be
> 'Twixt Tweedle-dum and Tweedle-dee.

Although the contempt for music, worthy of Chesterfield himself, shown in these lines may seem absurd, they yet contain a grain of truth. Handel differed from his rival only in degree not in essence. In other words, he was an infinitely greater composer than Buononcini, but had he continued to write Italian opera there is no reason to conclude from his existing works of that class that he would have reformed or in any essential point modified the existing *genre*. The contest was therefore essentially of a personal nature, and in these circumstances it is hardly necessary to add that Handel remained victorious. Buononcini for a reason not sufficiently explained left London, and Handel was left without a rival. But in spite of this his connexion with Italian opera was not to be a source of pleasure or of wealth to the great composer. For twenty years the indomitable master was engaged in various operatic ventures, in spite of a rival company under the great singer Farinelli, started by his enemies,—in spite also of his bankruptcy in 1737, and an attack of paralysis caused by anxiety and overwork. Of the numerous operas produced by him during this period it would be needless to speak in detail. Only the name of the final work of the long series, *Deidamia*, produced in 1741, may be mentioned here. That Handel's non-success was not caused by the inferiority of his works to those of other composers is sufficiently proved by the fact that the rival company also had to be dissolved for want of support. But Handel was in more than one way disqualified for the post of operatic manager, dependent in those days even more than in ours on the patronage of the great. To submit to the whims and the pride of the aristocracy was not in the nature of the upright German, who even at the concerts of the princess of Wales would use language not often heard at courts when the talking of the ladies during the performance irritated him. And, what was perhaps still more fatal, he opposed with equal firmness the caprices and inartistic tendencies of those absolute rulers of the Italian stage—the singers. The story is told that he took hold of an obstinate *prima donna* and held her at arm's length out of window, threatening to drop her into the street below unless she would sing a particular passage in the proper way. Such arguments were irresistible at the time, but their final results were equally obvious, in spite of Handel's essentially kindly nature and the ready assistance he gave to those who really wished to learn. No wonder therefore that his quarrels with virtuosi were numerous, and that Senesino deserted him at a critical moment for the enemy's camp.

It is a question whether Handel's change from opera to oratorio has been altogether in the interest of musical art. The opera lost in him a great power, but it may well be doubted whether dramatic music such as it was in those days would have been a proper mould for his genius. Neither is it certain that that genius was, strictly speaking, of a dramatic cast. There are no doubt in his oratorios,—for in these alone Handel's power is displayed in its maturity—examples of great dramatic force of expression; but Handel's genius was in want of greater expansion than the economy of the drama will allow of. It was no doubt for this reason that from an inner necessity he created for himself the form of the oratorio, which in spite of the dialogue in which the plot is developed is in all essentials the musical equivalent of the epic. This breadth and depth of the epic is recognized in those marvellous choral pieces expressive either of pictorial detail (as the gnats and the darkness tangible and impenetrable in *Israel in Egypt*) or of the combined religious feeling of an entire nation. By the side of these even the finest solo pieces of Handel's scores appear comparatively insignificant, and we cannot sufficiently wonder at the obtuseness of the public which demanded the insertion of miscellaneous operatic arias as a relief from the incessant choruses in *Israel in Egypt* at the second performance of that great work in 1740. Handel is less the exponent of individual passion than the interpreter of the sufferings and aspirations of a nation, or in a wider sense of mankind. Take, for instance, the celebrated *Dead March in Saul*. It is full of intense grief, in spite of the key of C major, which ought once for all to dispel the prejudice that sorrow always speaks in minor keys. Even Chopin himself has not been able to give utterance to the feeling in more impressive strains. And yet the measured and decisive rhythm, and the simple diatonic harmonies, plainly indicate that here a mighty nation deplores the death of a hero. It is for the same reason that Handel's stay in England was of such great influence on his artistic career. Generally speaking, there is little connexion between politics and art. But it may be said without exaggeration that only amongst a free people, and a people having a national life such as England alone had in the last century, such national epics as *Judas Maccabæus* and *Israel in Egypt* could have been engendered. In the same sense the *Messiah* became the embodiment of the deep religious feeling pervading the English people, and Handel, by leaving Italian opera for the oratorio, was changed from the entertainer of a caste to the artist of the people in the highest and widest sense. The *Messiah* is indeed the musical equivalent of Milton's *Paradise Lost*. This leads us to another and equally important aspect of the same subject—the important influence of English poetry on Handel's works. Not only are some of the greatest names of English literature—Milton (*Allegro and Penseroso*), Dryden (*Alexander's Feast*), Pope (*St Cecilia's Ode*)—immediately connected with Handel's compositions, but the spirit of these poets, and especially of Milton, pervades his oratorios even when he has to deal with the atrocious doggerel of Morell or Humphreys. In addition to this Handel received many a valuable suggestion from the works of Purcell and other early English musicians with which he was well acquainted. No wonder therefore that Englishmen claim Handel as one of themselves, and have granted him honours both during his lifetime and after his death such as have fallen to the share of few artists. But in spite of all this it is impossible to deny that the chances of a national development of English music were, if not absolutely crushed, at least delayed for centuries by Handel. Under Elizabeth and James England had a school of music which, after the storms of the civil war, was once more revived by such masters as Pelham Humphrey and his great pupil Purcell. The latter, although cut off in his youth, had left sufficient seed for a truly national growth of English music. But Handel soon concentrated the interest of connoisseurs and people on his own work, and native talent had to abandon the larger sphere of the metropolis for the comparative seclusion of the cathedral. The following is a chronological list of Handel's English oratorios taken from the catalogue of his works appended to Mr J. Marshall's article in Grove's *Dictionary of Music and Musicians*, vol. i. p. 657. *Esther* (1720), *Deborah* (1733), *Athalia* (1733), *Saul* (1738), *Israel in Egypt* (1738), *Messiah* (1741), *Samson* (1741), *Joseph* (1743), *Hercules* (1744), *Belshazzar* (1744), *Occasional* (1746), *Judas Maccabæus* (1746), *Alexander Balas* (1747), *Joshua* (1747), *Solomon* (1748), *Susanna* (1748), *Theodora* (1749), *Jephtha* (1751), *Triumph of Time and Truth* (1757). The sequence of these dates will show that the transition from Italian opera to sacred music was very gradual, and caused by circumstances rather than by premeditated choice. It would lead us too far to enter here into the genesis of each of these works, but a few remarks must be added with regard to Handel's *summum opus* the *Messiah*. It was written in twenty-four days and first performed April 18, 1742, at Dublin, where Handel was staying on a visit to the duke of Devonshire, lord-lieutenant of Ireland. Its first performance in London took place on March 23d of the following year. Its introduction into Handel's native country was due to Philip Emanuel Bach, the son of the great Bach, who conducted it at Hamburg. At Berlin it was for the first time given in April 1786, under the leadership of Adam Hiller, who also introduced it a few months later at Leipsic against the advice of all the musicians of Saxony. At the Berlin performance Signora Carrara, the celebrated singer, inserted in the first part an aria by Traetta, in which, according to a contemporary account, "she took much trouble to please the public, and the bravura passages of which she delivered with great success." Two years before this had taken place the great Handel commemoration at Westminster Abbey, when on the third day of the festival, May 29, 1784, the *Messiah* was splendidly performed by an orchestra and chorus of 525 performers. In the appreciation of Handel England thus was far in advance of Germany. The remainder of Handel's life may be told in few words. Owing to the machinations of his enemies he for a second time became a bankrupt in 1745, but nothing, not even his blindness during the last six years of his life, could daunt his energy. He worked till the last, and attended a performance of his *Messiah* a week before his death, which took place on April 14, 1759. He was buried in Westminster Abbey. His monument is by Roubilliac, the same sculptor who modelled the statue erected during Handel's lifetime in Vauxhall Gardens.

Handel was a man of character and high intelligence, and his interest was not, like that of too many musicians, confined to his own art exclusively. He liked the society of politicians and literary men, and he was also a collector of pictures and articles of vertu. His power of work was enormous, and the list of his works would fill many pages. They belong to all branches of music, from the simple air to the opera and oratorio. His most important works of the two last-named classes have already been mentioned. But his instrumental compositions, especially his concerti for the organ and his *suites de pièces* for the harpsichord, ought not to be forgotten. Amongst the contrapuntists of his time Handel had but one equal—Bach. But he also was a master of the orchestra, and, what is more, possessed the rare gift of genuine melody, unfortunately too often impeded by the rococo embellishments of his arias. The extraordinary rapidity with which he worked has been already referred to. It is true that when his own ideas failed him he helped himself to those of others without the slightest compunction. The system of wholesale plagiarism carried on by him is perhaps unprecedented in the history of music. He pilfered not only single melodies, but frequently entire movements from the works of other masters, with few or no alterations and without a word of acknowledgment.

A splendid collection of Handel's MSS., six volumes in all, is in the possession of her Majesty at Buckingham Palace. The Fitzwilliam Museum at Cambridge also possesses seven volumes, mostly sketches and notes for greater works, in the composer's handwriting. The German and English Handel Societies (the latter founded in 1843 and dissolved in 1848) have issued critical editions of his more important works. Three biographers of Handel deserve mention—an Englishman, Mainwaring, *Memoirs of the Life of the late G. F. Handel* (1760), a Frenchman, M. Victor Schœlcher, and a German, Herr Chrysander. (F. H.)

HAND TOOLS. Within the limits of the present article it would be impossible to describe even the majority of the instruments which may come under this designation, including as it does (in its popular if not in its technical sense) the whole of the appliances used by the handicraftsman in the treatment, by means of his muscular energy, of the natural substances used in the arts and manufactures,—whether in the preliminary operations of setting-out and measuring his materials, in reducing his work to the required form by cutting tools or otherwise, in gauging it and testing its accuracy, or in duly securing it whilst being thus treated. Omitting therefore the large but by no means unimportant class of measuring and gauging instruments, straight edges, templates, &c., we will confine our attention to examples of those in the use of which an actual expenditure of force is necessary. According to the structure and other properties of the materials to be treated by them, these act almost without exception either by impact, by pressure, or by cutting, the last being effected sometimes with impact and sometimes with pressure. The principal tools acting purely by impact are noticed under HAMMER (*q.v.*). Those which depend solely on pressure are for the most part of an auxiliary character only, and their consideration will be deferred till we have glanced at a few of the much more numerous and more important class known as cutting or edge tools.

It should be observed that the term "cutting" is applied to processes which have but little in common, the great differences of structure in the material operated upon demanding equally great differences in the modes of effecting the desired end, which is in almost all cases the forcible separation of their particles in some regular and definite manner. If we regard, for example, the action of a sharp knife upon a piece of chalk as one of true cutting,—i.e., the separation of its particles by the forcible insertion of a wedge-like blade of superior hardness to itself,—we shall find that in by far the larger proportion of instances this simple action is rendered complicated, either through the substance under treatment being insufficiently compact to afford in itself the necessary resistance, or through its want of homogeneity causing a tendency in it to part more readily in some directions than in others. Thus all kinds of wood and the generality of both vegetable and animal substances, being cellular or fibrous in their structure, offer so much less resistance in a direction parallel to their fibres than in one transverse to them that in the former case many of them may be parted by fissure without any true cutting at all. So also with crystalline materials—as is beautifully exemplified by the diamond, which lends itself to cleavage in certain planes in the most perfect manner, though the steel chisel which is employed for the process is very much inferior in hardness to itself. Metals also are frequently not homogeneous; indeed they are sometimes said to be fibrous in structure, but it is only to a very limited extent, if at all, that they are so, and their great natural tenacity even then prevents the separation of their particles except by a true cutting process. Lastly, some stones and minerals, such as sandstones, are said to be cut, though they are formed of material considerably harder than the tools which are used upon them, the fact being that their hard particles are not cut at all, but are merely separated from one another when the cementing material which holds them together is compelled to give way.

I. *Cutting or Edge Tools.*—These, the term "cutting" being thus qualified, are mainly of two classes—(i.) cutting tools used with impact, and (ii.) cutting tools used mainly with pressure. These again may be subdivided into tools used (1) for wood and soft materials, (2) for metal, and (3) for stone and hard substances.

i. 1.—*Wood-tools cutting by impact* comprise all the varieties of axes and adzes, such as the ordinary English pattern of carpenter's axe (*a*, fig. 1), the woodman's felling axe (*b*), the wedge axe (*c*) which was one of the first American improvements in edge tools introduced into Europe, and the shipwright's adze (*d*), which last is a particularly rapid and efficient tool in skilful hands. All these when used in the direction of the grain of the wood act by cleaving rather than by cutting, except when the thickness of the chip removed is so small that its tranverse strength is inferior to the lateral tenacity of the fibres. So also do chisels and gouges when driven by blows from a hammer or mallet. The ordinary mortice chisel (*e*, fig. 2) and the socket chisel (*f*) are specially adapted for being used in this way.

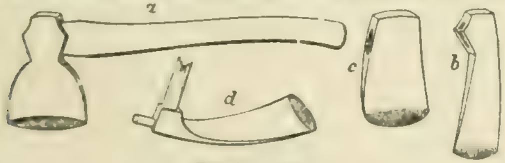


FIG. 1.—Axes.

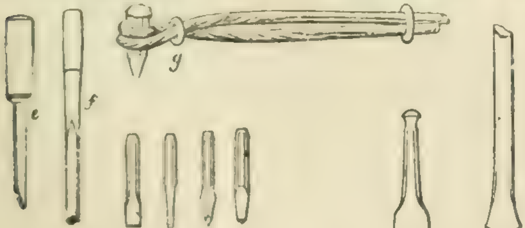


FIG. 2.—Chisels.

2. In the case of *metals* their hardness in general almost precludes the possibility of employing upon them any tools corresponding to the above. If we except a few special tools such as plumbers' knives, &c., chisels will be found to be almost the sole representatives of this class. A blacksmith's chisel (*g*) held in a hazel withe, and used for hot iron, and some common forms of chisel for chipping it cold are shown in fig. 2, these being known as a chipping chisel (*h*), a cross-cut (*j*), a diamond point (*k*), and a round-nose (*l*).

3. Tools of this class for *stone* also consist chiefly of chisels, the mason's chisel (*m*) varying greatly in width of edge according to the variety of stone and the depth of the cut to be taken. Frequently they are brought quite to a point like the mason's pick, when they cease to be cutting tools from our point of view. The jumper (*n*), employed for rock drilling, with which the hole is produced by means of successive cuts radiating in all directions from its centre, which are delivered with the impact due either to its own weight or to the blows of a hammer on its outer end, is also a form of chisel.

ii. *Edge tools operating by pressure.*—Of this class the ordinary clasp-knife is perhaps the best known example. A sharp knife serves well for showing the different kinds of treatment by cutting or by fissure to which any particular wood or other moderately soft material is capable of submitting itself. The "thickness" of the cutting edge, or in other words, the angle which the intersecting planes which include it form with one another, the degree of smoothness or roughness of edge which best effects the clean division or separation of the fibres, and the possibility or otherwise of producing a smooth surface by "scraping," can all to a great extent be judged of with the aid of a knife. And the subject is by no means an unimportant one. Consideration of the action which takes place at the edge of a cutting-tool, and the strain which this action produces on particular portions of it are frequently of service in enabling us successfully to meet the special cases which arise in practice, and may sometimes guide us towards remedying the defective action of the hand-tools in use for ordinary work. America has long taken the lead in originating thoughtful improvements of this kind, and the result is apparent in the rapid manner in which the use of edge tools and appliances of American patterns is now everywhere extending.

1. In fig. 3 are shown a few of the ordinary English *wood-tools.* They include the firmer chisel (*o*) used by carpenters, and a carver's chisel (*p*) and gouge (*q*). A wood-engraver's scooper (*r*) and knife (*s*) are examples of special tools, being intended only for cutting hard wood in a direction transverse to the grain, cross cut blocks of boxwood being alone used for the finer kinds of wood-engravings. The spoke-shave (*t*) affords a good example of what has just been said as to the result obtainable by a well-directed effort towards the improvement of an old established hand tool. In the form figured (*t*), which is the ordinary one in use in England, the blade or "iron" is rather complicated in shape and is not very easy to sharpen; each successive sharpening moreover impairs the efficiency of the tool by widening the "mouth," the unequal wear of the wooden sole, which very speedily takes place, having also a similar effect. Thus three essential conditions of a good cutting-tool, viz., constant maintenance of its proper action, durability of the parts exposed to wear, and facility in sharpening are all unfulfilled. On the other hand those manufactured in America fulfil them admirably; iron is substituted for wood as the material for the sole and handle, and the blade, which is merely a piece of flat steel, is firmly held in its place by a set screw, half a turn of which at once releases it.

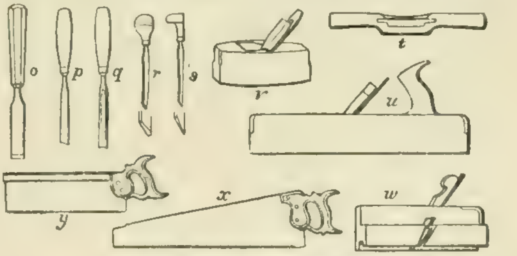


FIG. 3.—Chisels, planes, and saws.

Planes are to be met with in great variety, the most usual for ordinary carpentry being the jack plane (*u*), the trying plane, and the smoothing plane (*v*). Of these the first is used for taking off the rough, or for reducing the thickness of a board; the second, which resembles it, except in being of much greater length, for correcting inequalities of the surface; and the third, as its name implies, for the final smoothing. Planing being chiefly performed in the direction of the grain of the wood, a smooth surface can only be obtained when its fibres are cut instead of being allowed to separate from one another by cleavage, the tendency to which, in soft woods more especially, must therefore be carefully resisted. With this object the planes above mentioned, and many others also, are provided with what is called a "double iron," an inverted blade or "iron" being securely attached to the upper side of the cutting iron, with its edge at a short distance only from the cutting edge. This causes the shaving to be continually broken transversely, and so prevents the fibres of which it is composed from tearing up those in advance of the cut. The width of the "mouth" or space between the cutting edge and the portion of the plane stock in front of it is also kept as small as possible in planes intended for smoothing, so as to increase to the utmost their breaking action by supporting the as yet undisturbed fibres in advance of the cutting edge. Wear of the mouth is sometimes prevented by letting in a metal plate or by forming the stock entirely of iron or steel. Planes of great length, which are known as jointers, are used for some purposes, coopers' planes of this kind being sometimes over 6 feet long.

The use of moulding planes (*r*) is indicated by their name. Each is adapted only for producing one particular pattern of moulding. Hollows and rounds resemble them, but have the cross section of their soles simply concave and convex respectively. For planing work which is hollowed or rounded in the direction of its length compass planes are employed, each of which, as ordinarily made, cannot deviate much from its own particular curvature. American ingenuity has here again stepped in, and has got over this objection by making the sole of a springy plate of steel, which can be adjusted to any curve either convex or concave within very wide limits, so that this one tool takes the place of an entire set of ordinary compass planes. Ploughs are somewhat complicated planes which are used for forming grooves of various widths, depths, and distances from the edge of the work.

The "pitch" of a plane is the angle at which the blade or iron is inclined to the sole, and the inclination is greater in hard-wood than in soft-wood planes. Some of the former, indeed, have their irons so nearly erect that their action is what would ordinarily be described as scraping and not cutting—a difference which appears to be undefinable, and to be due to the structure of the materials which can be so treated, and not, as has been suggested, to any peculiarity in the form of the cutting edge. The action of a razor in shaving seems to favour this view, the sections of hair thus obtained being seen under the microscope to be beautifully cleanly sliced, though the blade is applied at a great angle to the plane of the cut.

The following may be taken as good examples of saws—the hand saw (*s*), the rip saw and half rip saw, which differ from it only in size and size of tooth, and the dovetail saw and tenon saw (*u*), of which the first three all have sufficient stiffness of blade to resist the force exerted in using them, and the last two are thin and unable to do this without the support of the iron or brass "back," which of course limits the depth to which a cut can be made with them. Pit saws and cross cut saws are the largest representatives of saws used by hand, being employed for large work, such as cutting timber in the log, and worked generally by two men. Frame saws of all sizes, from those of 8 feet or 10 feet used by pit sawyers down to the fret saws of but a few inches in length and scarcely thicker or wider than a horse hair, and compass saws, for cutting out curves, must also here be mentioned amongst hand-saws, though technically they are not included in the term.

In fig. 4 are some diagrams of saw teeth,—A being the usual form for all the smaller kinds that are used single-handed, which is varied however as to size and also as to the angle at which the three-square file used in bringing the teeth to an edge is applied, while B is the gullet tooth, for pit saws working with the grain of the wood, and C the ordinary cross-cut tooth for transverse cuts. It is evident that a saw tooth which is well adapted for producing a clean cut in one of these directions would be ill adapted for doing so in the other, at least in the case of the softer kinds of timber;—for in sawing with the grain the readiness and the uniformity with which the short section of fibres sliced off by each tooth parts from the fibres beside it, owing to their slight lateral cohesion already alluded to, assists in the operation, and a fairly clean cut results. But in cross-cutting special provision is required for cleanly dividing the fibres at each side of the cut, after which the removal of the intervening fragments may be accomplished readily by cleavage rather than by cutting. The rationale of the gullet tooth (B) is thus clear, the keen chisel-like edges of the teeth being well adapted for dividing the fibres of the wood transversely, and for this it has little to be desired. The ordinary cross-cut tooth (C), presenting as it does a series of lancet-like points which act alternately at each side of the cut, divides the fibres, but has no proper provision for their after removal, and the hand saw tooth (A) is a sort of compromise between the two (at least if we neglect the rounded portion of the gullet-tooth, which does not affect its edge), so that it can be used either with the grain or across it, though not with the best possible results. The cross-cut tooth (D), on the other hand, provides both for the clean separation of the fibres and the removal of their fragments.

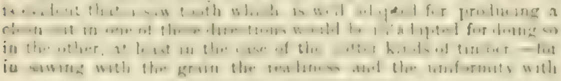


Fig. 4.—Varieties of saw teeth.

The "set" of a saw is the slightly increased width given to its toothed edge by alternately bending the teeth towards the opposite sides of the blade; the extent to which this is done, or the width of the set (as it is called), therefore determines the amount of material which a saw wastes in forming its cut, the more perfect its action the smaller being the amount of set required to make it work freely, and the less the power expended in working it.

Some boring tools for wood are shown in fig. 5. The bradawl (E) is adapted only for soft wood; the gimlet, either in its plain or its twisted form (F), has little to be said in its favour; and the shell-auger (G) requires an expenditure of force altogether disproportionate to the results produced by it. The screw-auger is an improvement upon it, although this, as generally made, still leaves a good deal to be desired as regards consumption of power. But the wood-worker's main stand-by for boring is the stock or brace (H) and set of bits. Those ordinarily supplied for boring across the grain consists mainly of centre-bits (I) for the larger and quill bits for the smaller holes,—neither of which are thoroughly efficient tools,—also nose bits (J), which resemble shell-augers and share their defects, for boring with the grain. The English wood-boring tools indeed offer a considerable field for improvement. Imported substitutes for the above are already to be met with, amongst others being the twisted centre-bits, of which the stems resemble the twist drill referred to below, and the expanding centre-bits, both of which appear to be an advance in the right direction, though they have not as yet come largely into use.

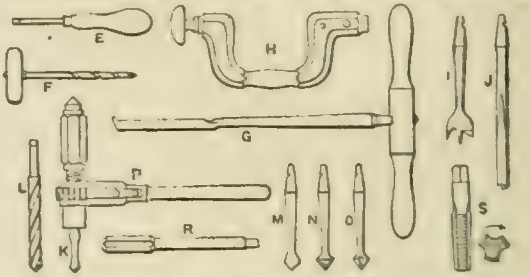


Fig. 5.—Boring tools.

2. Cutting tools for *metal* analogous to the foregoing are but few as regards surface work. Their chief characteristic—at least in the case of those used for the harder metals—is the greatly increased thickness of their edges. Files of various cross sections, lengths, and degrees of fineness of tooth, and scrapers (which are merely thick knife-edges, made not unfrequently from worn-out files by sharpening them at the extremity), constitute almost the only edge tools at the disposal of the fitter or mechanic for finishing work that he has roughly surfaced with his chipping chisels. For boring he has drills of various sizes, too often of the antiquated pattern (K), which in boring deep holes cannot be kept straight, though the very superior twist drill (L) is now often to be met with. Countersinks, either of the flat (M), rose (N), or snail-horn pattern (O), are generally included with carpenters' sets of bits, for enlarging holes in metal work to receive the heads of screws. They are used with the wooden brace figured above. The smith's brace resembles it, but is all made of iron, and a heavy pressure is applied to its upper end by means of a screw. A ratchet brace (P) is a more powerful instrument, and carries in itself the screw for obtaining the requisite pressure. Small holes can be drilled under a light pressure with rapid rotation on the part of the drill, which is then generally of the form K, but sharpened from both sides so as to form a knife edge which operates equally well in whichever direction the drill revolves. The drill bow, of which the string takes one turn round a bobbin either on the stem of the drill itself or on its holder, is a ready means of obtaining a rapid reciprocating motion for this purpose, and is not yet superseded, though various ingenious substitutes have been devised. For enlarging holes throughout their length, broaches or rimers are used; these may be either simply half round or polygonal in section, or may have any desired number of longitudinal or spiral flutings, each of which forms a cutting edge which removes successive portions from the sides of the hole to be enlarged. A parallel rimer with four flutings is shown at R, the square end when in use being inserted in a hole in the centre of a wrench, which affords the requisite leverage.

An internal screw thread is formed in an analogous manner by a tap, which bears on its surface the counterpart of the required thread, so that by successive cuts it produces a helical groove of the correct form and depth. Such a tap (S) is represented in the engraving, together with a diagram of its cross section, showing the three cutting edges by which the screw thread is formed. Three such taps constitute a set for any one size of screw, the first being known as a taper, the second as an intermediate, and the third as a plug-tap, this last being almost parallel throughout. By a reverse process with dies fixed in a stock (T, fig. 6) external screws are cut, the particular form shown being the improved pattern of Sir J. Whitworth, who has done much to correct the faults of the earlier screwing tools. Screw plates, however, some of which cannot be regarded as cutting tools at all, are still much used for small and fine screw threads.

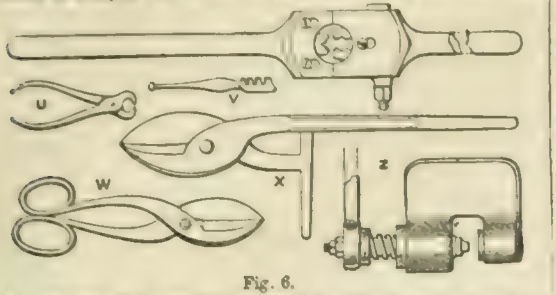


Fig. 6.

Cutting pliers and cutting nippers (U) have a pair of knife edges so arranged as to work exactly opposite to one another,—the handles, on being tightly grasped, affording sufficient leverage for these edges to be forced to a short distance into the two opposite sides of a nail or wire, which, if of small diameter or of soft metal, can thus be cut asunder. Tube-cutters are an ingenious device which the extensive use of wrought-iron tubing for gasfitting has rendered necessary. They effect their object by cutting a groove round the tube to a sufficient depth to enable it to be fractured at the desired point.

3. *Stone* and hard materials cannot in general be treated by cutting tools simply with hand pressure, though some of the softer kinds of stone are carved with chisels used almost or altogether without impact, and are sawn with toothed saws resembling the cross-cut saws used for wood. Glaziers' diamonds were till recently the only tools for producing the peculiar "cut" requisite for starting the clean fracture by which sheet glass is divided, theirs, however, being a case of fissure rather than of true cutting. But of late years steel glass cutters have been introduced which act—as long as the sharpness of their edges is maintained—in a manner precisely similar. In one form of these glass cutters (V) a cast-iron handle carries at its extremity a small freely revolving wheel of carefully hardened steel, round the circumference of which is the cutting edge, which can be sharpened on an oilstone when necessary. The so-called cut is produced by simply running this with a light pressure over the surface of the glass. Diamonds, however, are used for cutting glass, stone, &c., by actually detaching their particles; writing diamonds and diamond drills have this kind of action.

II. *Hand-tools without cutting action.*—With the exception of hammers and a few tools which are dependent on impact,—such as cleaving wedges amongst wood tools, and embossing and similar punches amongst those for metal,—tools of this class play in general only a subsidiary part to some cutting or other process.

Amongst those used with pressure which cannot be considered as auxiliary may be instanced—draw-plates, with which wire is made by drawing it through holes of conical form and of successively smaller diameters till the required size or "gauge" is reached; and burnishers, which reproduce on metals softer than themselves their own highly polished surfaces. Both of these act by inducing a flow of the metal under treatment for which, when it is not effected by impact, great force is required in proportion to the extent of the action. Metal shears and cutting punches of all kinds have been omitted till now, as their mode of operating cannot be regarded as true cutting from our point of view. It may be more correctly described as tearing, more or less completely localized according to circumstances. The ordinary sheet-metal shears (W) merely resemble very powerful scissors, and, their action being quite local, they serve well for dividing the plates or other thin sheets for which alone they are suitable. Block shears (X) act with additional leverage, and can consequently be used for rather thicker metal, the upper bow being replaced by a long straight handle, and the lower one by a stake which can be firmly fixed in a block of wood or otherwise. With these the tearing action begins to be apparent, though its imperfection is of no great importance with the thicknesses of metal capable of being treated by any hand shears (for some tools of this class, which by hydraulic or other means accumulate the power of one man to a sufficient extent to operate on bars or plates of comparatively great substance, are machines rather than hand tools, and in their case the mere slowness of the operation produces better results than would otherwise be obtained). The same may be said of the various punches used in combination with dies or bolsters, as in the punching bear (Z), of which the action exactly resembles that of shears, the punch taking the place of the upper blade, and the bolster that of the lower one.

Of subsidiary tools (figs. 7) the vice is an absolute essential for the generality of metal workers. The ordinary tail-vice (α) used by mechanics has not yet been largely superseded, though many ingenious arrangements have been devised for remedying its main defect, viz., the want of parallelism in the movement of the jaws. The English parallel vice (β) has not this objection, but its construction is not good mechanically, and it is but little used except for small work. In some patterns of vice, jaws are provided with a horizontal adjustment so as to grip tapering or other irregular forms, and in others the whole body of the vice can be swivelled either vertically or horizontally. Hand-vices are used in the manner implied by their name, without being attached to a bench like the foregoing. An ingenious form of hand-vice (γ) is shown in fig. 7. The screw wrench (δ), which is used for turning nuts, &c., of various sizes has of late been deservedly the subject of various improvements in which weight is sought to be saved without sacrifice of strength; and the shifting spanner, of which the duty is the same, has led to the exercise of much ingenuity without any perfectly satisfactory solution of the problem how it may best be constructed. The merit and simplicity of the ordinary screwdriver, on the other hand, are well known.

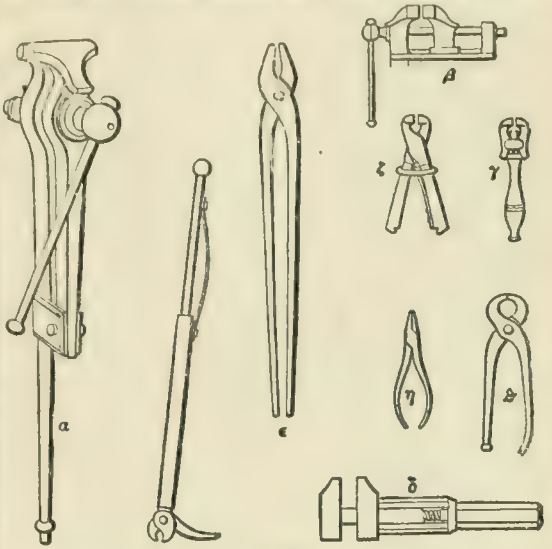


Fig. 7.

Instances of tools which afford a powerful grip by simple means are the blacksmith's tongs (ε), the vice-chop tongs (ζ), the pliers (η), and the pincers (ϑ). A very powerful modification of the last-mentioned tool has lately been introduced into use under the name of the nail-puller (ι). With this ingenious instrument very largely increased leverage is obtained, and the pull is given in a direction much more advantageous to the attainment of the desired object. (C. P. B. S.)

HANG-CHOW-FOO, a city of China, in the province of Che-Keang, about 2 miles north-west of the Tseen-tang-Keang, at the southern terminus of the Imperial Canal, by which it communicates with Peking. It lies about 100 miles south-west of Shanghai, in 30° 20′ 20″ N. lat. and 120° 7′ 27″ E. long. Towards the west is the Si-hu or "Western Lake," a beautiful sheet of water, with its banks and islands studded with villas, monuments, and gardens, and its surface traversed by gaily-painted pleasure boats. To the Chinese it is a very paradise. Exclusive of extensive and flourishing suburbs, the city has a circuit of 12 miles; its streets are well-paved and clean; and it possesses a large number of arches, public monuments, temples, hospitals, and colleges. It has long ranked as one of the great centres of Chinese commerce and Chinese learning. In 1869 the silk manufactures alone were said to give employment to 60,000 persons within its walls, and it has an extensive production of gold and silver work and tinsel paper. On one of the islands in the lake is the great Wan-lan-ko or pavilion of literary assemblies, and it is said that at the examinations for the second degree twice every three years from 10,000 to 15,000 candidates come together. In the north-east corner of the city is the Nestorian church which was noted by Marco Polo, the façade being "elaborately carved and the gates covered with elegantly wrought iron." There is a Roman Catholic mission in Hang-chow, and the Church Missionary Society, the American Presbyterians, and the Baptists have likewise stations. The local dialect differs from the Mandarin mainly in pronunciation. The population, which is remarkable for gaiety of clothing, was formerly reckoned at 2,000,000, but is now variously estimated at 300,000, 400,000, or 800,000.

Hang-chow-foo is the Kinsai of Marco Polo, who describes it as the finest and noblest city in the world, and speaks enthusiastically of the number and splendour of its mansions and the wealth and luxuriance of its inhabitants. According to his authority it had a circuit of 100 miles, and no fewer than 12,000 bridges and 3000 baths. The name Kinsai, which appears in Wassaf as Khanzai, in Ibn Batuta as Khansa, in Odericus as Camsay, and elsewhere as Campsay and Cassay, is really a corruption of the Chinese *King-sz*, capital, the same word which is still applied to Peking. From the 10th to the 13th century (960–1272) the city, whose real name was then Ling-nan, was the capital of Southern China and the seat of the Sung dynasty, which was dethroned by the Mongolians shortly before Marco Polo's visit. Up to 1861, when it was laid in ruins by the Taipings, Hang-chow continued to maintain its position as one of the most flourishing cities in the empire, and though for a time it lay comparatively desolate, it has considerably recovered within recent years. It is the seat of the governor of Che-Keang; but the governor-general or viceroy for Che-Keang and Fuh-Keen is now located at Fuh-chow. See Colonel Yule's edition of Marco Polo, vol. ii., for a plan of the city and further details.

HANKA, Wenceslaus or Waklaw (1791–1861), a Bohemian philologist, was born at Horeniowes, a hamlet of eastern Bohemia, on June 10, 1791. He attended the village school in winter only, being occupied during the summer on his father's farm. While still young he acquired a knowledge of Polish and Servian from some soldiers billeted in the neighbourhood, and in 1807 he was sent to school at Königgrätz, to escape the conscription. Proceeding then to Prague, he engaged in the study of philosophy, and founded a society for the cultivation of the Czech language. At Vienna, where he afterwards studied law, he established a Czech periodical; and in 1813 he made the acquaintance of Dobrowsky, the eminent philologist. On September 16, 1817, Hanka made the discovery of some ancient Bohemian manuscript poems of the 13th and 14th century in the church-tower of the village of Kralodwor, or Königinhof. These were published in 1818, under the title *Kralodworsky Rukopis*, with a German translation by Swoboda. Great doubt, however, was felt as to their genuineness; and Dobrowsky, by pronouncing *The Judgment of Libussa*, another manuscript found by Hanka, an "obvious fraud," confirmed the suspicion. But some years afterwards Dobrowsky saw fit to modify his decision; and in 1840, after a careful examination of the manuscripts by two eminent antiquaries, Hanka was ultimately vindicated. A translation into English, *The Manuscript of the Queen's Court*, was made by Wratislaw in 1852. The originals were presented by the discoverer to the Bohemian Museum at Prague, of which he was appointed librarian in 1818. In 1848 Hanka took part in the Slavonic congress and other peaceful national demonstrations, being the founder of the political society Slovanska Lipa. He was elected to the imperial diet at Vienna, but declined to take his seat. In the winter of 1848 he became lecturer and in 1849 professor of Slavonic languages in the university of Prague, where he died, January 12, 1861.

His chief works and editions are the following.—*Hankowy Pjsne* (1815), a volume of poems; *Starobyla Skladanie* (1817–1826), in 5 vols.,—a collection of old Bohemian poems, chiefly from unpublished manuscripts; *A Short History of the Slavonic Peoples* (1818); *A Bohemian Grammar* (1822) and *A Polish Grammar* (1839),—these grammars were composed on a plan suggested by Dobrowsky; *Igor* (1821), an ancient Russian epic, with a translation into Bohemian; a part of the Gospels from the Rheims manuscript in the Glagolitic character (1846); the old Bohemian Chronicles of *Dalimil* (1848) and *Prokop Lupac* (1848); *Evangelium Ostromiri* (1853).

HANKOW (that is, the "Mouth of the Han"), the great commercial centre of the middle portion of the Chinese empire, and since 1858 one of the principal places opened to foreign trade. It is situated on the northern side of the Yang-tse-kiang at its junction with the Han river, about 450 miles west of Shanghai in 30° 32′ 51″ N. lat. and 114° 19′ 55″ E. long., at an absolute height of 150 feet. By the Chinese it is not considered a separate city, but as a suburb of the now decadent city of Hanyang; and it may almost be said to stand in a similar relation to Wu-chang the capital of the province of Hupeh, which lies immediately opposite on the southern bank of the Yang-tse-kiang. Hankow extends for about a mile along the main river and about two and a half along the Han. It is protected by a wall 18 feet high, which was erected in 1863 at an expense of £250,000, and has a circuit of about 4 miles. In 1861 the port was declared open by James Hope and Sir Harry S. Parkes, C.B., and the site of a British settlement was selected in the east end of the town, with a river frontage of 2400 feet, and a depth of from 1200 to 1500. The building area, divided into 108 lots, was quickly bought up, and houses after the Shanghai style were erected. Leases were granted to foreigners as well as to British subjects. A municipal council was formed, and by 1863 a great embankment and a roadway were completed along the river, which has the awkward fashion of rising as much as 50 feet or more above its ordinary levels, and not unfrequently, as in 1849 and 1866, lays a large part of the town under water. On the former occasion little was left uncovered but the roofs of the houses. The success of the foreign settlement has not been so great as was anticipated: even in 1866 the number of foreign residents was 125 instead of 150 as in 1863. Chinese merchants have rapidly got even the foreign trade into their hands: in 1873 they began to run steamers on the river; in 1875 they purchased the property of the Shanghai Steam Navigation Company; and in 1876 they had 57 steamers flying the national flag. Besides tea, which is the staple, the exports of Hankow are leaf tobacco, of which 6,700,000 ℔ was sent to Europe in 1876, raw silk mainly obtained from Szechuen, rhubarb, gall-nuts, and musk. Of this last the quantity was as much as 2937 ℔ at £20 sterling per ℔. Tea was first sent direct to London in 1864–65; in 1876 this market received from Hankow no less than 34,540,000 ℔ out of a total export of 86,402,271 ℔. The Russian merchants, who are fixing their brick tea factories in the town, obtained 12,844,476 ℔ in the same year. They send their goods by water to Tientsin, and thence to Kalgan partly by land and partly by water. A public assay office was established at Hankow in 1864. The Roman Catholics, the London Missionary Society, and the Wesleyans have all missions in the town; and there are two missionary hospitals. Before the Taiping wars, the full brunt of which fell on this part of the country, the sister cities of Hankow, Hanyang and Wu-chang-fu had a population, it is said, of over 5,000,000. At present Hankow has from 600,000 to 800,000 (Sosnoffsky says only 300,000), and the other two from 400,000 to 700,000.

HANLEY, a market town and municipal borough of Staffordshire, England, is situated in the centre of the pottery district, 2 miles E.N.E. of Stoke-upon-Trent, and 18 miles N. of Stafford. It is indebted for its rise and prosperity to its pottery manufactures, which include porcelain, encaustic tiles, and earthenware, and give employment to the greater part of the population, women and children being employed almost as largely as men. In the neighbourhood coal and iron are obtained. The streets, which are paved with brick, are wide and regular, and in the suburbs there are a number of fine villas. The principal public buildings are the six churches (St John's being a handsome structure with a tower 100 feet in height) and the dissenting chapels, the town hall, the mechanics' institute, the museum, the theatre, and the national and board schools. There is also a flourishing Government school of art. Hanley, which includes the former township of Shelton, received a municipal constitution in 1857. It is the central and most important of the group of towns constituting the parliamentary borough of Stoke-upon-Trent. The population of Hanley in 1861 was 31,953, and in 1871 39,976.

HANNAY, JAMES (1827-1873), critic, novelist, and journalist, was born at Dumfries in 1827, and came of the Hannays of Sorbie, an ancient Galloway family. He entered the navy in 1840 and served till 1845, when he adopted literature as his profession. In 1857 Hannay contested the Dumfries burghs in the Conservative interest, but without success. He edited the *Edinburgh Courant* from 1860 till 1864, when he removed to London. In July 1868 he was appointed British consul at Barcelona, a post which he occupied till his death on the 8th of January 1873. While at Barcelona he contributed to English periodicals; and his letters to the *Pall Mall Gazette* "From an Englishman in Spain" were highly appreciated. Hannay's best books are *Singleton Fontenoy*, *Satire and Satirists*, *Eustace Conyers*, and *Essays from the Quarterly Review*. *Satire* not only shows loving appreciation of the great satirists of the past, but is itself instinct with wit and fine satiric power. The book sparkles with epigrams and apposite classical allusions, and contains admirable critical estimates of Horace (Hannay's favourite author), Juvenal, Erasmus, Sir David Lindsay, George Buchanan, Boileau, Butler, Dryden, Swift, Pope, Churchill, Burns, Byron, and Moore. The *Essays* are full of learning and historical knowledge, and are lit up with sunny humour and brilliant flashes of wit and poetry. Hannay passionately admired three things—learning, literary genius, and good blood. He showed great interest in the history and fortunes of aristocratic families; and his wonderful skill in matters of heraldry and genealogy is recognized by highly competent authorities (see Masson's *Life of Milton*, vol. i. p. 8). He was a ripe Latin scholar; and his style is marked by grace, vivacity, and poetical feeling. He was intimate with his leading literary contemporaries, and wrote the valuable notes to Thackeray's *English Humorists*.

In addition to contributions to *Punch* and the leading reviews, Hannay issued the following works:—*Biscuits and Grog*, *Claret Cup*, and *Hearts are Trumps* (1848); *King Dobbs* (1849); *Sketches in Ultramarine*; *Singleton Fontenoy* (1850); an edition of the *Poems of Edgar Allan Poe*, to which he prefixed an exquisite essay on the poet's life and genius (1852); *Sands and Shells* and *Satire and Satirists* (1854); *Eustace Conyers* (1855); *Essays from the Quarterly Review* (1861); *Characters and Criticisms*, consisting mainly of his contributions to the *Edinburgh Courant* (1865); *A Course of English Literature* (1866); and a family history entitled *Three Hundred Years of a Norman House* (1867).

HANNIBAL. Hannibal was a very common Carthaginian name. Its final syllable *bal* occurs repeatedly, as a suffix, in Punic names, and is in fact taken from the chief Phœnician deity, Baal. The entire name denotes, according to a probable interpretation, "the favour of Baal."

The famous Hannibal, the hero of the Second Punic War, was the son of Hamilcar Barca, and was born in 247 B.C. He and his two brothers, Hasdrubal and Mago, were called by the father "the lion's brood." At the age of nine he begged his father, who was leaving Carthage for Spain, to take him with him. The request was granted, but not before he had sworn at that father's bidding on the altar of sacrifice eternal enmity to Rome. That vow determined his life's future. In Spain he was bred up in camps under his father's eye. He was present at the battle in which his father fell in 228 B.C., being then in his nineteenth year. Hamilcar's son in law, Hasdrubal, succeeded to the command. Eight years afterwards, in 221 B.C., he was struck down by an Iberian assassin. Meantime the young Hannibal had proved himself thoroughly able both "to obey and to command." It was a matter of course that the soldiers with one voice at once hailed him as their general.

His first object was to complete the work of his father and his father's successor. Spain, he felt, must be more thoroughly overawed, if it was to be a base of operations against Rome. He pushed into the heart of the country, crossed the Tagus, and crushed the resistance of the tribes of the interior. Two campaigns sufficed for the conquest of all Spain to the south of the Ebro, except Saguntum, a town considerably south of the Ebro and some way to the north of the modern Valencia. It was a Greek colony from Zacynthus (Zante), and had grown into a rich and prosperous place, but, what was now far more important, it was in friendly relations with Rome. To attack it therefore would be like throwing down the gauntlet to the Roman senate and people. But Hannibal was able to tell the home Government at Carthage that the Saguntines were molesting Carthaginian subjects in the neighbourhood. Without awaiting an answer, he began the siege. Roman ambassadors at the solicitation of envoys from Saguntum landed on the coast, but were told by Hannibal that he could not see them. They went on to Carthage, but their remonstrances, though the subject of a long debate, were in vain. Eight months passed away, and Saguntum, after a gallant defence, was forced to surrender. Hannibal got a rich booty for his army, and went into winter quarters at New Carthage (Cartagena). Again a Roman embassy went to Carthage and insisted on his being given up. The demand was refused. By the close of the year 219 B.C. the Second Punic War was in fact begun.

Hannibal's resolution was now taken. He prepared at once to invade Italy. He had a numerous and efficient army and a well-filled exchequer. All who shrank from the expedition he dismissed to their homes. In the spring of 218 B.C. he began his great march from New Carthage with an army of 90,000 foot, 12,000 horse, and 37 elephants. The Ebro was easily crossed. In the country beyond he had some fighting with the native tribes, and there he left Hanno, with a force of 10,000 foot and 1000 horse to secure the passes between Spain and Gaul. Again he sent back all in whom he saw signs of hesitation. With a considerably diminished army he passed the Pyrenees at Bellegarde and encamped at Iliberris (Elne). Some Gallic tribes, alarmed at his advance, had assembled in the neighbourhood, but he soon conciliated their chiefs and persuaded them that he meant them no mischief. So he continued his march without molestation to the Rhone.

Meanwhile the Romans had done little or nothing to check their enemy. At last the consul, Publius Cornelius Scipio, arrived at Massilia (Marseilles), and was surprised to find that Hannibal was about to cross the Rhone. But he was too late to oppose the passage, and Hannibal crossed the river probably at some point near the village of Roquemaure. He then followed its course, marching up its left bank to its junction with the Isère at Valence, and entered what was known as the "Island of the Allobroges." It was from thence that he began his famous passage of the Alps.

The narrative of Polybius, though it raises some difficult questions has conveyed to most modern students and scholars the impression that Hannibal crossed by the pass of the Little St Bernard. If so, he must have entered Italy by the valley of Aosta. The subject has had a literature of its own devoted to it. The result is that the Little St Bernard Pass may be almost said to have made good its claims to the honour of Hannibal's memorable march. It was familiar to the ancients, and more than once Gauls had passed through it into the plains of Italy. Such high authorities as Arnold, Niebuhr, and Mommsen regard the question as settled in its favour.

Fifteen days in all were occupied in the passage. If the view above indicated is correct, Hannibal at first made his way over Mont du Chat through the Chevelu Pass, then continued his march up the valley of the Isère, and mounted the St Bernard. He must have descended the mountain by the valley of the Doria. Part of his route, that by which he climbed to the summit, was a narrow defile, and there he was threatened by the mountain tribes which appeared on the heights. At the "white rock," *la roche blanche*, as it is still called, he halted his infantry, while the cavalry and beasts of burden were making their way during the night to the top of the pass. Next day, the ninth day, he stood with his whole army on the highest point and spoke, it is said, some cheering words to his half-frozen Africans and Spaniards. The descent proved trying and dangerous. From the mountain tribes he had little to fear; it was the mountain slope, covered with recent snow, which caused delay and anxiety. The Italian side of the Alps is considerably steeper than the French side, and a road had to be constructed for the passage of the elephants and horses. This was a work of three days. In three more days they arrived in the valley of Aosta, and were welcomed by the Salassi, a friendly tribe of the Insubrian Gauls. The October of the year 218 B.C. saw the passage of the Alps accomplished and Hannibal with his army encamped in northern Italy.

Thus far he had been successful, but at a tremendous cost. His army was shrunk to a force of 20,000 infantry and 6000 cavalry,—the former being composed of Libyans and Spaniards in about the proportion of three to two, and the latter being chiefly Numidians, and admirably efficient.

It was now five months since he had set out from New Carthage. His men of course sorely needed rest, and this they had for a brief space amid the friendly tribes of Cisalpine Gaul. One tribe indeed, the Taurini, was hostile, but he soon captured their chief city, thus overawing the remaining tribes in the upper valley of the Po. It was now high time for the Romans to exert themselves. Scipio after quitting Massilia, whence he had sent on his army into Spain, had hurried back to Italy, and on reaching Placentia took command of the Roman army quartered there. He was indeed numerically weaker than Hannibal, and was deficient in cavalry. Still he advanced up the Po to meet him, and on the Ticino, somewhere, it would seem, near Vercellæ, was fought the first engagement of the Second Punic War. It was a cavalry action, and the inferiority of the Romans in this arm was decisively proved. They were driven back with heavy loss, and Scipio himself was severely wounded, being rescued, it is said, by his son, a lad of seventeen, who subsequently became as famous as Hannibal himself, and had the good fortune to be his conqueror. He has passed down to posterity as Scipio Africanus. The defeated general fell back to the walls of Placentia. The Trebia, a southern tributary of the Po, was between him and the enemy, and he was soon joined by the other consul, Sempronius. Their united armies numbered not less than 40,000 men. Sempronius was for instantly risking battle; Scipio was still disabled by his wound. Sempronius had his way, and on a bitterly cold December day the Romans plunged into the swollen waters of the Trebia in the face of a sleet storm and a cutting wind. They fought well, but when taken in flank by Hannibal's brother Mago, who was lying in ambush amid brambles and bushes in a watercourse, they broke and fled in utter rout.

This decisive victory gave nearly all northern Italy to Hannibal. He let his troops rest during the winter, and added to them a number of Gauls. Early in the spring of 217 B.C. he decided to cross the Apennines and to penetrate into the heart of Italy. The route which he took brought him into the marshy lowlands of the Arno near Lucca and Pisa, and here he and his men had to wade through water for four days. Many of them perished miserably, and Hannibal himself lost an eye from ophthalmia. At last he encamped at Fiesole on high ground. The two consuls Flaminius and Servilius were, with their armies, respectively at Arezzo and Rimini. Flaminius was an impetuous man, and eager to win the glory of settling the war once for all. Hannibal, quitting the valley of the upper Arno, marched past him towards Perugia, ravaging the country and so provoking the Roman general to pursue him. The road from Cortona to Perugia skirts the northern shore of Lake Trasimene, and into this road, which is in fact a mountain defile, the Roman column unwarily entered. They were caught in a trap. Hannibal had posted his light troops on the hills on either side, while he himself blocked the outlet near Passignano with the best of his infantry. As soon as the Romans were in the pass they were assailed on all sides, and the battle soon became a mere massacre. The Roman army was in fact destroyed, and Flaminius was among the slain. We might suppose that Hannibal would have now done well to have marched straight on Rome, and this the Romans expected. But he may well have thought that it would be better to wait the chance of insurrection among the Italian communities. So he marched through Umbria, and again crossed the Apennines into Picenum. He then marched southwards along the coast into Apulia and encamped at Arpi. Meanwhile the Romans had made the famous Fabius Maximus their dictator. After levying an army of four legions, Fabius marched in pursuit of the enemy having first effected a junction with the army under Servilius at Rimini.

From the first Fabius had decided on the policy which earned for him the name of the *Cunctator*, the Delayer. He dogged his enemy's steps, but would never risk an engagement. The richest districts of southern Italy were laid waste under his very eyes. But he could not be provoked into any rash movement. Once indeed it seemed as if Hannibal was himself entrapped. He had been ravaging Campania, and was on the point of retreating into Samnium, when Fabius posted a force at the head of the pass which afforded the only available means for his retreat. Hannibal is said to have driven a multitude of oxen with lighted faggots on their horns up the hills overhanging the road, so as to give the impression that he and his army were retreating over the heights. Fabius's detachment quitted its position to check the supposed movement, and thus gave Hannibal an opportunity of escaping through the pass. The tactics of Fabius disgusted his men, and when he had to leave them for a time, he found on his return that his master of the horse, Minucius, on the strength of a small success won in his absence, was eager to hurry on a general engagement. Fabius gave him a part of the army, with which Minucius ventured on an attack. He was on the brink of destruction when he was rescued by the dictator's timely interposition. After this Hannibal went into winter quarters at Geronium in the north of Apulia.

In the spring of the next year, 216 B.C., he moved south and pounced on Cannæ, where Roman supplies were stored up in great abundance. The town is about 6 miles from the mouth of the Aufidus and about 8 from Canosa. The Romans were now again eager to strike a decisive blow. So a vast army was raised by the consuls of the year, Æmilius Paulus and Terentius Varro, numbering 80,000 infantry and 6000 cavalry. Hannibal's army was probably far inferior numerically. The consuls on arriving in Apulia made Canusium (Canosa) their headquarters. For some few days the armies faced each other on the banks of the Aufidus. There were some preliminary manœuvres and skirmishes, till at last Varro, when it came to his turn to command, determined to fight. Both armies crossed the river, and Hannibal's men were drawn up within a loop which it forms near Cannæ. On either flank he stationed a strong body of his veteran infantry. His other infantry, ranged in the centre in a crescent form, was soon driven in by the Roman legions, which had advanced to the attack in very deep formation. But meanwhile Hannibal's cavalry had put the Roman horse to rout, and had fallen on their rear. The Roman columns were now attacked also on either flank by the Carthaginian infantry. Pressed into a dense mass they were cut down without the possibility of resistance. The carnage is said to have been prolonged for eight hours. The Roman army was all but utterly destroyed. The consul Æmilius Paulus, nearly all the officers, and eighty senators, perished in the slaughter. Varro indeed escaped with a few horsemen to Venusia. The remainder were slain or made prisoners. It was at a comparatively small cost to himself that Hannibal won this great victory.

It might well be thought that such a victory would prove decisive, and that it must have been had Hannibal instantly pushed on to Rome. But he had probably good reasons for not doing so. He was, it must be remembered, as much as 200 miles from Rome; he would have had to march through still hostile populations, and by the time he would have arrived, he must have known that the first panic would have abated, and that the notion of carrying the city by a *coup de main* was simply preposterous. What he counted on was the dissolution of the Italian confederacy, and a widespread revolt throughout Italy. Nor was he altogether deceived. The disaster of Cannæ shook the loyalty of the Italian peoples. Rome was deserted by most of Apulia and Samnium, and almost wholly by the Lucanians and Bruttians. She retained indeed some strong fortresses, as Cales, Fregellæ, Casinum, Beneventum, Venusia, and these enabled her armies to maintain their ground. But Capua, in Campania, the richest and most powerful city in Italy after Rome itself, was lost to her. Thither Hannibal made his way from Cannæ, and there he went into winter quarters, which were perhaps too comfortable and luxurious. But the story that his men became utterly demoralized is absurd. They proved in the subsequent years of the war that they could move rapidly and fight bravely. We may indeed well suppose that by this time many of his veteran Spaniards and Africans had been replaced by native Italian soldiers. It is, however, clear that he still had a fine army. It is true indeed that after Cannæ his star seems rather to decline, but the explanation of this is that the Romans again reverted to the steady cautious tactics which they had learnt under Fabius. They too were for the most part well officered. The ablest of their generals was Marcellus. Yet even he never beat his antagonist in anything like a pitched battle. The Romans after Cannæ made prodigious efforts. They sent three armies into the field, to watch and to check the enemy's movements. They kept themselves in strongly entrenched camps near fortresses which Hannibal had not the means of taking. Some indeed he did capture, as Nuceria, Acerræ, and Casilinum in Campania. At Cumæ, Neapolis, and Nola he was foiled. The two years after Cannæ, 215 and 214 B.C., passed without much being achieved on either side. Hannibal was vaguely hoping for reinforcements from Carthage, and for the aid of Philip, king of Macedon.

Next year, 213 B.C., he gained a considerable success. Tarentum surrendered, and so did Metapontum and Thurii. At Tarentum indeed the Roman garrison still clung to the citadel, and Hannibal could not dislodge it. From Carthage he had received a reinforcement of some elephants and of 4000 Numidian cavalry, but this did not enable him to resume the offensive with much effect. Meanwhile Capua, besieged by two consular armies, seemed doomed to fall again into Roman hands. One of Hannibal's subalterns, Hanno, was defeated in the attempt to revictual the place. Hannibal himself hurried to its aid, but he could not bring the Romans to a battle, though he did temporarily raise the siege. The year 212 B.C. was one of mingled success and disaster for Rome. Syracuse that year had to surrender to Marcellus, and Carthage seemed to have quite lost Sicily. Here was an important gain for Rome. But in Spain the two brother Scipios had been cut off by Hasdrubal, who could now cross into Gaul and advance on Italy. And in Italy there had been some serious reverses. It would appear that there were actually six Roman armies in the field against Hannibal. One of these under Fulvius he destroyed in Apulia; another, made up of enfranchised slaves under Gracchus—a proof this of the extremity to which Rome was reduced—he put to rout, Gracchus himself perishing in an ambuscade.

By the spring of 211 B.C. the Romans were besieging Capua with three armies. It was clear that the city must fall, unless Hannibal could come to its rescue. He made the attempt indeed, but he could not break the hostile lines, so strongly were they entrenched. Then he conceived the idea of drawing them off by menacing Rome itself. Now for the first time he marched through Latium and made it taste all the horrors of war. At last he encamped 3 miles from Rome on the Anio. But the Romans did not lose their presence of mind, or even relinquish the siege of Capua; they simply recalled Fulvius with one of the armies. There were two legions within the city, and Hannibal probably never meditated a serious assault. He ravaged the country up to the walls, but he did nothing more. Through Samnium he again marched into Apulia and thence into Bruttium, where he unsuccessfully attacked Rhegium and the citadel of Tarentum. Capua meanwhile was forced to surrender. This greatly discouraged Hannibal's Italian allies. Marcellus too had come back from Sicily after his capture of Syracuse. Altogether the year 211 B.C. was a very unpromising one for Hannibal. Next year, 210 B.C., however, he partly recovered lost ground by completely defeating the Roman prætor Cneius Fulvius at Herdonea, the modern Ordona, in Apulia. But he could not follow up this success, and his evident weakness led to the speedy return of Samnium and Lucania to the Roman confederacy. The following year saw Tarentum slip from his grasp. But he soon had his revenge. Next year the two consuls, Crispinus and Marcellus, were both cut off and slain by the Numidian cavalry in the neighbourhood of Venusia. Another disaster soon followed. A Roman army was besieging Locri in the extreme south. It was routed and indeed destroyed by Hannibal. Thus at the close of the year 208 B.C. the struggle was clearly by no means decided.

Rome had been making immense efforts. We hear of her having twenty-three legions under arms, and possibly the total number of her armies may have reached 200,000 men. The patriotic spirit of her citizens was still at the highest. But her finances were in a deplorable plight, and corn had risen to an almost famine price. The country round must have been woefully wasted, and multitudes reduced to beggary: One thing indeed the Romans had had to console them during these trying years. The Latin communities in Etruria and Latium had stood by them with wonderful fidelity. This had been their salvation. But now in the years 209 and 208 B.C. came signs of discontent and wavering. Of the Latin colonies several declared that they could no longer furnish contingents or contributions. There were rumours too of a disloyal movement in Etruria. But, worst of all, there came news in the autumn of 208 B.C. that Hasdrubal had crossed the Pyrenees. By next summer he would have passed the Alps. Should the two brothers unite their forces, Rome's fate, it could hardly be doubted, would be sealed. She was now in far greater jeopardy than she was even after the disastrous day of Cannæ.

The year 207 was thus a very anxious one. Claudius Nero and Marcus Livius were the consuls. The first was to watch Hannibal in Apulia, the other was to encounter Hasdrubal in Cisalpine Gaul. Livius retreated before the new invader, and let him reach Sena in Umbria, to the south of the river Metaurus, without opposition. Thence Hasdrubal sent despatches to his brother, who was at Canusium in Apulia. The plan was that they should join their armies at Narnia on the Flaminian road, between 50 and 60 miles from Rome. Unluckily for the two brothers the despatches fell into the hands of Nero. His resolution was formed in a moment. Leaving the bulk of his army in its camp, he hurried northwards with 7000 of his best troops, and after a rapid march of 200 miles he joined Livius. The two generals forced Hasdrubal to a battle. The Carthaginian was utterly defeated, and he was himself slain. Nero returned with all speed to his army, and informed Hannibal of the defeat and death of his brother by having the head of Hasdrubal flung into his camp. With that sight all hope must have died in Hannibal's heart. The battle of the Metaurus was indeed one of the decisive battles of the world. It decided the Second Punic War. From that time, for four more years, Hannibal could but stand on the defensive in the southernmost corner of the Italian peninsula. But even to the last no Roman general dared to close with him. Never in a single battle, as Polybius says, was he beaten while in Italy. Before quitting the country, he left a memorial of his wonderful achievements. In the temple of Juno on the Lacinian promontory, near Crotona, he inscribed on brazen tablets in Punic and in Greek an account of his expedition and his campaigns. Polybius saw the inscription and doubtless availed himself of it for his history. For fifteen years Hannibal had maintained himself in Italy, ravaging it from end to end, and inflicting on the Romans according to their own calculation a total loss of 300,000 men. Now all was clearly over. After Nero's victory the Romans could afford to wait the course of events. Scipio had been victorious in Spain, and only in 204 B.C. he was allowed to cross into Africa. Soon it was clear that he would threaten Carthage more effectively than Hannibal had ever threatened Rome. He received the order of recall at Croton, and thence embarked for Africa. He landed at the smaller Leptis, on the coast of Tunis, late in the year 203 B.C., and lingered during the winter at Hadrumetum, the modern Susa. His brothers Hasdrubal and Mago had both fallen, and he was now the last of the "lion's brood." Fugitive as he was, his presence roused the Carthaginian spirit. The people would not hear of peace. Hannibal indeed attempted to negotiate, and had an interview with Scipio, but in vain. When he saw that he must fight, he could not have felt any of his old confidence. He had some good troops, but he was numerically inferior to the enemy. Of his veterans but few could have remained. The armies at last met at Zama, somewhere near the modern Keff. The battle was obstinately contested, and Hannibal's old soldiers died fighting in their ranks. But he never really had a chance of victory. Many of his men were raw mercenaries, and some of them deserted to the enemy. His army was utterly discomfited, and indeed annihilated. The defeat was not discreditable to him, but it was decisive. With a handful of men he escaped to Hadrumetum, and in the year 202 B.C. the Second Punic or, more properly, the Hannibalian War was at an end.

He was still only in his forty-sixth year. He soon showed that he could be a statesman as well as a soldier. Peace having been concluded, he was appointed chief magistrate of the state. The office had become rather insignificant, but Hannibal restored its power and authority. The oligarchy, always jealous of him, had even charged him with having betrayed the interests of his country while in Italy, and neglected to take Rome when he might have done so. The dishonesty and incompetence of these men had brought the finances of Carthage into grievous disorder. So effectively did Hannibal reform abuses that the heavy tribute imposed by Rome could be paid by instalments without additional and extraordinary taxation. Carthage grew prosperous, and again the Romans trembled. Seven years after the victory of Zama they demanded Hannibal's surrender. They were still in mortal dread of their old enemy. Hannibal did not wish his countrymen to disgrace themselves, and he therefore at once became an exile. First he went to Tyre, the mother-city of Carthage, and thence to Ephesus, where he was honourably received by Antiochus, king of Syria, who was then preparing for war with Rome. Hannibal soon saw that the king's army was no match for the Romans. He advised him to equip a fleet and throw a body of troops on the south of Italy, adding that he would himself take the command. But he could not make much impression on Antiochus, who was a conceited man, quite ignorant of the strength of Rome. The story was told that, pointing to the great army he had assembled at Ephesus, he asked Hannibal if he did not think that these were enough for the Romans. Hannibal's reply was, "Yes, enough for the Romans, however greedy they may be." The great army in which Antiochus had trusted was in 190 B.C. routed by Scipio at Magnesia near Smyrna. Again Rome demanded the surrender of Hannibal.

The end was now at hand. From the court of Antiochus Hannibal fled to Crete, but he soon went back to Asia, and sought refuge with Prusias, king of Bithynia. Once more the Romans were determined to hunt out the old man, and they sent Flamininus to insist on his surrender. Prusias was but a poor paltry princeling, and he promptly complied. Hannibal did not choose to fall into his enemies' hands. At Libyssa, on the eastern shore of the Sea of Marmera, he took poison, which, it was said, he had long carried about with him in a ring. The precise year of his death was a matter of controversy. If, as Livy seems to imply, it was 183 B.C., he died in the same year as his great and victorious antagonist, Scipio Africanus.

As to the transcendent military genius of Hannibal there cannot be two opinions. The man who for fifteen years could hold his ground in a hostile country against several powerful armies and a succession of able generals must have been a commander and a tactician of supreme capacity. Wonderful as his achievements were, we must marvel the more when we take into account the grudging support he received from Carthage. As his veterans melted away, he had to organize fresh levies on the spot. We never hear of a mutiny in his army, composed though it was of Africans, Spaniards, and Gauls. He who could throw a spell over such rough and various natures must indeed have been an extraordinary man. Again, all we know of him comes for the most part from hostile sources. The Romans feared and hated him so much that they could not do him justice. Long after the peril had passed away, we may well believe that Horace accurately reflected their sentiment in describing him, as he does more than once, as the *dirus Hannibal*. Livy speaks of his great qualities, but he adds that his vices were equally great, among which he singles out his "more than Punic perfidy" and "an inhuman cruelty." For the first there would seem to be no further justification than that he was consummately skilful in the use of ambuscades. For the latter there is, we believe, no more ground than that at certain crises he acted in the general spirit of ancient warfare. Sometimes he contrasts most favourably with his enemy. No such brutality stains his name as that perpetrated by Claudius Nero on the vanquished Hasdrubal. Polybius merely says that he was accused of cruelty by the Romans and of avarice by the Carthaginians. He had indeed bitter enemies, and his life was one continuous struggle against destiny. For steadfastness of purpose, for organizing capacity and a mastery of military science, he has perhaps never had an equal.

Considering his fame, we should have expected to find a number of anecdotes about him. There are, however, only a few. One is given by Cicero (*De Oratore*, ii. 18); and may fairly find a place here. When he was an exile at Ephesus, he was invited to hear a lecture from one Phormio, a philosopher. The lecturer discoursed on things in general and on the duties of a commander-in chief in particular, and was warmly applauded by his audience. Some of the hearers turned to Hannibal and asked him what he thought of it. "I have seen," said he, "plenty of old fools in my time, but this man beats them all."

Our chief sources for the life of Hannibal are Polybius and Livy. With Polybius we are generally on safe ground, but unfortunately we have not his guidance throughout. Livy's narrative is too much devoted to his country to be impartial; but he is minute, and his entire history of the Second Punic War has come down to us. There are besides the meagre epitomes of Florus and Orosius, and the remains of the abridgment of Dion Cassius by Zonaras. We have also Plutarch's Lives of Fabius Maximus and Marcellus, in which of course Hannibal figures conspicuously, and a life by Cornelius Nepos. To these must be added Appian, whose book on the *Wars of Hannibal* is not without some value. (W. J. B.)

HANNIBAL, a city of the United States, in Marion county, Missouri, is situated on the west bank of the Mississippi river, 150 miles above St Louis. Owing to its position on the river and its extensive railroad connexions, it has become a busy commercial town; and evidence of the prosperity of many of its inhabitants is afforded by the number of fine residences on the surrounding slopes. It possesses a city hall, a Roman Catholic seminary, and a high school. The river is crossed by a splendid iron bridge, which has provision both for ordinary and for railway traffic. The principal shipping trade is in lumber with other parts of the State, as well as with Kansas and Texas; but tobacco, pork, and flour are also extensively shipped. The manufactories include foundries, car-works, machine-shops, tobacco-works, beef-curing establishments, and flour-mills. In the neighbourhood there are lime-works and coal-pits. The population, which in 1860 was 6505, and in 1870 was 10,125, of whom 1616 were coloured and 1632 foreigners, is now (1880) estimated at 15,000.

HANNO (a very common Carthaginian name, Greek Ἄννων), according to the title of the *Periplus* that passes under the name, was a king (basileus) of the Carthaginians who undertook an exploring and colonizing expedition along the north-western coasts of Africa beyond the Pillars of Hercules, and on his return inscribed a narrative of his voyage in the temple of Saturn. There are no data to fix with any precision the time at which he flourished, the most definite statement about the matter being Pliny's "Punicis rebus florentissimis." Bougainville and Vivien de Saint Martin are disposed to assign him to *circa* 570 B.C.; Heeren, Kluge, and others make him contemporary with a Hanno, father of Hamilcar (*c.* 510 B.C.); and Muller thinks he may be possibly identified with Hanno the son of Hamilcar (*c.* 470 B.C.). According to the *Periplus*, which is the only detailed notice of the expedition that has come down to us, he sailed with sixty galleys (*[illegible]*) and 30,000 (?) men and women, and in the course of his voyage south founded the city of Thymiaterium and settled colonies at Gytte, Acra, Melitta, Arambys, and in the island of Cerne or Kerne. The terminus of the voyage was an island beyond a gulf called the Noti Cornu, in which they found a number of "hairy women" whom the interpreters named *gorillas*.

The identification of the various points mentioned in the narrative has given scope to abundant dissertation and conjecture, and the question as to the site of the gorilla island, or southmost limit of the exploration, has been discussed with special interest. Bougainville and Dureau de la Malle maintain that Hanno reached the Bight of Benin; Muller and Vivien de Saint Martin find his *ultima Thule* in the Gulf of Sherboro; Mannert decides in favour of Bissagos, Heeren for the mouth of the Gambia, Malte Brun for the Bay of Cintra, and Quatremère for the neighbourhood of the Senegal, while Gosselin would go no further south than Cape Nun. But while authorities differ so much in the matter of identification, almost all agree that the narrative is one of the most remarkable records of early exploration that have been preserved. "In its original form," says Vivien de Saint Martin, "it was only a commemorative inscription of barely a hundred lines, and yet in spite of this extreme conciseness there is not one of its details, whether of localities or distances, which is not rigorously conformable to the very accurate acquaintance which we now have of these coasts." In the 18th century Dodwell called the authenticity of the *Periplus* in question, but it was considered that his arguments had been disposed of by Falconer and others. Recently, however, M. Tauxier has renewed the attack, maintaining that in reality we have nothing before us but "a compilation due to an ignorant Greek of the 1st century B.C., brought to its present form by some Christian of the time of Theodosius, probably a student to whom the task was assigned of adapting the old *Periplus* to the geographical ideas of the day."

The editio princeps of the *Periplus* of Hanno issued from the press of Frobenius at Basel in 1533 (Ἀρριανοῦ περίπλους, κ.τ.λ.; *Αννωνος περίπλους Λιβύης*, κ.τ.λ.). Of more recent editions it is enough to mention that in Hudson's *Geographiæ veteris scriptores Græci minores*, vol i., Oxford, 1698, with Dodwell's dissertations prefixed; Arnold Schmidt, *Arrians Indische Merkwürdigkeiten und Hannons Seereise*, Brunswick and Wolfenbuttel, 1764; Thomas Falconer, *The Voyage of Hanno translated . . . and defended against the objections of Mr Dodwell*, London, 1797; Kluge, *Hannonis Navigatio*, Leipsic, 1829; and Carl Müller, *Geographi Græci Minores*, Paris, 1855. For further details see Muller's *Prolegomena*; Bougainville in *Acad. des Inscr. et Belles Lettres*, tome xxvi.; Vivien de Saint Martin, *Le Nord de l'Afrique dans l'Antiquité*, Paris, 1863; Dr Judas in *La Revue d'Orient*; and M. Tauxier in *La Globe*, Geneva, 1867, and *Comptes Rendus de l'Acad. des Inscr.*, Paris, 1875.

HANNO, the chief opponent of Hamilcar and Hannibal at Carthage. Few details are known of his life; his influence on the history of his country, which for more than forty years was very great, can be appreciated only from a detailed history of the period. During the First Punic War he conducted successfully a campaign against some African nation, and he soon became the most trusted leader of the aristocratic party. When in 240 B.C. Hamilcar's veterans returned from Sicily, clamouring for their promised pay, Hanno was sent to require them to accept partial payment; and on their rebellion he was appointed to the command against them. His unpopularity with the army and his incapacity led to several defeats, and the Government was reluctantly forced to associate Hamilcar with him. After Hamilcar had at length crushed the rebellion, Hanno seems to have remained at Carthage exerting all his influence against the democratic party. During the Second Punic War he advocated peace with Rome; and he even, according to Livy (xxiii. 13), advised that Hannibal should be given up to the Romans. After the battle of Zama (203 B.C.) he was one of the ambassadors sent to Scipio to sue for peace, and after the war he is mentioned among the leaders of the Roman party.

HANOVER (German, *Hannover*), formerly an independent kingdom, but since 1866 a province of Prussia, lies between 51° 18' and 53° 52' N. lat. and 6° 43' and 11° 45' E. long., and is bounded on the N. by the North Sea, N.E. by Holstein, Hamburg, and Mecklenburg, E. and S.E. by Prussian Saxony and the duchy of Brunswick, S.W. by Hesse-Cassel and Westphalia, and W. by Holland. These boundaries include the grand-duchy of Oldenburg, which stretches southward from the North Sea nearly to the southern boundary of Hanover. A small portion of the province in the south is separated from Hanover proper by the interposition of a part of Brunswick. The area of the province extends to 14,548 English square miles.

Physical Features.—The greater part of Hanover is embraced in that extensive plain which, commencing on the shores of the North Sea, terminates on the frontiers of Russia. The most fruitful districts are on the banks of the Elbe and near the North Sea, where, as in Holland, rich meadows are preserved from being immersed in water by broad dykes and deep ditches, constructed and kept in repair at great expense. It is only the southern portion that is mountainous; the district of Klausthal, containing the Harz, is wholly so, as well as some parts near Gottingen, and in the district of Hildesheim. The Harz mountains are not a part of any chain, but rise from a plain in an isolated group, the highest points of which are nearly in the centre (see HARZ). They are covered with extensive forests. On their lower slopes the trees are of the deciduous kinds, but pines alone are found on the summits.

The whole of Hanover dips towards the north, and the rivers consequently flow in that direction. The Elbe, which forms the boundary on the N.E., receives the following tributaries:—the Ohre, which rises in the district of Luneburg; the Aland and the Jetze, which come out of the province of Saxony, and are navigable in their lower course; the Ilmenau, which becomes navigable at Luneburg; the Este, navigable to Buxtehude, the Luhe, navigable to Horneburg; the Schwinge, by which vessels reach Stade; the Oste, navigable to [illegible]; and the Medem, which runs through the Hadeln land, and admits large vessels up to Otterndorf. The Weser enters Hanover at Münden, being there formed by the junction of the Fulde and the Werra. It is navigable for barges from the spot at which its name commences; and it receives the Hamel, the Aller, the Oertze, the Leine, the Bohme, the Eyther, the Wumme, which in the lower part of its course takes the name of Lesum, the Geeste, and the Hunte,—all of them purely Hanoverian rivers. The Ems rises in the province of Westphalia, and after entering Hanover receives the waters of the Aa, the Hase, the [illegible], and the Leda; it falls into the Dollart near Emden, which is the principal seaport in the kingdom. It is navigable for flat-bottomed vessels from Rheine downwards, and for sea-going ships from Halte and Weener. The Vecht, a river of short course, rises in the province of Westphalia, and falls into the Zuyder Zee. A navigable canal from the Vecht to Munster connects that city with the Zuyder Zee. Navigable canals connect the various river systems.

The principal lakes are the Steinhuder Meer, about 4 miles long and 2 broad, and 20 fathoms deep, on the borders of Schaumburg-Lippe, the Dummersee on the borders of Oldenburg, about 12 miles in circuit; the lake of Bederkesa, and some others in the moorlands of the north, the Seeburger See near Duderstadt, and the Oderteich, in the Harz, 2400 feet above the level of the sea.

Climate.—The climate in the low-lying districts near the coast is moist and foggy, on the plains mild, on the Harz mountains severe and variable. In spring the prevailing winds blow from the N.E. and E., in summer from the S.W. The mean annual temperature is about 46° Fahr.; in the town of Hanover it is higher. The average annual rainfall is about 23·5 inches; but this varies greatly in different districts. In the west the Höhenrauch, a thick fog arising from the burning of the moors, is a plague of frequent occurrence.

Agriculture.—Though agriculture constitutes the most important branch of industry in the province, it is still in a very backward state. The greater part of the soil is of inferior quality, and much that is susceptible of cultivation is still lying waste. Of the entire area of the country 28·2 per cent. is arable, 16·6 in meadow or pasture land, 13 per cent. in forests, 37·2 per cent. in uncultivated moors, heaths, &c.; from 17 to 18 per cent. is in possession of the state. The best agriculture is to be found in the districts of Hildesheim, Calenberg, Gottingen, and Grubenhagen, on the banks of the Weser and Elbe, and in East Friesland. Of the whole area under cultivation in 1878 there was under wheat 1·9 per cent.; rye, 16·9; barley, 0·9; oats, 5·7; buckwheat, 1·4; pease, 0·4; potatoes, 2·8; and meadow, 16·4 per cent. The extent of tillage was 3,295,752 acres of a total area of 9,464,446 acres. The total yield for the season 1878 was—wheat, 2,208,743 cwt.; rye, 10,843,726 cwt.; barley, 1,350,417 cwt.; oats, 7,054,889 cwt.; buckwheat, 1,150,515 cwt.; pease, 248,934 cwt.; potatoes, 17,828,490 cwt.; hay, 34,228,480 cwt. Rye is generally grown for bread. Flax, for which much of the soil is admirably adapted, is extensively cultivated, and forms an important article of export, chiefly, however, in the form of yarn. Hemp, turnips, and hops are also among the exports. There were in 1877 895 acres planted with tobacco, the produce of which was 12,287 cwt., valued at £15,150. Of beet there were 27,700 acres, yielding 5,276,480 cwt. of beet-root, from which was manufactured in 27 sugar-mills with 211 engines of 2455 horse-power 581,797 cwt. of raw sugar. Apples, pears, plums, and cherries are the principal kinds of fruit grown. Red bilberries (*Vaccinium Vitis idaea*) from the Harz and black bilberries (*V. Myrtillus*) from the Luneburg heath form an important article of export.

Live Stock.—By the returns of 1873 there were in Hanover 191,666 horses, 132 mules, 494 asses, 894,158 head of horned cattle, 1,856,962 sheep (including 511,892 heidschnucken, a very coarse breed), 510,550 pigs, 172,302 goats, and 217,645 beehives. Bees are principally kept on the Luneburg Heath. The number of sheep was larger before 1867, but the number of horned cattle has increased. Horses are reared in the marshes of Aurich and Stade, in Hildesheim and Hanover; the cattle of Aurich in East Friesland are famous for their size and quality. The best sheep belong to the country lying between the capital and the Harz. Large flocks of geese are kept in the moist lowlands; their flesh is salted for domestic consumption during the winter, and their feathers are prepared for sale.

Minerals.—Minerals occur in great variety and abundance. The Harz mountains are rich in silver, lead, iron, and copper; coal is found around Osnabruck, on the Deister, at Osterwald, &c., lignite in various places; salt-springs of great richness exist at Egestorfshall and Neuhall near Hanover, and at Luneburg; and petroleum may be obtained south of Celle. In the cold regions of the northern lowlands, peat occurs in beds of immense thickness. The mining returns for the year 1878 gave the following quantities and values:—coal, 501,728 tons (£115,700); lignite, 120,714 tons (£28,726); asphalt, 26,000 tons (£28,000); iron ores, 170,000 tons (£16,000); zinc, 5141 tons (£10,940); lead ore, 32,806 tons (£188,785); copper ore, 16,783 tons (£15,286); silver ore, 35 cwt. (£1420); manganese ore, [illegible] cwt. (£719); salt from springs, 73,007 tons ([illegible] 493).

Manufactures.—Works for the manufacture of iron, copper, brass, wire, silver, lead, vitriol, and sulphur are carried on to a large extent. About 16,000 persons are employed in these works and in the mines, the yearly revenue from which amounts to £1,200,000. The production of 1878 consisted of—iron, 1,562,251 tons; lead, 8771 tons; copper, 2506 cwt.; silver, 59,992 lb.; gold, 171 lb.; sulphuric acid, 578 tons; blue vitriol, 788 tons. The iron works are very important; smelting is carried on in the Harz and near Osnabruck; there are extensive foundries and machine factories at Hanover, Linden, Osnabruck, Hameln, [illegible], Harburg, Osterode, &c., and manufactories of arms at Herzberg. [illegible] in the towns of the Harz and in the [illegible] [illegible] especially in the south about Osnabruck and Hildesheim [illegible] considerable [illegible] and Hanover [illegible] paper [illegible] to a considerable extent, [illegible] copper works, and [illegible]. Shipbuilding is an important in-dockyards, especially at Papenburg, Emden, Leer, Stade, and Harburg, and the Weser [illegible] trade.

Commerce.—A [illegible] trade of Hanover is to a great [illegible] to Hamburg and Bremen, the shipping of the [illegible] vessels, the larger vessels all belonging to [illegible] to become a very important port when the extensive harbour improvements have been completed.

Administration.—The province is divided into six landdrostein or counties, and these again have been subdivided, since the annexation by Prussia, into smaller districts. There is a provincial assembly representing 43 towns and 111 bailiwicks. A court of appeal for the whole province sits at Celle, and there are 12 superior courts. To the German parliament (Reichstag) Hanover sends 19 members, to the Prussian house of assembly (Abgeordnetenhaus) 36. The debts of the province, contracted before the occupation by Prussia, amount to [illegible].

Population.—The census of 1871 gave the population as 1,963,618; 1,718,[illegible] belonged to the Evangelical Church, 2[illegible] were Roman Catholics, and 12,[illegible] Jews. The urban population numbered [illegible] 3,1[illegible]2, and the rural 1,454,587. By the census of 1875 the population had reached 2,017,393. There are 114 towns, but only 9 have a population exceeding 10,000, viz., Hanover, Osnabruck, Hildesheim, Linden, Harburg, Luneburg, Celle, Gottingen, and Emden.

Counties.	Extent in English sq. miles.	Population, 1st Dec. 1875.			Inhabitants to the sq. mile.
		Males.	Females.	Total.	
Hanover ...	2197·4	215,364	214,695	430,059	196
Hildesheim.	1941·7	204,010	209,587	413,597	213
Luneburg ...	4375·6	194,586	192,128	386,714	88
Stade ...	2493·7	154,694	153,515	308,209	123
Osnabruck...	2358·6	139,761	138,000	277,761	118
Aurich ...	1181·0	99,310	101,743	201,053	170
	14548·0	1,007,725	1,009,668	2,017,393	139

Education.—Amongst the educational institutions the university of Gottingen stands first, with an average yearly attendance of 900 students. There are besides 18 gymnasiums, a progymnasium, 9 first-class grammar schools, 11 normal and training schools, a polytechnic school at Hanover, a school of mines and forestry at Klausthal, several naval academies and schools of arts, 3 asylums for the deaf and dumb, 2 for the blind, and numerous other charitable institutions.

History.—The word Hanover originally applied only to the city so called. It was gradually, however, extended to the country of which Hanover was the capital; and it was officially recognized as the name of the state when in 1814 the electorate of Luneburg was made a kingdom.

In ancient times the country formed part of Saxony, which remained independent until the time of Charlemagne; and afterwards it was included in the duchy of Saxony. After the extinction of the Billung family, which ruled Saxony for about two centuries, the duchy was granted to Lothair of Supplinburg, who in 1125 was elected emperor. He gave his daughter in marriage to Henry the Proud, duke of Bavaria, of the ancient house of Guelph, which already had important allodial possessions in Saxony. Henry the Proud became duke of Saxony as well as of Bavaria; and his son Henry the Lion, after a time of bitter dispute, was installed by Frederick Barbarossa in his father's great position. In the latter part of Frederick's reign, in 1180, Henry was deprived of both his duchies, but was allowed to keep the allodial possessions of his family, viz., Brunswick and Luneburg. In 1235 these lands were yielded by Henry's grandson, Otto Puer, to the emperor Frederick II., who granted them to him in fief as a duchy. Otto's two sons divided their inheritance into two duchies in 1267, and thus were formed the old Luneburg and the old Brunswick lines. There was a fresh division in 1428, whereby were formed the so-called middle lines of Brunswick and Luneburg. From 1527 Luneburg was under the sole government of Duke Ernest the Confessor, who was an ardent adherent of Luther, and so persistently laboured to promote the Reformation in his country that it has been essentially Protestant ever since. He died in the same year as his friend Luther, 1546; and from him descended the younger lines of Brunswick and Luneburg, or of Brunswick-Wolfenbuttel and Brunswick-Luneburg. For in 1634 Duke Frederick Ulrich of Brunswick-Wolfenbuttel suddenly died childless, and his duchy was inherited by Augustus the younger, the descendant of Ernest's eldest son Henry; and Brunswick has remained in the hands of this dynasty till the present day. Meanwhile Luneburg had been ruled over by William, the younger son of Ernest the Confessor; and when he died in 1592 he left seven sons, of whom four, Ernest, Christian, Augustus the elder, and Frederick, one after the other, became rulers of the land. Frederick, who survived all his brothers, died in 1648, the year in which the Thirty Years' War was brought to a close. The only one of the seven brothers who married was George, to whom was granted as a separate duchy a part of Luneburg called Calenberg, of which he made Hanover the capital, Celle being the capital of Luneburg. He arranged that his eldest son should be allowed to select either Calenberg or Luneburg, that the second should take the duchy not chosen by his brother, and that the remaining sons should be content without having territory to govern. The result of this settlement was that his eldest son, Christian Louis, chose Luneburg, where he ruled till his death in 1665. George William, the second son, ruled over Calenberg till 1665, when he transferred himself to Luneburg, which he governed till 1705. On his going to Luneburg, the third brother, John Frederick, became duke of Calenberg, in which position he was succeeded in 1679 by Ernest Augustus, the fourth brother, who married Sophia the granddaughter of James I. of England. Ernest Augustus was an exceedingly ambitious prince, and in order to increase the power of his country introduced in 1682 the law of primogeniture. Afterwards, in 1692, in consequence of a vast amount of negotiation and intrigue, he managed to secure for himself and his successors the electoral title. He died in 1698, and was succeeded by his son George Louis, who, having married his cousin Sophia Dorothea, the daughter of George William of Calenberg, finally united the two duchies on the death of the latter prince. In 1714 George Louis, the elector of Luneburg, ascended the throne of Great Britain as George I.

After this time, until the death of William IV., Luneburg or Hanover had the same sovereign as Great Britain; and this personal union of the two countries was not without important results for both. George II., as the ally of Frederick the Great in the Seven Years' War, joined the struggle in the capacity both of elector and of king; and while George III. was on the throne there was hardly a phase of the foreign policy of England by which Hanover was not affected. In 1803, when the Hanoverian troops capitulated at Sulingen, the country was invested by a French corps, which it had to maintain at a heavy cost. The Prussians received temporary possession of Hanover from Napoleon in 1806; but in 1807 a part of it was annexed to the kingdom of Westphalia, to which the remaining portion was added in 1810. The people never acquiesced in French predominance, and when the final struggle with Napoleon came they distinguished themselves by the ardour with which they flung themselves into it. At the congress of Vienna in 1815 it was demanded in the name of the elector (King George III.) that the electorate should be recognized as a kingdom; and not only was the demand admitted, but the new kingdom received considerable accessions of territory.

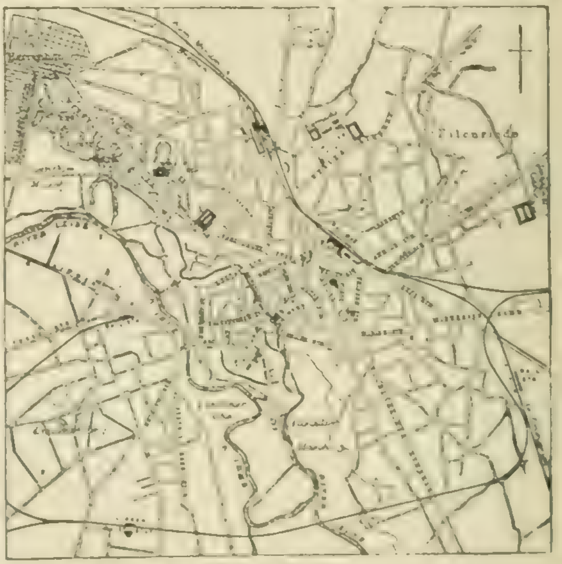
Partly through the influence of the French, partly in consequence of the general progress of ideas Hanover was now, like many other parts of Germany, penetrated by a desire for freedom; and such had been the sufferings of the people, willingly borne for their sovereign and country, that they felt they had a right to be treated in a conciliatory and generous spirit. Their wishes were, however, disregarded. Count Munster, who virtually ruled the country from London, drew up a constitution which came into force in 1819. It was thoroughly reactionary in tendency, and the more resolutely it was enforced the more completely were the people alienated from the ruling class. Not until 1831, when there were several popular risings of so serious a nature that Count Munster resigned, was it deemed necessary to make important concessions, and even then the constitution which the states assembly prepared was made considerably less liberal by William IV. before he sanctioned it in 1833.

As the law of Hanover prevented a woman from mounting the throne, Ernest Augustus, duke of Cumberland, became king after the death of William IV. in 1837. He proved to be a harsh and narrow-minded despot. In 1837 he arbitrarily abolished the constitution of 1833, and when seven professors of the university of Gottingen protested against the act as unlawful, they were deprived of their chairs, and three of the most distinguished—Gervinus, Jacob Grimm, and Dahlmann—were banished from the country. The people were profoundly stirred, and it was hoped that the confederate diet might be induced to protect their rights, but it declined to interfere. A pitiful imitation of a constitution was granted in 1840, but this only intensified the public indignation, which became so strong that in 1848 the revolutionary movement that swept over Europe seemed about to overthrow King Ernest Augustus and his throne together. By hasty concessions he succeeded in preventing this catastrophe, but no sooner did the agitation begin to abate than he showed a disposition to evade the obligations imposed by the constitution which had been wrung from him. The comparatively liberal ministry which had been appointed in the moment of danger was dismissed in 1850, and probably only the death of the king in 1851 prevented him from engaging in as serious a contest as ever with the progressive forces that surrounded him. In 1849, when the Frankfort diet failed to establish the unity of Germany, he joined the kings of Prussia and Saxony in forming what was called "the three kings' alliance"; but he soon withdrew from this connexion, and associated himself with the thoroughly conservative policy of Austria.

Ernest Augustus was succeeded by his blind son, George V. Personally King George was of an amiable disposition, but he shared his father's extravagant conceptions of royal rights, and at once appointed a ministry whose aim was to get rid of the movement constitution of 1848. The second chamber, however, resisted its designs so energetically that in 1852 the more reactionary ministers had to resign, and in 1853 even the modified cabinet was completely defeated. The king then created a Government which advised him to appeal to the confederate diet. This was done, and in 1855 the diet proclaimed the constitution of 1848 to be invalid. That a more easy triumph might be secured, the states assembly was dissolved, and a ministry was formed which boldly restored the nominal constitution of 1840. This Government spared no effort to obtain an overpowering majority, but, as it still encountered some resistance in the new parliament, fresh elections were ordered, and in 1857 it had the satisfaction of meeting as pliant a body of deputies as the king himself could wish. The people, however, were not in sympathy with their nominal representatives, and gave many proofs of their discontent with the arbitrary rule to which they were subjected. In 1862, when an attempt was made to impose upon the schools the use of a catechism of the 17th century, the popular feeling was so decisively expressed that the king was compelled to dismiss his ministers. The new cabinet, which was rather less extravagant, included Herr Windthorst, who had for a short time had a seat in the Government that resigned in 1853, and who has since acquired distinction as leader of the Ultramontane party in the imperial parliament of Germany. King George could not long submit even to a slight modification of his absolutist notions, and in 1865 entrusted Herr von Borries, who had done him faithful service in previous administrations, with the task of bringing together a cabinet to his liking.

Meanwhile, however, dangers had arisen in Germany, compared with which the internal troubles of Hanover were of small account. Herr von Bismarck, who now controlled Prussian policy, was devising methods for the realization of his vast schemes; and it became increasingly clear, after the Schleswig-Holstein war, that the minor states of Germany would soon have to accept finally the lead either of Prussia or of Austria. Before the outbreak of that conflict Hanover and Saxony had despatched troops to Holstein for the purpose of executing the will of the bund. Although the federal army was driven back by Prussia, Hanover seemed for a time to be favourable to her rather than to Austria; but in reality the sympathy of the court was altogether with the latter power. On the 14th of June 1866, in regard to the decisive question whether the federal army should be mobilized, Hanover voted in the confederate diet with Austria; and by doing so she irrevocably declared on which side she would range herself in the approaching struggle. In consequence of this vote Prussia addressed an ultimatum to Hanover on the 15th of June, requiring her to maintain unarmed neutrality and to accept the scheme for the reform of the confederation which the Prussian plenipotentiary had submitted to the diet before retiring from it. As Hanover rejected these demands, Prussian troops at once crossed the frontier; and on the 17th of June they were in possession of the capital. On the 27th a battle was fought at Langensalza, in which the Hanoverians were victorious; but they could make no use of their victory, and were soon compelled to capitulate. At the conclusion of the war, by the treaty of Prague, Hanover, with Hesse, Nassau, and Frankfort, was annexed to Prussia. King George addressed from Hietzing, near Vienna, a protest to the European cabinets, but it was disregarded; on the 3d of October 1866 his dominions were formally taken possession of, and in the following year the population were subjected to the Prussian constitution. In 1878 George V. died at Hietzing; but his son, Ernest Augustus, duke of Cumberland, maintains his right to the crown; and there is still a party in Hanover which declares itself favourable to his claims. The mass of the population, however, whether originally willing to be annexed to Prussia or not, have reconciled themselves to the new régime, and there is evidence that they are gradually becoming loyal subjects of the Prussian king.

Hanover, the capital, is situated in the south of the above province, on a sandy but fertile plain on the river Leine, which here receives the Ihme, and is from this point navigable to the Weser. It is 38 miles W. by N. of Brunswick by rail, 157 miles W. of Berlin, 78 S.E. of Bremen, and 107 S. of Hamburg. The Leine flows through the town, having the old town on its right bank, and the Calenberg or new town between its left bank and the Ihme. The old town is irregularly built, with narrow streets and old-fashioned houses; while the new town has wide streets, handsome buildings, and beautiful squares. Of the latter the most remarkable are the square at the railway terminus, with an equestrian statue of King Ernest Augustus in bronze; the triangular theatre square; George Square, with the statue of Schiller; Waterloo Square, with a column 90 feet high, surmounted by Victory, and having inscribed on it the names of 800 Hanoverians who fell at Waterloo. In the gardens near the square an open rotunda has been erected enclosing a marble bust of Leibnitz, and near it a monument of General Alten, commander of the Hanoverian troops at Waterloo. The town has numerous churches; in the chapel of the palace are preserved the relics of saints which Henry the Lion brought from Palestine. The royal palace—built 1636-1640, rebuilt 1837—contains a picture gallery and collection of natural curiosities, and the palace of Ernest Augustus is remarkable for its historic collections, especially the famous Welfen museum. The other principal public buildings are the record office, containing a library of 150,000 volumes; the town-hall, built in the 15th century; the theatre, the museum, the aquarium, the handsome railway terminus, and the exchange. Hanover has a number of colleges and schools, and is the seat of several learned societies. During the last ten years the town has become the seat of various new industries and of an increasing trade. It is connected by rail with Berlin, Harburg, Bremen, Hameln, Cologne, Altenbeken, and Cassel; and the annual fairs for cloth, leather, yarns, linen, wool, &c., are frequented by large numbers of buyers. There are several banks and a chamber of commerce. Almost every industry is at present represented, whilst in former times the inhabitants derived their chief support from the presence of the court and the nobility. The town possesses large cotton mills, iron-foundries, and machine factories, numerous tobacco manufactories, breweries, distilleries, &c. Hanover was the first German town that was lighted with gas. It is the birthplace of Sir William Herschel the astronomer (1738), of the brothers Schlegel, and of the historian Pertz, and the philosopher Leibnitz died there (1716). The population has increased from 49,909 (including suburbs) in 1852 to 106,677 in 1875 (with the adjoining Linden, 127,576). In the vicinity are the royal palaces of Herrenhausen, the unfinished Welfenschloss (formerly Mont Brilliant), and Marienburg, the private property of Queen Marie, all surrounded by gardens.



Plan of Hanover.

1 Cavalry Barracks.
2 Bank.
3 Theatre.
4 George Square, statue of Schiller.
5 Royal Palace.
6 Markt Kirche.
7 Town Hall.
8 Royal Castle.
9 Palace of Ernest Augustus.
10 Library.

See Baring, *Notitia Scriptorum rerum Brunsvicensium ac Luneburgensium* (Hanover, 1720); Leibnitz, *Scriptores rerum Brunsvicensium* (Han., 1707–11); Bünting, *Braunschweig-Lüneb. Chronica* (Magdeburg, 1584), continued till 1620 by Meibom (3d. ed., Han.); *Gesch. des Königr. Hannover und Herzogth. Braunschweig* (Han., 1823–32); Havemann, *Gesch. der Lande Braunschweig und Lüneburg* (Göttingen, 1853–57); Grotefend, *Gesch. der allg. landständ. Verfassung des Königreichs Hannover*, 1814–48 (Han., 1857); Schaumann, *Handbuch der Gesch. der Lande Hannover und Braunschweig* (Han., 1864); Guthe, *Die Lande Braunschweig und Hannover* (Han., 1867); Oppermann, *Zur Gesch. Hannovers*, 1832–60 (Leip., 1868); Sichart, *Gesch. der Königl. hannoverschen Armee* (Han., 1866–71). (E. J.—J. Sl.)

HANSARD, LUKE (1752–1828), English printer, whose name is familiar in connexion with the parliamentary reports, was born July 5, 1752, in St Mary's parish, Norwich. Reverses in business compelled his father, a manufacturer there, to apprentice him to Mr Stephen White, printer. Immediately on the expiry of his apprenticeship Hansard started for London with only a guinea in his pocket, and obtained there in 1772 a situation as compositor in the office of Mr Hughs, printer to the House of Commons. There his ability and energy commended him so well to his master that in two years' time he was made a partner, and undertook almost the entire conduct of the business, which in 1800 was resigned completely into his hands, through the retirement of Mr Hughs. Among those whose acquaintance Hansard made in the exercise of his profession and retained by his amiable private qualities, were Orme, Burke, and Dr Johnson; while Porson eulogized him as the most accurate printer of Greek. The promptitude and accuracy with which Hansard printed parliamentary papers were often of the greatest service to Government,—notably on one occasion when the proof-sheets of the report of the Secret Committee on the French Revolution were submitted to Pitt twenty-four hours after the draft had left his hands. On the union with Ireland in 1801, the increase of parliamentary printing was so great that Hansard was forced to give up all private printing except when parliament was not sitting. He devised numerous expedients for reducing the expense of publishing the reports; and in 1805, when his workmen struck at a time of great pressure, he and his sons did not scruple themselves to work as compositors, and to instruct the new hands they had procured. Shortly after printing the report of the session that rose in July 1828, Hansard's health, which had been failing, completely gave way, and he died on October 29th of the same year. See the *Gentleman's Magazine* for December 1828.

HANSEATIC LEAGUE. The word "hansa," when we find it first in the Gothic Bible of Ulfila, signifies a military assemblage or troop. From this comes the general sense of union, and especially in the Middle Ages of union for mercantile purposes. A later but less important meaning is that of a tax paid by traders for the right of forming such an union.

The Hansa, the league which ultimately overshadowed all rivals and usurped the name for itself, was no intentional creation, and we can fix no exact date for its origin. It arose gradually from two elements, the union of German merchants abroad, and the union of German towns at home.

The first impulse to mercantile union came from the dangers of travelling in the early Middle Ages. In those days mariners had neither chart nor compass to guide their course, and were forced to creep timidly along the shore and to avoid as much as possible the open sea. The merchant had also to dread more positive dangers than those of storm and wreck. The coasts of northern Germany harboured numbers of rovers and pirates, who regarded the peaceful trader as their natural prey. To increase their powers of resistance, it was usual for merchants to undertake their voyages in more or less numerous companies. The union thus begun on sea was still further cemented on land. In those days law was personal and not territorial. The foreign merchant had no share in the law of the land where he sojourned; he brought with him his own law, and administered it as best he could. The legal customs of northern Germany were substantially alike; and this similarity strengthened the bonds of union among the merchants who found themselves for a time settled in a foreign land. Moreover, the state of trade frequently required a long stay, and sometimes a depositing of goods among strangers. This led in time to the acquisition of common possessions abroad, lodgings, storehouses, &c. This common depôt, or "factory," became the central point of the union or Hansa formed by the merchants. The union soon received a corporative constitution. At its head stood the elders, whose chief functions were to administer justice and to represent the society in its relations to the natives of the country. It was by means of these orderly unions that the German merchants obtained their important privileges, chiefly advantages in trade and taxes, from the people among whom they sojourned.

The most important German mercantile settlements were founded in Wisby, the capital of Gothland, in London, Novgorod, Bergen, and Bruges. Wisby was the central point of the Baltic trade; the other towns represent the four extreme points of North-German commerce. It was not unnatural that the mercantile settlements should exercise great influence on the towns from which they sprang. In those towns the municipal government was wholly in the hands of merchants. There was no feudal aristocracy as in the Italian cities, and the artisan was always jealously excluded from political power. It is obvious therefore that the policy of the town-councils would often be influenced by the exigencies of foreign commerce. But the influence of the foreign factories was not exercised by all in an equal degree. Wisby differed from the other settlements in the fact that the Germans there were not merchants making a temporary visit, but were real settlers living side by side with the native population. Novgorod was a mere colony of the German settlement in Wisby, and never held an independent position. Bergen was comparatively unimportant, and the German "counter" in Bruges was not formed until some amount of union had been attained at home. But in the German colony in London the majority of the members were merely passing traders, who remained citizens of their native towns. It was therefore the London Hansa which exercised the greatest influence on the growth of the town league.

In the reign of Edgar we find the "people of the emperor" occupying a prominent position in London trade, and joined in a lasting league. The members of this league came mostly from Cologne, the first German town which obtained great importance both at home and abroad. Its citizens possessed at an early date a guild-hall of their own, and all Germans who wished to trade with England had to join their guild. This soon included merchants from Dortmund, Soest, and Münster, in Westphalia; from Utrecht, Stavern, and Groningen, in the Netherlands; and from Bremen and Hamburg on the North Sea. But when, at the beginning of the 13th century, the rapidly rising town of Lübeck wished to be admitted into the guild, every effort was made to keep her out. The intervention of the emperor Frederick II. was powerless to overcome the dread felt by Cologne towards a possible rival to its supremacy. But this obstacle to the extension of the league was soon overcome. In 1260 a charter of Henry III. assured protection to all German merchants. A few years later Hamburg and Lübeck were allowed to form their own guilds. The Hansa of Cologne, which had long been the only guild, now sinks to the position of a branch Hansa, and has to endure others with equal privileges. Over all the branch Hansas rises the "Hansa Alamanniæ," first mentioned in 1282.

The opposition to the exclusive pretensions of Cologne was chiefly the work of Lübeck, and with the rise of Lübeck we must connect the second element, the internal political element, which contributed to the formation of the Hansa. The old capitals of German trade, Cologne and Wisby, took their stand on the unions of German merchants abroad. In opposition to them Lübeck found support in home alliances, in its league with Hamburg and with the Wendish towns. The alliance between Lübeck and Hamburg is generally and with some truth given as the origin of the Hanseatic League. It was well fitted to play this part. These two towns commanded the commerce of the North Sea and the Baltic. By taking the land route between them, a merchant could avoid the dangerous passage of the Sound or the Belts, and could evade the Sound dues which were often exacted by the Danish kings. The first alliance between the two towns, for which there is no exact date, had for its object the defence of the roads between them. From that came agreements as to mutual legal security, and thence they advanced to common political action in London and in Flanders.

The league between Lübeck and Hamburg was not the only, and possibly not the first, league among the German towns. But it gradually absorbed all the others. Besides the influence of foreign commercial interests there were other motives which compelled the towns to union. The chief of these were the protection of commercial routes both by sea and land, and the vindication of town independence as opposed to the claims of the landed aristocracy. The first to join this league were the Wendish towns to the east, Wismar, Rostock, Stralsund, &c., which had always been intimately connected with Lübeck, and were united by a common system of law known as the "Lübisches Recht." The Saxon and Westphalian towns had long possessed a league among themselves; they also joined themselves to Lubeck. Lubeck now became the most important town in Germany. It had already surpassed Cologne both in London and Bruges. It soon gained a similar victory over Wisby. At a great convention in which twenty-four towns from Cologne to Revel took part it was decided that appeals from Novgorod which had hitherto been decided at Wisby should henceforth be brought to Lübeck.

In the 14th century the Hansa changes from a union of merchants abroad to a league of towns at home. In 1330 mention is first made of the Hanse towns, where before it had been the Hanse merchants. In 1343 the league is first designated as the Hansa by a foreign prince, Magnus of Norway, and thus acquires a diplomatic position as a united state. In 1356 a statute about mercantile privileges at Bruges is made, not by the German merchants, but by the towns themselves, through their representatives assembled at Bruges. Henceforth the town league subordinates to itself the mercantile unions; the factories and depôts of the merchants lose their independence, and become the "comptoirs," as they are called, of the Hanse towns.

The league thus formed would scarcely have held long together or displayed any real federal unity but for the pressure of external danger. The true function of the Hansa, and especially of the Baltic towns, was to conduct the commerce between the east and west of northern Europe. But the geographical position of the Scandinavian countries enabled them to interpose a bar to this commerce. Thus from an early period the Hansa stood in a position of watchful hostility towards these countries. It was the careful maintenance of this watch over the Baltic which gave Lübeck its position in the league, and which gave the League its political as contrasted with its mercantile character.

The most dangerous of the Scandinavian countries at this time was Denmark. Until the 16th century the southern coast of what is now Sweden was in the hands of the Danes, who were thus enabled to command the important channel of the Sound, and to interfere with the herring fisheries, a great source of wealth to the Hanse merchants. The Danish kings were almost always opposed to German interests, and were especially jealous of the supremacy of German traders in the Baltic. Eric Menved (1286–1319) almost succeeded in making himself master of the southern coast of the Baltic. He captured Rostock and the island of Rügen. Even Lübeck submitted to him, and was for a time practically detached from the empire. Stralsund alone successfully resisted the Danish attack. The league of Wendish towns was for the time wholly broken up, and the growth of the Hansa was arrested; but it was saved from total dissolution by the feuds which distracted Denmark. Eric's successor, Christopher II., an exile from Denmark, fled to the very towns which his predecessor had humbled. After extorting from him numerous privileges, especially the exclusive right to the fisheries on the coast of Schonen, the Hanse towns restored him to his throne, though to only a fraction of his former power. From 1333 to 1340 Denmark was without a king, and a prey to the wildest anarchy. But as it recovered strength it again became formidable to the Hansa. Waldemar III. (1340–1377) devoted the early part of his reign to the recovery of the lands which Denmark had lost during the recent troubles. To carry out this policy he had to spend large sums of money, and in his straits he determined to enrich himself by the plunder of German commerce. In 1361 he sailed to Gothland, and surprised and captured the town of Wisby. The news of this act reached the representatives of the Hansa as they were assembled at Greifswald. They at once resolved on war, and in 1362 their fleet stormed and captured Copenhagen. But while they were besieging the strong fortress of Helsingborg, Waldemar attacked their defenceless fleet and destroyed it. This defeat was followed by a truce, which recognized the Danish possession of Gothland. Waldemar might easily have turned this truce into an advantageous peace, but his success seems to have inspired him with the hope of crushing German ascendency in northern Europe. In 1367 a Hanseatic assembly at Stralsund was informed that Waldemar had laid new duties on the fishing stations, and that he had robbed German merchants in the Sound and the Belts. Another war was inevitable, and this time the result was different. Waldemar did not await the arrival of the hostile fleet, but fled in 1368 to Brandenburg. Denmark fell entirely into the hands of the League. In 1370 Waldemar was compelled, as the price of his return to his kingdom, to sign the treaty of Stralsund. By this treaty the Hansa obtained possession for five years of all fortresses on the coast of Schonen, and as compensation for its losses was to receive for fifteen years two thirds of the Danish revenues. It was also stipulated that henceforth no king should ascend the throne of Denmark without the consent of the Hanse towns, and that their privileges should be expressly confirmed at each coronation. The treaty of Stralsund marks the zenith of the power and prosperity of the Hansa. The emperor Charles IV., who had always looked coldly on independent confederacies among his subjects, seems to have been induced to alter his policy, and in 1375 he distinguished Lübeck by a personal visit.

The war against Waldemar III. seems to have had a great effect in consolidating the Hanseatic League, and in forcing it to adopt a federal constitution. From 1361 we can date the regular meeting of the general assemblies, whose acts (Recesse) have been preserved in the archives at Lübeck. These assemblies met once a year about midsummer, usually but not exclusively at Lübeck. They were attended by representatives of the various towns, but no one below the rank of councillor could act as representative. The League always endeavoured to maintain its aristocratic character. The assemblies busied themselves with all the details of foreign policy as well as of internal management. The penalty for non-observance of their decrees was expulsion from the League (Verhansung). The chief offence which brought this punishment on a town was the admission of democratic tendencies. The struggle between the artisans and the old burgher families, which is so important a feature of European history in the 13th and 14th centuries, necessarily affected the Hanse towns. It was for admitting artisans to the council that Brunswick was expelled from the League in 1375, and was not readmitted till 1380, when the old constitution was restored.

Besides the central constitution of the Hansa, there are also traces of an internal grouping. At Bruges the German merchants are divided, according as they came from (1) the Wendish and Saxon towns, (2) Westphalia and Prussia, (3) Gothland, Livonia, and Sweden. This division is supposed to refer to a real division of the League, each third being gathered round one of the three chief towns, Lubeck, Cologne, and Wisby. But in later times we find the League divided into four quarters with their respective capitals,—Lübeck, Cologne, Brunswick, and Dantzic.

Although, by comparing the documents which have come down to us, we can trace the existence of a fairly definite system of government, yet we must not imagine that this system was carried out with the regularity of a modern constitution. The composition of the League was always fluctuating, and it is impossible to say at any fixed time how many members it contained. The towns lay scattered over a large territory extending from Revel to the Scheldt, and their interests, both territorial and commercial, must have often clashed. It was only in time of danger that the League displayed any real consistency. When the immediate danger was withdrawn, the want of union soon made itself again manifest. It is true that the towns joined the League of their own accord, but when they had joined, they tried to make their position as independent as possible. They never considered themselves bound to send deputies to the general assemblies. When the deputies did appear they usually came late, and after a matter had been discussed they would insist on referring it to the town-council at home, as their own powers were insufficient. The wonder lies, not in the dissensions which sprang up among the towns, but in the fact that for three centuries they did in a manner hold together, and not infrequently sacrificed their individual advantages for the common good.

From the very moment of the treaty of Stralsund, the weakness of a community founded chiefly on commercial interests began to show itself. The eastern Baltic towns, especially those of Prussia, were indignant at the erection of a staple at Lübeck. They desired to trade directly with England and Flanders. To repress this movement Lübeck as the head of the League entered into the closest relations with the Teutonic order. But the evil of these dissensions lay in the fact that they distracted the attention of the Hanse towns from events in Scandinavia. The influence guaranteed to them by the treaty of Stralsund was never exercised, and their supineness allowed Margaret, Waldemar III.'s daughter, to unite the crowns of the three Scandinavian kingdoms at Calmar in 1397. The erection of a powerful northern state was obviously dangerous to the ascendency of the Hansa. About the same time their allies, the Teutonic knights, were threatened in a similar manner by the accession of the Jagellon dynasty in Poland. The battle of Tannenberg (1410) and the peace of Thorn (1411) were clear signs that the Slavonic race was beginning to turn the tables on its German oppressors. At one time it seemed probable that Slavs and Scandinavians would unite in a great anti-German crusade, and that the Hansa and the Teutonic order—the pioneers of German civilization in northern Europe—would fall victims to the alliance. During the 15th century the Hanse towns were frequently compelled to seek safety in arms. Their constant policy was to break up the union of Calmar. In 1428 they sent a large fleet against Eric, Margaret's successor, who wished to add Schleswig and Holstein to his possessions. The accession of two German princes, Christopher of Bavaria and Christian I. of Oldenburg, to the Danish crown was due in no slight measure to the exertions of the Hansa. On the whole the League held its own in this century, though not without considerable and increasing difficulty.

But with the 16th century the Hansa begins really to decline. The English and Dutch proved formidable rivals for the commercial supremacy in northern Europe. Henry VII. secured in 1489 a treaty from Hans of Denmark, which gave England the right of commerce in the northern seas, and which enabled English merchants to found mercantile establishments in the ports. The herrings no longer came in crowds to the Swedish and Norwegian coasts, where the members of the Hansa had so long held a practical monopoly of the fisheries. These fish made at this time one of their periodical changes of course, and went to the coasts of Holland. The Dutch were not slow to grasp at the advantages thus offered to them. Another great blow was dealt to Hanseatic commerce by the grand discoveries of the age. Most of the German towns were out of the way of the new commercial routes, and could scarcely hope to hold their own with more favourably situated countries.

Besides these causes of decline, the domestic position of the Hanse towns had altered very much for the worse. While in other countries the power of the feudal nobles had fallen before the rapid rise of the monarchy aided by the sympathy of the commons, in Germany alone the power of the princes had constantly increased, at the expense of both king and people. The Reformation and the consequent secularization of church property in northern Germany only served to strengthen the hands of the lay princes. Such a state of things was fatal to the independence of a town league which had always stood opposed to the lawless independence of the nobles. Gradually most of the towns fell off from the League. Foreign countries triumphed at the fall of their formerly successful rival. In Elizabeth's reign the Hanse merchants in London lost the privileges which they had held since the time of Henry III.

Religious disturbances and the fearful disasters of the Thirty Years' War completed the work thus begun. The peace of Westphalia restored the form but not the reality of the League. In 1669 the last general assembly was held. Henceforth the name of Hanse towns was kept by Lübeck, Hamburg, and Bremen, but it was to designate their independence, not their union.

References.—*Hanse-Recesse*, 1256–1430, B. i.-iv., and 1431–1476, B. i. and ii.; G. F. Sartorius, *Urkundliche Geschichte des Ursprunges der deutschen Hanse* (edited by J. M. Lappenberg); Lappenberg, *Urkundliche Geschichte des hansischen Stahlhofes zu London* (Hamburg, 1851); Wehrmann, *Die Lubeckischen Zunftrollen* (Lubeck, 1872); Karl von Schlozer, *Die Hansa und der deutsche Ritter-Orden in den Ostseeländern*; the *Hansische Geschichtsblätter*; Schafer, *Die Hansestädte und Konig Waldemar von Danemark* (1878). (R. L.)

HANSEN, Peter Andreas (1795–1874), astronomer, was born on December 8, 1795, at Tondern, in the duchy of Schleswig. When a youth he served an apprenticeship to a clock and watchmaker at Flensburg, with whom he remained several years. During this time he exhibited an intense interest for mathematics and the physical sciences, which was the means of his introduction in 1820 to Schumacher, professor of astronomy at Copenhagen, who, appreciating Hansen's abilities, engaged him to assist in the measurement of an arc of meridian in Holstein. This led to his appointment as assistant to Schumacher at the observatory of Altona, on its foundation in 1823. Hansen's reputation as an excellent mathematician had by this time become generally known, and in 1825 he was selected to succeed Professor Encke as director of the observatory of Seeberg, near Gotha. There he remained for the rest of his life, devoting his talents to the development of the highest branches of mathematical astronomy, with an originality of conception which was acknowledged by the English Royal Astronomical Society on two occasions, by the award of their gold medal for his researches in physical astronomy and his lunar tables. His *Tables de la Lune* appeared in 1857, published at the expense of the British Government; they have been adopted for use in the calculations of the *Nautical Almanac*. In addition to his important volume containing the full details of the formulæ explanatory of his lunar theory, Hansen was the author of a large number of miscellaneous astronomical papers, principally relating to the orbits of comets and planets or to perturbational astronomy. In one of these he was the first to point out that Encke's value of the horizontal equatorial solar parallax required to be increased to reconcile the lunar theory with modern observations,—an opinion which was subsequently confirmed by Le Verrier from his planetary researches, and by the observations of Mars and the transit of Venus of 1874. Hansen was a foreign member of the Royal Society, and an associate of the Royal Astronomical Society. He died on March 28, 1874, at the age of seventy-eight.

HANSTEEN, CHRISTOPHER (1784–1873), astronomer and physicist, was born at Christiania, Norway, September 26, 1784. From the cathedral school he went to the university at Copenhagen, where first law and afterwards mathematics formed his main study. In 1806 he taught mathematics in the gymnasium of Frederiksborg, Zeeland, and the following year he commenced the inquiries in his favourite branch of science—terrestrial magnetism—which have made his name famous. He took in 1812 the prize of the Danish Royal Academy of Sciences for his reply to a question on the magnetic axes. Appointed lecturer in 1814, he was in 1816 raised to the chair of astronomy and applied mathematics in the university of Christiania. In 1819 he published his researches on terrestrial magnetism, a work which attracted the notice of the physicists of Europe and particularly of England, where the search for a formula by which the variation of the needle might be found at any given time and place was being actively pursued. The researches were translated into German by P. T. Hanson, under the title *Untersuchungen über den Magnetismus der Erde*, with a supplement containing *Beobachtungen der Abweichung und Neigung der Magnetnadel*, and an atlas. The rules there framed for the observation of magnetical phenomena have been generally followed. Hansteen hoped by them to accumulate analyses for determining the number and position of the magnetic poles of the earth. In prosecution of his researches he visited London, and also Paris and other Continental cities, and travelled over Finland and the greater part of his own country; and in 1828–30 he undertook, in company with Ermann and Due, and with the cooperation of Russia, a Government mission to Western Siberia, the chief aim of which was to find the ideal point of the Asiatic pole of magnetism—ten observatories being established in Russia to further the project. The scientific results—magnetic, astronomic and meteorological—form the bases of many valuable theories. A narrative of the personal adventures soon appeared (*Reise-Erinnerungen aus Sibirien*, 1854; *Souvenirs d'un voyage en Sibérie*, 1857); but the chief work was not issued till 1863 (*Resultate magnetischer Beobachtungen*, &c.). Shortly after the return of the mission, an observatory was erected in the park of Christiania (1833), and Hansteen was appointed director. On his representation a magnetic observatory was added in 1839. In 1835–38 his text-books on geometry and mechanics were published; and in 1842 he wrote his *Disquisitiones de mutationibus quas patitur momentum acus magnetici*, &c. He also contributed various papers to different scientific journals, especially the *Magazin for Naturvidenskaberne*, of which he became joint-editor in 1823. He superintended the trigonometrical and topographical survey of Norway, begun in 1837. He was a member of the Royal Society of London, the French Institute, the American Academy of Arts and Sciences, and the Academies of Berlin and St Petersburg. In 1861 he retired from active work, but still pursued his studies, his *Observations de l'inclination magnétique* and *Sur les variations séculaires du magnétisme* appearing in 1865. Hansteen died at Christiania, April 15, 1873.

HANUSCH, IGNAZ JOHANN (1812–1869), Bohemian savant and philosopher, was born at Prague on the 28th November, 1812. He received his early education in his native city, and taught for a short time in a monastic school there. At the universities of Prague and Vienna, where he afterwards studied, he directed his attention successively to theology and law, and finally, under the influence of Hegel's writings, to philosophy. After temporarily supplying in 1835 the place of Lichtenfels, professor of philosophy at Vienna, he was next year appointed ordinary professor of philosophy at Lemberg, whence he passed in the same capacity to Olmütz in 1847, and two years later to Prague. There he began a successful course of philosophy in the Czech language, but in 1852 was abruptly suspended from teaching, owing to his leanings towards Slavism. He still, however, retained his full salary; and in 1860 he was nominated director of the imperial university library at Prague, where he died on the 19th May 1869.

His chief writings, mainly on philosophic and Slavonic subjects, are the following:—*Wissenschaft des Slavischen Mythus* (1842); text-books in *Logic* (1843), *Ethics* (1866), *Metaphysics* (1846), and *Empirical Psychology* (1849); *Geschichte der Philosophie von ihren Ursprüngen bis zur Schliessung der Philosophenschulen unter Justinian* (1850); *Vorlesungen über die Kulturgeschichte der Menschheit* (1849); *Quellenkunde und Bibliographie der böhmisch-slovenischen Literatur* (1868). Besides these and others, Hanusch wrote some works in Czech, and published the works of the old Slavonic philosopher, Ritter Thomas, in 1852.

HANWAY, JONAS (1712–1786), an English traveller and philanthropist, was born at Portsmouth, but he was still a child when the death of his father, a victualler by trade, caused his mother to remove with her family to London. At the age of seventeen the boy was apprenticed to a merchant in Lisbon, and he remained there till he entered business for himself. In 1743, after he had been for some time again in London, he became a partner with Mr Dingley, a merchant in St Petersburg, and in this way had his attention turned to the trade between Russia and Persia. Leaving St Petersburg on the 10th of September 1743, and passing south by Moscow, Zuratzin, and Astrakhan, he embarked on the Caspian on November 22d, and arrived at Astrabad on December 18th. Here his difficulties began. The town was attacked and captured by a rebel, Mohammed Hassan Beg; his goods were seized, and it was only after great privations that he reached the camp of the Shah Nadir. Obtaining an order for the restoration of his goods he returned to Astrabad, and succeeded in recovering about 85 per cent. of their original value; but he was obliged to retrace his steps, and after a painful journey, during which he was attacked by pirates, detained by sickness, and obliged to perform six weeks' quarantine, he arrived at St Petersburg July 9, 1750 The autumn of that year he spent travelling in Germany and Holland, and on October 28th he landed in England, where the narrative of his travels published in 1753 soon made him a man of note. The rest of his life was for the most part spent in London, and his leisure was devoted to the advocacy and support of all kinds of useful and benevolent enterprises. In 1762 he was appointed one of the commissioners for victualling the navy, and on his resignation in 1783 he received the whole of his salary as a pension. He died September 5, 1786. Hanway was naturally a healthy and active man; in Russia he was known as the handsome Englishman; but the efforts of his travels in Persia rendered him somewhat of a valetudinarian. He is popularly known as the first Englishman to carry an umbrella in his native country; this he persisted in using in spite of all the efforts of the hackney coachmen to hoot or hustle him into conformity. He succeeded in writing down the custom of giving vails; and in his *Journey from Portsmouth to Kingston* he attacked the pernicious habit of tea-drinking, which, however, found an able and ardent defender in Dr Johnson. In 1757 he took an active part in founding the Marine Society, the object of which was to fit out poor boys and men for the navy; he was one of the originators of the Magdalen Hospital; it was due to his continued efforts that the Act of George III. was passed for the better treatment of the parish infants; and in 1785 he took up the lamentable case of those little chimney-sweeps whose dangerous occupation is now a thing of the past. The method of solitary confinement for prisoners found in him one of its earliest advocates, and in various other ways he sought to improve the chances of the criminal population. "Every man," was his theory, "is capable of good if properly treated. If doing justice to an offender implies an attempt to reform him by using the proper means, by parity of reasoning the using of improper means is doing injustice." Hanway's writings are of little value except for the sake of the causes which they supported; while effective as pamphlets, they lack both style and method, and are apt to run over into platitudinous moralizings. See Pugh, *Remarkable Occurrences in the Life of Jonas Hanway*, 1787.

HAPARANDA, from *Haaparanta*, "Aspen-shore," a small town of Sweden in the district of Torneå, at the northern end of the Gulf of Bothnia, in 65° 51′ N. lat. It lies about a mile from the mouth of the Torneå-Elf, exactly opposite the town of Torneå, which has belonged to Russia since 1809. Haparanda was founded in 1812, and at first bore the name of Carljohansstad or Charles John's Town. It received its municipal constitution in 1842. The inhabitants, who according to the census of 1875 number 944, carry on a brisk trade and engage in ship-building. Since 1859 the town has been the seat of a meteorological station, which is one of the most valuable in Europe, not only because it lies so far north, but also because of its position at the head of the Gulf of Bothnia, and immediately to the south of the line of junction between the permanently open sea and the sea which is frozen during the winter months, or, in other words, in the region where at certain seasons there is an extraordinary crowding together of the isothermal lines.

HAPSBURG, or HABSBURG (originally *Habichtsburg*, that is, Hawkscastle), an old German family which has given sovereigns to Germany, Spain, and Austria, takes its name from the old Swiss castle of Habsburg, now in ruins, situated on the river Aar in the canton of Aargau. The first mention of the countship of Habsburg is in a document of 1099, where the name Werner, count of Habsburg, occurs in connexion with the consecration of the monastery of Muri as confirming the grants of the pious foundations made by his ancestors. This Werner of Habsburg was a nephew of Werner, bishop of Strasburg, who built the castle of Habsburg about the year 1020. The succession of the family cannot be traced between this period and the time of the emperor Frederick Barbarossa, but in a document whose date is 30th May 1153, Werner II. and his son Albert the Rich are mentioned as counts of Habsburg. This Albert was by Frederick created landgrave of Upper Alsace, and received the countship of the district of Zurich and the protectorship of the monasteries of Seckingen and Murbach; and on the extinction of the house of Zähringen he also succeeded to a considerable portion of their territories. Albert died in 1199, and was succeeded by his son Rudolf the Old, who, as a reward for placing a large sum of money at the disposal of Frederick II., received from him the countship of Aargau. He held an influential position among the Swabian nobility, and so increased his possessions that they included the territories of the bishops of Strasburg, Constance, Basel, Coire, Ghent, and Lausanne, and of the abbot of St Gall, in addition to which he also obtained the countship of Frickgau. Rudolf left behind him two sons, Albert the Wise and Rudolf II., who shared the possessions between them, and founded respectively the lines of Hapsburg-Hapsburg and Hapsburg-Laufenburg,—Albert, besides the castle of Hapsburg, holding the lands in Aargau and Alsace, and Rudolf the countships of Klettgau, Rheinfeld, and Laufenburg, and the possessions in Breisgau. The Laufenburg line also divided into two branches, the former of which became extinct in 1408 and the latter in 1415. Laufenburg thereupon fell to Austria, and Klettgau, through the marriage of the female heiress of the line, to the counts Sutz, from whom it passed by marriage in 1687 to the house of Schwarzenberg. Albert the Wise of Hapsburg-Hapsburg was married to the countess of Kyburg, who was descended from the dukes of Zähringen, and related to the emperor Frederick II. From this union there was born on the 1st May 1218, Rudolf, the founder of the royal dynasty of Hapsburg. He was elected king of Germany in 1273, and after the defeat and death of Ottocar, king of Bohemia, in 1278, at Marchfeld on the Danube, he annexed to his possessions Austria, Styria, Carinthia, and Carniola. On the death of Rudolf in 1291 Adolf, count of Nassau, was elected his successor to the German crown, but although on the death of Adolf it again reverted to the Hapsburg line in the person of Albert I., it passed on his death to Henry, count of Luxembourg, and with the exception of the doubtful period when Frederick, eldest son of Albert, and Lewis, duke of Bavaria, divided the suffrages of the electors and were crowned, the one at Bonn and the other at Aix-la-Chapelle, the Hapsburg line remained excluded from its possession till the time of Albert II., who succeeded Sigismund as king of Bohemia and Hungary in 1437, and was chosen emperor of the Romans in 1438. The greater part of the original lands of the house were gradually lost by the victories of the Eidgenossen, who finally in 1474 obtained Aargau, in which the castle of Habsburg was situated. Philip, son of Maximilian I. and of Donna Juana of Spain, ascended the Spanish throne in May 1506, and on his death in September of the same year, he was succeeded by Charles I., who was chosen emperor in 1519, and was thenceforth known as Charles V. In 1521 Charles granted his Austrian possessions to Ferdinand I., who became the head of the Austrian dynasty The Spanish branch became extinct in 1700 with the death of King Charles II., and the male line of the Austrian branch became extinct with the death of the emperor Charles VI. in 1740; but the Austrian house was continued in the female line by Maria Theresa, who by her marriage with Francis of Lotharingia, chosen emperor in 1745, founded the line of Hapsburg-Lotharingia, from which the present imperial dynasty of Austria is descended.

The main facts of the history of the house of Hapsburg, from the time of Rudolf I., king of Germany, will be found in the articles AUSTRIA (vol. iii. p. 124), GERMANY (vol. x. p. 496), and SPAIN. See also Coxe's *House of Austria*, 2 vols., London, 1807; Herrgott's *Genealogia diplomatica augustæ gentis Habsburgicæ*, Vienna, 1737-38; Kopp's *Vindiciæ Actorum Murensium*, Leipsic, 1751; Röpell, *Die Grafen von Habsburg*, Halle, 1832; Lichnowsky, *Geschichte des Hauses Habsburg*, 8 vols., Vienna, 1836-37; Huber in the *Almanach of the Vienna Academy* for 1870; Münch, "Die Münze zu Laufenburg, nebst einem Abriss der Geschichte der Grafen von Habsburg-Laufenburg," in *Argovia*, vol. viii., 1874; and the same writer's "Regesten der Grafen von Habsburg, laufenburgischer Linie, 1198–1408," in vol. x. of the same publication, 1879.

HÁPUR, or HAPOOR, an ancient town of India in the Meerut district, North-Western Provinces, 28° 43′ 20″ N. lat., 77° 49′ 45″ E. long., lies on the Meerut and Bulandshahr road, 18 miles south of the former city. During the mutiny, Walidád Khán of Malágarh threatened Hápur, but was obliged by the loyal Játs of Bhatona to retire. Several fine groves surround the town, but the wall and ditch have fallen out of repair, and only the names of the five gates now remain. It contains a *tahsílí*, a police station, school-house, dispensary, 3 *saráis*, 28 mosques, and 25 temples. Considerable trade is carried on in sugar, grain, cotton, timber, bamboos, and brass utensils. Population (1872), 14,544, comprising 8696 Hindus, 5847 Mahometans, and 1 Christian. Municipal revenue (1875–76), £1208.

HARAN, or CHARRAN (Hebrew, חָרָן; LXX., *Χαῤῥάν* or *Χαῤῥά*; Strabo, *Κάῤῥαι*; Pliny, *Carræ* or *Carrhæ*; Arabic, *Harrán*) is the name of a fertile district in the north of Mesopotamia (Padan-aram or Aram-naharaim), and also of a town situated some 10 miles south-eastward of Edessa (Orfa), on the banks of the small river Belik about 50 miles to the north of its junction with the Euphrates. It thus lies immediately on the highway between Arrapachitis and Canaan, and at the point where that highway is crossed by the great western road connecting Media, Assyria, and Babylonia with the Cilician coast. For the Assyrians accordingly it became a strategic position of first-rate importance, and in this aspect it is mentioned in inscriptions as early as the time of Tiglath Pileser I., about 1100 B.C. (see Schrader, *Die Keilinschriften und das alte Testament*, p. 45; and compare 2 Kings xix. 12, Isa. xxxvii. 12). It also, for the same reason, ultimately became the centre of a considerable commerce (Ezek. xxvii. 23), one of the specialities particularly named being the odoriferous gum derived from the strobus (Pliny, *H. N.*, xii. 40). It was here that Crassus in his eastern expedition was attacked and slain by the Parthians (53 B.C.); and here also the emperor Caracalla was murdered at the instigation of Macrinus (217 A.D.). Herodian (iv. 13, 7) mentions the town as possessing in his day a temple of the moon; in the Middle Ages it is mentioned as having been the seat of a particular heathen sect, that of the Haranite Sabeans. It retained its importance down to the period of the Arab ascendency; but by Abulfeda it is mentioned as having before his time fallen into decay. It is now wholly in ruins. According to the patriarchal history (Gen. xi. 31), Haran was the first resting-place of Terah and his family after their migration from Ur of the Chaldees, and here Terah and Nahor remained when Abraham and Lot passed on to Canaan. According to Dr Beke, indeed, this Haran is not the well-known town on the Belik, but "a place of that name (Harrán el Awamid), between Abana and Pharpar, the two rivers of Aram or Syria" (see *Journ. of Royal Geog. Soc.*, vol. xxxii.). His arguments, however, have not been generally accepted as sufficient to set aside the powerful evidence in favour of the Mesopotamian site.

HARAR, HERER, HURRUR, HARRAR GAY, or ADARGE, a city of north-eastern Africa, in the country of the Gallas, at one time the capital of the province of Hadiyah in the Zayla empire, for a long period a small independent state under an emir of its own, and since 1876 subject to the Egyptian crown. The Somali call it Adari and the Gallas Adaray. According to Burton it stands in 9° 20′ N. lat. and 42° 17′ E. long, but the *Bulletin de l'état major général de l'armée égyptienne* makes the latitude 9° 26′ and the longitude 42° 6′. The height above the sea is according to Burton 5500 feet, and according to the *Bulletin* 5580. A stone wall, pierced by five gates and flanked by 24 towers, encloses the city, which occupies an area of 128 acres on the irregular slope of a hill, and comprises 9560 houses and 346 huts, arranged in narrow streets that run up and down hill. There are five mosques within the walls, but only one, the *jami* (or cathedral, so to speak), is a building of considerable dimensions. The palace of the emir is a mere shed, long, single-storied, and windowless. Among the chapels to Mahometan saints it is enough to mention that of Sheikh Umar Abadir El Bakai, the patron of the city. Harar has long been the seat of a considerable commerce, though before the Egyptian conquests the merchants had to submit to the exorbitant exactions of their Galla neighbours, who had command of all the caravan routes. Slaves, ivory, coffee, tobacco, safflower, cotton cloths, mules, holcus, wheat, glue, honey, and gums are mentioned by Burton among their principal articles of trade, in return for which they brought back a great variety of wares for local consumption. The Harar coffee especially has a high repute, and the tobacco also is good. The kât or gât (*Catha edulis* of Forskal), the leaves of which are a favourite stimulant or narcotic in north-eastern Africa, grows abundantly in the neighbourhood; and the inhabitants often sit together reading the Koran and enjoying the drug for ten or eleven hours at a time. The rainy season at Harar begins about the 15th of March, and lasts for six months, the heaviest rains occurring about June. In the hot season the thermometer reaches 61° Fahr.; in March and April it is not more than 49°. According to Burton the population of the city was only 8000, of whom 2500 were Somali and 3000 Arabs; but the *Bulletin* states the total at 35,000.

The Harari proper are of a distinct stock from the neighbouring peoples, and speak a special language. A small glossary in Salt's *Abyssinia*, and another in the *Philological Journal* for 1845, were the only materials available for the investigation of the language previous to the publication of Burton's sketch in his *First Footsteps in North-Eastern Africa*. By him it is maintained that the Hararese is semi-Semitic or, like the Galla, Dankali, and Somali, "a Semitic graft inserted into an indigenous stock;" and his opinion is followed by Bleek and Lepsius. The older statement, strongly supported by Burton, that the language is fundamentally Semitic, and has a special affinity with Amharic, has in its favour no less authorities than Friedrich Müller (*Sitzungsbericht der Wiener Akademie*, Dec. 1863) and F. Prætorius ("Ueber die Sprache von Harar," in *Zeitschrift der deutschen Morgenland. Gesell.*, 1869). The Harari are Mahometans of the Shafa'i or Persian sect; and they employ the solar year and the Persian calendar. Monogamy prevails, and the women exercise great social influence; but the moral character of the people is said to be very low. It was in 1521 that Harar became a Mahometan city. Burton, the first European to put foot within its walls, spent ten days there in 1854-55, but it was only under the guise of an Arab that he was able to do so. Mohammed Mokhtar, the Egyptian general, has drawn up a sketch of the history of Harar from the native manuscripts brought with him to Cairo, and in company with Abd' Allah Fauzi he has published a plan of the town in the *Bulletin* already quoted (Cairo, 1876).

HARBOURS AND DOCKS

I. Harbours

Plates VIII.-XII.

ALL harbours may be classed either as havens for the protection of ships during storms, or as ports suited for commercial purposes. Of the first mentioned class, or those which are called harbours of refuge, some are natural and some artificial.

The designing of harbours constitutes confessedly one of the most difficult branches of civil engineering. In making such a design the engineer, of course, avails himself of the information which is derived from past experience, and endeavours, to the best of his power, to institute a comparison between the given locality and some existing harbour which he supposes to be similarly situated. Perfect identity, however, in the physical peculiarities of different localities seldom if ever exists, and all that can be done in deriving benefit from past experience is to select the harbour which seems most nearly to resemble the proposed work.

In order the better to understand the nature of the difficulties which beset the marine engineer, let us suppose that he is called upon to design works for the accommodation of shipping in a given locality. The questions which immediately press on his attention are—(1) What is the cheapest kind of design that is suitable for the place and sufficient for the class of shipping which has to be accommodated? and (2) What are the smallest sizes of materials and thickness of walls that are admissible in its construction? as on these the cost of the work will materially depend. Before considering how far it is possible to answer such questions, let us endeavour to define the varieties of design into which all sorts of harbours may, with propriety, be resolved.

In the first place they may be all classified under two main heads—viz., *interior works* and *exterior works*.

The interior works are provided for the accommodation and repair of vessels, while the exterior works may be conveniently enough divided into the following five classes.

Different classes of harbours.

1. *Harbours of Refuge and Anchorage Breakwaters.*—These consist of one or more breakwaters, so arranged as to form a safe roadstead, which shall be easily accessible to the largest vessels in all states of the weather and tide. A breakwater forms a barrier either complete or partial to the progress of the waves, and is intended for sheltering the anchorage ground under its lee. It is not used for commercial traffic as are piers or quays, and therefore a parapet is not necessarily required for preventing the waves from breaking over the top, although this may be useful as a protection against the wind.

2. *Deep-water and Tidal Harbours for Commercial Purposes* (fig. 1, *a*, *b*).—A harbour for commercial purposes is any arrangement of piers or breakwaters, or of both, which encloses and so tranquillizes a sheet of water, that vessels may be moored at the quay walls or wharves which form the inner sides of the piers. Where the coast line lies open to a very heavy sea it is often found necessary to make a double or compound harbour (fig. 1, *b*). In such a case the entrance to the inner basin is situated within the sheltered area formed by the outer works.

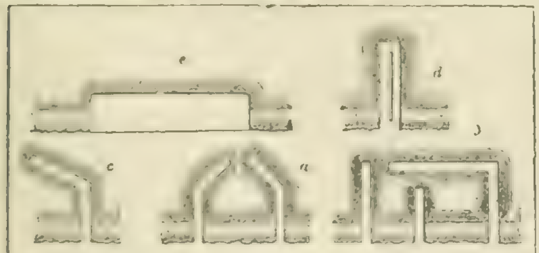


Fig. 1.

3. *Kanted or Curved Piers* (fig. 1, *c*).—Where there is a single pier of this kind vessels lie under the lee of the kant or kants, and the sheltered side of the pier is therefore finished as a quay. As the outer end of any such single pier is surrounded by the open sea, it may be convenient to call it a "free end" in contradistinction to the outer end of a close harbour, where the sea room in the fairway is limited to the breadth of the entrance which ought, for sheltering the basin, to be made as narrow as is consistent with the safe passage of vessels. Both extremities of all single insulated breakwaters are of course free ends, as are also the seaward ends of all single breakwaters which are connected with the land.

4. *Straight Piers* (fig. 1, *d*).—A straight pier generally projects at right angles to the coast line, with a free end at its seaward extremity; and, unless when the wind blows right in upon the shore, a straight pier will always afford some shelter on its lee side.

5. *Quay or Wharf* (fig. 1, *e*).—A quay wall is usually built parallel to the line of shore. It affords no shelter of any kind, and the only advantage which it possesses is that of enabling vessels to load and unload without their having to "beach," or, where the shores are steep, even to take the ground.

It will be observed that all the kinds of piers or harbours just enumerated differ materially from each other in the amount of shelter which they afford, and are suitable for places having very different degrees of exposure. The first step to be taken, therefore, is to select from the different classes of designs which have been enumerated the one which is best adapted to the physical peculiarities of the situation. The engineer in order to make this selection judiciously must keep in view the essential elements of stability, economy, safety of ingress and egress, and convenient accommodation for the trade of the port. If the place be much exposed, he must therefore arrange the different parts of the work so as to produce a harbour which may be easily taken and left in stormy weather, without endangering the tranquillity of the internal area; for it is *the combination of the qualities of an easy and safe entrance and exit, with a good "loose" and a smooth interior, which alone constitutes a good harbour.* Lastly, he must fix the width of the piers and height of the parapets.

Local characteristics.

The local characteristics which at the outset demand our consideration are—(1) the geological and other physical peculiarities of the shore; (2) the exposure; (3) the force of the waves due to the exposure; (4) the strength, direction, and range of the tides; (5) the depth of the bay or sea in which the harbour is to be built; (6) the proximity of deep water to the works, or in other words, the slope of the foreshore; and (7) the angle at which the heaviest waves impinge on the coast line and on the works.

Before considering some of these questions the reader may refer to figs. 2 and 3, on which are marked the technical names of different parts of harbour works.

Generation of Waves.

Level of plane of action of waves.

Mistakes as to the level of the highest tides are sometimes made by drawing too hasty conclusions from the presence of vegetable life. In the Shetland Islands there may often be seen large blocks of rock (and to these reference will afterwards be made), which during storms have been driven over the land at heights much greater than that at which vegetation commences and far above the ordinary run of the surf.

Level of mud a measure of exposure.

The level below the surface of low water at which mud reposes will be found of very considerable value in judging of the exposure of a coast. It may appear unlikely that the disturbance of the surface of the sea occasioned by storms should be propagated to great depths, but there is no want of evidence on this head. Sir G. B. Airy, the astronomer-royal, has shown, on theoretical grounds, that at a depth equal to the length of the wave the motion is $\frac{1}{535}$ of that at the surface, and mentions that heavy ground swells break in a depth of 100 fathoms. Sir J. Coode found, from under-water examinations made with the diving dress, that the shingle of the Chesil Bank was moved during heavy winter storms at a depth of 8 fathoms; and Captain E. K. Calver, R.N., has seen waves 6 or 8 feet high change their colour

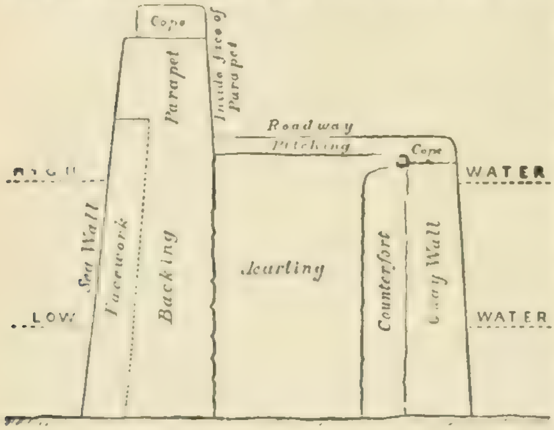


Fig. 2.

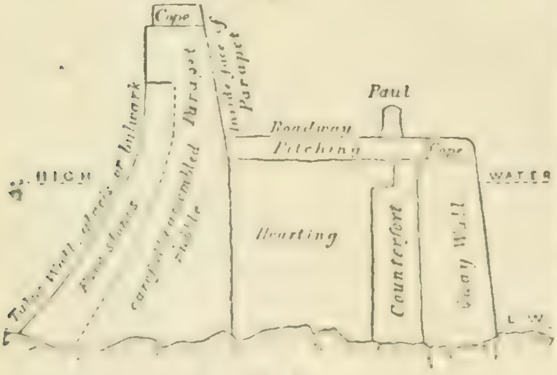


Fig. 3.

from the abrasion of the bottom after passing into water of 7 or 8 fathoms. Captain Cialdi maintains that waves may excavate the bottom at a depth of 655 feet in the ocean, of 163 feet in the Mediterranean, and of 132 feet in the English Channel and Adriatic. From these statements it may easily be inferred that in exposed situations mud cannot repose near the surface. Applying such a test to the German Ocean, it is found that in Shetland mud lies in from 80 to 90 fathoms below low water, and its level gradually rises till, on the coast of Holland, it is found at a depth of from 16 to 12 fathoms at the mouth of the Elbe. Now, the violence of the waves upon the shores of the German Ocean certainly corresponds with the rise in the level of the mud, there being a gradual decrease as we come from Shetland and the north of Scotland, where, as will be afterward shown, wonderful energy is displayed by the sea—to the coasts of Holland, where the waves are much modified. Although it is no doubt true that the flat-bottom vessels of the Dutch are built purposely for resisting a heavy surf, still the fact of their being able to take the open beach in nearly all weathers without any protection from harbours proves that the waves are very much reduced before they reach the Dutch coast. Mr Hyde Clarke says—"On the coast of Zealand the Dutch reckoned 8½ feet as the greatest height to which any wave would be thrown."

Line of maximum exposure.

In comparing an existing harbour with a proposed one, perhaps the most obvious element is what may be termed the *line of maximum exposure*, or, in other words, the line of greatest fetch or reach of open sea, and this can be easily measured from a chart. But though possessed of this information, the engineer still does not know in what ratio the height of the waves increases in relation to any given increase in the line of exposure.

Law of ratio of square roots of distances from the windward shore.

In 1852, in the *Edinburgh New Philosoph. Journal*, Mr Thomas Stevenson stated as the result of experimental observation that the heights of the waves were most nearly "*in the ratio of the square roots of their distances from the windward shore*;" or, when h = height of wave in feet, d = distance in miles, and a a coefficient varying with the strength of the wind, then

$$h = a\sqrt{d}.$$

The truth of this law has since then been variously tested.[1] The accompanying table contains some of the observations made in 1850-52, as well as later observations on the effects of heavy gales which could only be made at long intervals of time:—

Place of Observation	Length of Fetch in Miles Nautical.	Observed Height of Wave.	Height due to Fetch, calculated from Formula $h = 1.5\sqrt{d}$.	Height due to Fetch, calculated from Formula, $h = 1.5\sqrt{d} + (2.5 - \sqrt[4]{d})$. Vide p. 457.
Scalpa Flow	1·0	4·0	1·5	[illegible]
Firth of Forth	1·3	1·8	1·8	6·2
Granton	2·8	4·0	2·5	7·35
[illegible]	3·5	2·0	2·9	[illegible]
Granton	6·0	4·0	3·7	4·3
Lough Foyle	7·5	4·0	4·1	4·36
Clyde	9·0	4·5	4·5	[illegible]
Guernsey	9·0	5·0	4·5	5·35
Dysart	10·0	4·2	4·7	6·5
Invergordon	11·0	[illegible]	5·0	5·7
[illegible]	11·0	[illegible]	5·0	5·7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Australia	[illegible]	[illegible]	7·[illegible]	7·7
Lake of Geneva (stated by M. [illegible])	[illegible]	8·2	8·2	[illegible]7
Buckie	[illegible]	7·[illegible]	8·1	[illegible]
"	[illegible]	[illegible]	[illegible]2	[illegible]2
"	[illegible]	[illegible]	[illegible]2	9·2
"	4[illegible]	8·[illegible]	9·[illegible]	[illegible]
Macduff	[illegible]	8·0	[illegible]	[illegible]
"	[illegible]	10·0	[illegible]	10·0
Douglas, Isle of Man, St George's Channel	[illegible]	10·12	12·0	
Kingstown[2]	[illegible]	15·0	16·0	15·25
[illegible] from [illegible]	[illegible]	1[illegible]	1[illegible]	1[illegible]
		149.82	165.57	[illegible]
	Means	6.51	7.19	7.[illegible]

Some of these earlier results have also been laid down in fig. 4, so as to form a storm curve, but since the diagram was made many more observations have been obtained which corroborate the law.

The formula $h = 1.5\sqrt{d}$ is represented by the parabolic curve in the diagram, which indicates pretty fairly the height of waves during heavy gales, at least in seas which do not greatly differ in depth from those where the observations were made. This formula is of course inapplicable where the water is not of sufficient depth to allow the waves to be fully formed, or where it becomes so shallow as to reduce their height after they are formed.

---

[1] It follows from this law that the heights [illegible] be proportional to the square roots of the lengths of water over which the wind acts.

[2] [illegible], p. 8.

[3] Mr M[illegible] and that the extreme waves appeared to be about twice this height.

It must be observed that in short fetches, as in narrow lochs or arms of the sea, waves are raised higher during very violent gales than the formula indicates; though it does not appear that such waves go on progressing in height in the same high ratio for any considerable distance.

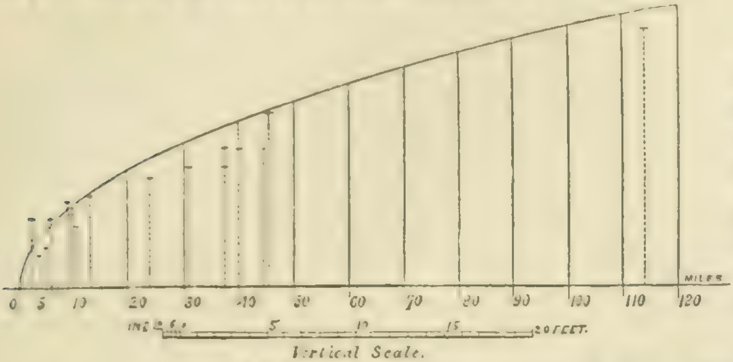


Fig. 4.

For short reaches and violent squalls, the formula given in column 5 of the foregoing table will be found more suitable, viz. :—

$$h = 1{\cdot}5\sqrt{d} + (2{\cdot}5 - \sqrt[4]{d})$$

For all ordinary situations the results in the following table will be found sufficient as a general guide.

Table showing approximate Heights of Waves due to lengths of Maximum Fetch by the Formula.

Miles	Heights	Miles	Heights.	Miles	Heights	Miles	Heights
1	3·0	20	7·1	39	9·4	130	17·1
2	3·4	21	7·2	40	9·5	140	17·7
3	3·8	22	7·4	41	9·6	150	18·4
4	4·1	23	7·5	42	9·7	160	19·0
5	4·3	24	7·6	43	9·8	170	19·5
6	4·6	25	7·8	44	9·9	180	20·1
7	4·8	26	7·9	45	10·0	190	20·7
8	5·0	27	8·0	46	10·2	200	21·2
9	5·3	28	8·1	47	10·3	210	21·7
10	5·5	29	8·3	48	10·3	220	22·2
11	5·7	30	8·4	49	10·5	230	22·7
12	5·9	31	8·5	50	10·6	240	23·2
13	6·0	32	8·6	60	11·6	250	23·7
14	6·2	33	8·6	70	12·5	260	24·2
15	6·3	34	8·8	80	13·4	270	24·6
16	6·5	35	8·9	90	14·2	280	25·1
17	6·7	36	9·0	100	15·0	290	25·5
18	6·8	37	9·2	110	15·7	300	26·0
19	7·0	38	9·3	120	16·4		

Maximum recorded height of waves.

The Comte de Marsilli, in 1725, observed waves 14 feet 10 inches in height where the longest possible fetch is 600 miles. At Wick, with much the same exposure, waves of about 40 feet have been seen to strike the breakwater. But the highest which are known to have been accurately measured were by Dr Scoresby in the Atlantic, where they attained the height of 43 feet above the hollow. Cialdi gives observations of others which were from 60 to 108 feet high, but he does not state how the heights were ascertained.

Maximum effective exposure—oblique action of waves.

It does not follow, however, that the line of the maximum exposure is in every case the line of maximum *effective* force of the waves, for this must depend, not only on the length of fetch, but on the angle of incidence of the waves on the walls of the harbour. What may be termed the line of *maximum effective exposure* is that which, after being corrected for obliquity of impact, produces the maximum result, and this can only be ascertained from the chart by successive trials.

Let x = the greatest force that can assail the pier, h = height of waves which produce (after being corrected for obliquity) the maximum effect, and which are due to the line of maximum effective exposure, a = azimuthal angle formed between the directions of pier and the line of exposure; then, when the force is resolved normal to the line of pier, —

$$x \propto h \sin^2 a\,;$$

but if the force be again resolved in the direction of the waves themselves, the expression becomes

$$x \propto h \sin^3 a.$$

It should not, however, be forgotten, in connexion with this subject, that in some cases there are modifying elements to which special attention requires to be given. The waves, for example, when approaching the land obliquely, alter their direction when they get close to the shore, in consequence of the change of depth, and from this cause they approach more nearly at right angles to the general line of the beach, and thus strike with greater force than the line of maximum effective exposure would lead us to expect.

The extraordinary difference between waves which impinge at right angles and others which have even a very slight amount of obliquity has been shown in the most unmistakable manner at the Wick breakwater, where all attempts to make the work stand when exactly at right angles to the waves have hitherto been unsuccessful. It was found by observation that while waves coming from the direction of S. by E. struck the outer part at normal incidence, they struck the landward end of the same kant at an angle of 81°, giving 9° of obliquity. This small measure of relief was found to make a great difference in the impact upon the wall.

The value of the line of effective exposure varies in certain localities with the geographical configuration of the land, as in Loch Fyne, where the wind seems to alter its direction with the winding of the loch, so that the effective fetch is greater than the width of free water at the place. On the other hand, where the channel expands, the height of the waves is decreased, as at Craignure in Mull, where the highest wave observed during the winter of 1853–4 was very much less than the formula indicates.

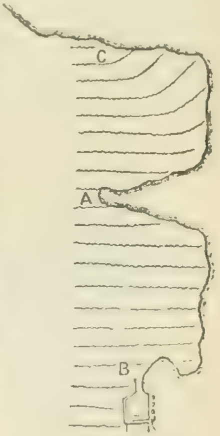


Fig. 5.

In a case such as represented in fig. 5, the waves which enter the entrance channel or harbour mouth B, though generated apparently in the fetch AB, are largely due to the fetch CB. For the waves generated in the length CA pass round the point A, and are thereafter subject to the impulse of the wind along the line AB. The waves then which enter the harbour mouth, instead of having their point of genesis at A, really take their origin at C, and their height is due to the fetch CB, though reduced by a deflexion round the point A.

Lateral friction and erosion.

Lateral friction is due to the passage of the end of the wave along the face of a vertical wall, while lateral erosion is due to the end of the wave breaking as it passes along the face of long talus walls or sloping beaches.

Force of Waves.

Smeaton, in referring to the propriety of using joggles in the masonry of the Eddystone Lighthouse, says—"When we have to do with and to endeavour to control those powers of nature that are subject to no calculation, I trust it will be deemed prudent not to omit, in such a case, anything that can without difficulty be applied, and that would be likely to add to the security." This statement of our greatest marine engineer indicates the propriety of carefully collecting any facts that may help us to a more accurate estimation of those forces which he regarded as being "subject to no calculation."

At the Bishop Rock lighthouse, a bell was broken from its attachments at the level of 100 feet above the high water mark during a gale in the winter of 1860, and at Unst, the most northern of the Shetland Islands, a door was broken open at a height of 195 feet above the sea. To these facts it may be added that, as proved by the testimony of an eye-witness, a block of 50 tons was moved by the sea at Barrahead, one of the Hebrides. But still more extraordinary effects have been observed at Whalsey in Shetland, where heavy blocks have been quarried, or broken out of their beds *in situ*, on the top of the Bound Skerry at a great elevation above the sea. On the south-east side, about 370 feet from the low water mark, and at a height of 62½ feet above its level, there occurs a remarkable beach of angular blocks varying in size from 9½ tons downwards, which are huddled together just as one would have expected to find, had they been elevated only a few feet above the high water level. Towards the north-east at the level of 72 feet above the sea, in addition to many smaller blocks which had evidently been recently detached, there was one 5½ tons in weight. It presented the appearance of recent detachment, having a fresh unweathered look. Within 20 feet of the spot where it lay, there was a comparatively recently formed void in the rock, which upon examination and comparison by measurement was found to suit exactly the detached block. Here then was a phenomenon so remarkable as almost to stagger belief—a mass of 5½ tons not only moved but actually quarried from its position *in situ* at a level of 72 feet above high water spring tides, and higher up still there was another detached rock weighing no less than 13½ tons tilted up in a peculiar position, and underneath which numerous angular masses had been wedged, obviously by aqueous action.

But by far the most striking effects as yet recorded were at the harbour works of Wick, which were commenced in 1863, and consisted of blocks of from 5 to 10 tons set on edge, first built above high water neap tides with hydraulic lime, then with Roman and latterly with Portland cement. In October 1864, 380 feet of the contractor's staging were carried away; and greenheart were afterwards substituted for Memel piles, but these too were broken by the sea. The first portion of the wall was, in conformity with usual practice, founded at 12 feet below low water, but 18 feet was subsequently adopted, and the rubble has since been washed down to 15 feet below that level. In 1872 a huge monolithic block of concrete, weighing in all 1350 tons, was removed *en masse* out of its position and carried to leeward of the breakwater. Extraordinary as this may appear, it was surpassed in 1873, when another concrete mass which had been substituted for the one that was moved, was in like manner carried away, though it contained 1500 cubic yards of cement rubble the weight of which was about 2600 tons.

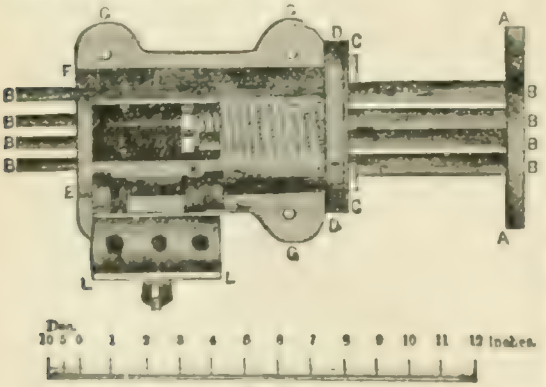


Fig. 6.

Thomas Stevenson's marine dynamometer.

The marine dynamometer was constructed by Mr T. Stevenson for the purpose of ascertaining the force of the waves against an obstacle. DEFH is a cast-iron cylinder, which is firmly bolted at the proper level to the rock where the experiments are to be made. The cylinder has a circular flange at D [illegible] and a door which is opened when the [illegible] H. A is a circular disk on which the waves impinge. Fastened to the disc are four guide rods B, which pass through a circular plate C (which is screwed down to the flange D), and also through holes in the bottom of the cylinder EF. Within the cylinder there is attached to the plate C a very strong steel spring, to the other or free end of which is fastened the small circular plate K, which again is secured to the guide rods B. There are also rings of leather T, which slide on the guide rods, and serve as indices for registering how far the rods have been pushed through the holes in the bottom EF, or, in other words, how far the spring has been drawn out by the action of the waves against the disk A. These disks were from 6 to 9 inches in diameter.

The greatest result obtained by the dynamometer at Skerryvore Lighthouse, in the Atlantic, was during the heavy westerly gale of 29th March 1845, when there was registered a force equivalent to 6083 lb, or nearly 3 tons, per square foot, deduced from the area exposed. The next highest was 5323 lb. In the German Ocean the greatest result obtained at the Bell Rock was 3013 lb per square foot. But subsequent and much more extended observations at Dunbar, in the county of East Lothian, gave 3½ tons; while at the harbour works of Buckie, on the coast of Banffshire, the highest result of observations, extending over a period of several years, was 3 tons per square foot.

Depth in front of a harbour regulates the height of waves.

Mr David Stevenson, when referring, in 1835, to the lakes in North America, pointed out that the general depth of water must, in order to allow the waves to be fully formed, be considerable, and that the sea must be unobstructed by shoals, and also of sufficient area to admit of the wind acting fully on the water.

If in front of a harbour shoal water extends seawards for a considerable distance so as to form an extensive flat foreshore, the depth of water above it becomes the true limit of the maximum wave, whatever may be the general depth of the sea outside. But at Arbroath harbour and at Alnemouth, the heaviest waves are tripped up by the shoal water near the mouths of the harbours, and are not found so dangerous to the works inside as the smaller waves which reach the beach in an unbroken state.

Depth in which waves break.

Mr Scott Russell states that waves break when they come into water of the same depth as their height. At Wick, however, the height of the waves above the mean level was about two-thirds of their height. In 1870, at Scarborough, it was found that waves of from 5 to 6½ feet broke when the depth was 10 feet 3 inches below their troughs, and 6 feet waves broke in water 13 feet 8 inches deep, which would for waves of this class give $h = \frac{1}{2}d$, where d is depth below mean level, and h the height from hollow to crest.

The late Dr Macquorn Rankine has shown that, theoretically, the mean water level is not situated half way between the crest and trough of the sea. The following formulæ furnished by him give the mean level of the sea from the height and length of the wave. These formulæ are exact only for water of considerable depth as compared with the length of the wave. For shallower water they are only approximate:—

Let L be the length of a wave, H the height from trough to crest; then, diameter of rolling circle $= \frac{L}{3.1416}$, radius of orbit of particle $= \frac{1}{2}H$, and elevation of middle level of wave above still water $= \frac{3.1416H^2}{4L} = {·7854}\frac{H^2}{L}$.

Consequently—

$$\text{Crest above still water} = \frac{H}{2} + {·7854}\frac{H^2}{L};$$

$$\text{Trough below still water} = \frac{H}{2} - {·7854}\frac{H^2}{L}.$$

Deep-Water Harbours.

Harbours of refuge are distinguished from tidal harbours mainly by the superior depth of water which they possess and the larger area which they enclose. The requisites are—shelter during storms, good holding ground, and easy access for shipping at any time of tide and in all states of the weather. A breakwater, though a passive, is yet a real agent, having true work to do. During storms many thousand tons of water are elevated and maintained above the sea level; and a breakwater has to stop their onward motion within a given space or else to change the direction of their movement. There are two ways in which this work can be performed. One is by means of a plumb wall to alter the direction of the moving water by causing it to ascend vertically, and then to allow it to descend vertically, by which process the waves are reflected and sent back seawards. Another mode is to arrest the undulations by a sloping wall of length sufficient to allow the mass of elevated water to fall down upon the slope. If, however, the slope is not long enough to enable the waves to destroy themselves, they will, though reduced in height, pursue their original direction and pass over the top of the breakwater. In this case the breakwater does not do its full amount of work, and imperfect shelter is obtained.

The principle asserted in favour of the vertical wall is that oceanic waves in deep water are purely oscillatory, and exert no impact against vertical barriers, which are therefore the most eligible, as they have only to encounter the hydrostatic pressure due to the height of the impinging billows which are reflected without breaking.

From the effect of winds and tide-currents already referred to, and perhaps from other causes, the action of which seems to have been overlooked by the advocates of the upright wall, we have good reason for believing that any form of barrier, in whatever depth of water it may be placed, must occasionally be subjected to heavy impact. The possibility of waves of translation being generated in the deepest water is established by the following facts:—*first*, that oceanic waves break, partially at least, long before they reach the shore, because (as admitted by the advocates of the purely oscillatory character of oceanic undulations) the depth of water is too small to admit of their being fully propagated; *secondly*, that waves in strong tideways break in deep water during calm weather—a phenomenon which is apparent to the eye and familiar to all sailors; *thirdly*, and negatively, that to leeward of those races which produce broken water, and which certainly do not reflect the incoming waves, there is comparatively smooth water both at sea and on the adjoining shore until the strength of the tide is exhausted and the race has disappeared, after which violent action is again fully manifested on the shore. Even a vertical wall, if built of ordinary masonry in courses, must during its formation present to the action of the waves at its unfinished end a sloping or at least a stepped face like a talus wall, but which, unfortunately for its stability, possesses none of the advantages of such a finished work. In short, during the most critical period of the history of every built vertical wall, the face work and hearting are exposed, at the outer end, to the force of breaking waves. At Dunbar the force against the unfinished end of a nearly vertical wall was found by the marine dynamometer to be nearly six times greater than on the face of the finished wall, where the waves were at the time purely oscillatory.

Oblique force in vertical plane.

An important advantage of the sloping wall is the small resistance which it offers to the impinging wave, but it should also be borne in mind that the weight resting on the face-stones in a talus wall is decreased in proportion to the sine of the angle of the slope. If we suppose the waves which assail a sloping wall to act in the horizontal plane, the component of their impulsive force at right angles to the surface of the talus will be proportional to the sine of the angle of inclination to the plane, while the effective force estimated in the horizontal plane will be proportional to the square of the sine of the angle of inclination. But if we assume the motion of the impinging particles to be horizontal, the number of them which will be intercepted by the sloping surface will be also reduced in the ratio of the sine of the angle of inclination, or of the inclination of the wall to the vertical. Hence the tendency of the waves to produce horizontal displacement, on the assumption that the direction of the impinging particles is horizontal, will be proportional to the cube of the sine of the angle of elevation of the wall.

If it further happens that, owing to the relative direction of the pier and of the waves, there is an oblique action in azimuth as well as in altitude, there will be another similar reduction in the ratio of the squares or cubes of the angle of incidence, according as the component of the force is reckoned at right angles to the surface of the pier or in the direction of the waves.

Let f = force of the wave on unit of surface of wall for perpendicular incidence;

f' = force on unit of surface at vertical incidence ϕ and azimuthal incidence ψ;

then $$f' \propto f\,(\sin\phi\,\sin\psi)^2.$$

Protective value of a breakwater proportional to the resistance it overcomes.

The amount of shelter which is produced by a breakwater must be measured by the length of the portion of wave which is either destroyed or reflected by it. The amount of work done by it decreases from the maximum, which is at normal incidence, to zero when the waves come upon it "end on," in which last case it ceases to act as a breakwater at all, unless to the extent due to lateral friction or erosion where there is a wall or a slope on which the end of the waves can break.

A breakwater may increase the waves.

If a breakwater be so situated in relation to the coast line that waves may strike obliquely upon its inner or sheltered side, an extension of its length in the same direction will increase the amount of sea intercepted by it. The lengthening of a breakwater may therefore, during certain winds, increase the sea within the harbour instead of reducing it. In such a case the extension should, if possible, be made in a different direction, or a separate breakwater may be brought from the shore so as to shelter the inner side. If these works cannot be undertaken, then an addition to the sheltered space within must be provided in which the waves can spread, or additional slopes be provided on which they can break.

The table of the principal proportions of some of the most remarkable breakwaters given on p. 460 may be found useful as a guide in designing works of a similar kind.

Cost of breakwaters.

The following costs of different breakwaters are from the minutes of the Institution of Civil Engineers and other sources:—

Name of Breakwater.	Depth of Water in Fathoms.	Cost per Lin. Foot.	Cost per Lin. Yard.	Remarks
		£	£	
Joliette, Marseilles	5 to 6	72	215	
Marseilles (new)..	5 to 6·6	109	328	
Portland	8 to 10	116 to 120	348 to 360	Convict labour.
Algiers...............	6 to 9	122	366	No rubble, all large beton blocks.
Holyhead	3 to 7	about 163	480	
Alderney	3·3	170	510	
Plymouth	6·6 to 7·5	200	600	
Dover	6·6 to 8·3	360	1080	

Although some of these prices have given rise to lengthened discussions as to the comparative economic advantages of the various designs, the results have not been of much value, on account of the different degrees of exposure and of depth of water at the various places. The economic values may perhaps be arrived at in a more satisfactory manner, although still but only very approximately, thus:—When x = the price per foot of depth, p = the

Table of principal Proportions of remarkable Breakwaters.

Name.	Kind of Work.	General Slope of Outer Face.				Inner Slopes.			Level of top of loose Rubble below Low Water	Level of foundations of Wall below Low Water
		From Bottom to near Low Water.	Near Low Water.	Up to High Water	Above High Water.	Above High Water	Below Low Water.	Top above High Water		
	Sloping Breakwaters.							Feet.		
Plymouth	Pitched slopes above high water, loose rubble below.	1⅓ to 1	4 to 1	5 to 1	5 to 1	2 to 1	2 to 1	3	[illegible]	0
Portrush	Slopes of loose rubble.	1¾ to 1	6 to 1	3 to 1	1⅓ to 1	1⅓ to 1	1 to 1	16	0	.
Kingstown........	Pitched slopes of rubble.	1¼ to 1	5 to 1	5 to 1	5 to 1	⅓ to 1	⅓ to 1	15	[illegible]	0
Holyhead	Slopes of loose rubble.	2 to 1	5 to 1	12 to 1	...	...	1¼ to 1	..	...	..
	Composite Breakwaters.									
Portland..	Slopes of loose rubble, with plumb wall above high water.	1¼ to 1	5 to 1	4½ to 1	4 to 1, & plumb wall.	plumb wall.	1 to 1	25	0	...
Cherbourg	Do. do.	2 to 1	7 to 1	7 to 1	...	7½ to 1, & ⅛ to 1	1 to 1	12½	[illegible]	0
Alderney	Do. do.	2 to 1	5 to 1	wall ⅛ to 1	½ to 1, & plumb.	wall ⅓ to 1	1¼ to 1	25	[illegible]	12
Cette	Do. do.	1½ to 1 & 6 to 1	3½ to 1	wall	wall	...	1 to 1	12½	...	...
Pulteneytown.. .	Do. do.	1 to 1 & 7 to 1 [This is from bottom to 15 feet below low water.]	wall ⅛ to 1	⅛ to 1	⅛ to 1	⅛ to 1	⅛ to 1	6 & 21	15	18
	Vertical Breakwaters.									
Dover...	Solid masonry.	¼ to 1	¼ to 1	1¼ to 1	¼ to 1, & cavetto	¼ to 1	¼ to 1	23	....	45
Aberdeen .	Concrete blocks below low water, and solid above.	⅛ to 1	⅛ to 1	⅛ to 1	⅛ to 1	⅛ to 1	⅛ to 1	11	...	20

price per lineal foot, and d = the depth in feet at high water, then

$$x = \frac{p}{d}.$$

The results calculated in this manner are arranged in order of their costs in the following table, from which the plumb pier at Dover appears to be by far the most costly:—

Name of Harbour.	Depth in Feet at High Water	$\frac{p}{d}$
Portland	62	£1·90
Joliette	35	2·06
Algiers	42	3·00
Marseilles (new)	35	3·10
Plymouth	58	3·45
Holyhead	36	4·40
Alderney	37	4·60
Dover	38	9·47

Available capacity of harbours of refuge and of anchorages.

Minard allows for large merchant vessels in harbours of refuge one cable-length, which would give about four vessels per acre. Captain Calver allows three vessels per acre for a small sheltered harbour of refuge. At Cardiff Flats there were at one time 224 vessels anchored as close to each other as they could well be, in an open roadstead, and occupying a space of 560 acres, which would give 0·4 vessel per acre.

Tidal Harbours.

We have hitherto been considering outer breakwaters erected in deep water, and which are constantly exposed to the waves; we now turn to piers and sea walls which are placed within the range of the breaking surf, and which are exposed to its force for a limited period only, being sometimes left nearly or altogether dry by the receding tide.

In dealing with waves which are admitted by all to exert a tremendous percussive force, the question arises as to how this force may be best resisted — whether by opposing to it dead weight or a comparatively light structure, the stability of which is dependent on strong fixtures connecting it with the bottom. On this subject the late Mr Alan Stevenson made the following remarks, in relation to lighthouse towers, but his views are equally applicable to piers and breakwaters :—

> "A primary inquiry in regard to towers in an exposed situation is the question whether their stability should depend upon their *strength* or their *weight*, or, in other words, on their *cohesion* or their *inertia*? In preferring weight to strength we more closely follow the course pointed out by the analogy of nature, and this must not be regarded as a mere notional advantage, for the more close the analogy between nature and our works the less difficulty we shall experience in passing from nature to art, and the more directly will our observations on natural phenomena bear upon the artificial project. If, for example, we make a series of observations on the force of the sea as exerted on masses of rock, and endeavour to draw from those observations some conclusions as to the amount and direction of that force as exhibited by the masses of rock which resist it successfully, and the form which these masses assume, we shall pass naturally to the determination of the mass and form of a building which may be capable of opposing similar forces, as we conclude with some reason that the mass and form of the natural rock are exponents of the amount and direction of the forces they have so long continued to resist. It will readily be perceived that we are in a very different and less advantageous position, when we attempt, from such observations of natural phenomena in which weight is solely concerned, to deduce the strength of an artificial fabric. Another very obvious reason why we should prefer mass and weight to strength as a source of stability is that the effect of mere inertia is constant and unchangeable in its nature, while the strength which results even from the most judiciously disposed and well-executed fixtures of a comparatively light fabric is constantly subject to be impaired by the loosening of such fixtures, occasioned by the almost constant tremor to which structures of this kind must be subject from the beating of the waves. Mass therefore seems to be a source of stability, the effect of which is at once apprehended by the mind as more in harmony with the conservative principles of nature, and less particularly liable also to be deteriorated, than the strength which depends upon the careful proportion and adjustment of parts."[1]

Effect of [illegible] structures.

It is a remarkable fact that during a summer gale 14 blocks, each 2 tons in weight, which had been permanently fixed in the Dhu Heartach lighthouse tower by joggles and cement, at the level of 35½ feet above the sea, were torn out and swept off the rock, while the thin panes of crown glass in the lantern of Winstanley's Eddystone tower, which were only about 5 feet higher, resisted the waves for a whole winter. The impact on marine masonry seems therefore to depend on the relation subsisting between the height of the waves at the place and the height and configuration of the rock itself above and below low water, and perhaps also on the configuration of the bottom of the sea near the rock.[1] While the rock at Dhu Heartach from its height above the sea forms a protection against the smaller waves, it operates as a dangerous conductor to the larger waves, enabling them to exert a powerful action at a much higher level than if the rock had been lower. It is of great importance that these facts should be kept in view, and that the Eddystone should not be regarded as a safe model for imitation at all rocks which are exposed to a heavy sea.

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[1] *Account of the Skerryvore Lighthouse*, by Alan Stevenson, LL.B., F.R.S.E., Edin., 1848, p. 48.

Forces on outside of masonry.

The impact of the waves against the outside of a sea wall or pier gives rise to four distinct forces, namely—(1) the direct horizontal force, which tends to shake loose, or drive in, the blocks of which the masonry consists; (2) the vertical force acting upwards on any projecting stone or protuberance, as well as against the lying beds of the stones; (3) the vertical force acting downwards, which results either from the receding wave striking upon the toe of a talus wall, or from its passing over the parapet and falling upon the pitching behind, so as to plough it up; (4) the "backdraught," which tends by reaction from the wall to remove the soft bottom, and in this way to undermine the lower courses or to suck loose stones out of the work.

It may be concluded from the above that the points which require to be most attended to are—the contour and quality of masonry of the wall itself; the parapet, which if not of proper form, or of insufficient height, leads to damage in the pitching behind it; and lastly, the foundation-courses, in the design and construction of which, if similar precautions be not attended to, underwashing of the bottom may take place, so as to leave the lowest courses without protection.

Forces within the masonry.

Within the masonry, as well as without, the waves exert force in the following different ways:—(1) by the propagation of vibrations produced by the shock of the waves on the outer or sea-wall, through the body of the pier to the inner or quay-wall; (2) by the direct communication of the impulses through the particles of the fluid occupying the interstices of the hearting, so as to act against the back joints of the face stones of the inner quay; (3) by the sudden condensations and expansions of the air in the hearting, so as to loosen, and at last to blow out, the face stones of the quay; combined with (4) the hydrostatic pressure of the water, which is forced through the sea-wall, and, from want of free exit, is retained and acts as a head at the back of the quay, and which, however small in quantity, will, as in a Bramah press, act with equal force upon all surfaces exposed to its pressure, however large those surfaces may be. The last three causes are probably the most efficient agents in the work of destruction.

From a comparison of different piers in the German Ocean where we have most examples, and from careful consideration of the other data, it appears that vertical piers, fully exposed to the ordinary waves of that sea, should be not less than from 35 to 45 feet broad at the level of high water. Of course this remark does not apply to anomalous cases where waves are exceptionally high, but, as already stated, to works exposed to the ordinary waves.

The positions in which the piers are to be placed depend on the nature and configuration of the shore and of the bottom.

Design of ground plan of harbour

After a correct plan, with soundings, has been obtained, the next step is to lay down contour lines of the different depths which make the limits of the deep and shoal water at once obvious to the eye. The lines of the piers may then be sketched so as, without disregarding other conditions, to keep the works as much as possible on the shoal ground, while they at the same time enclose the greatest possible area of deep water.

Entrance

The entrance should be fixed seaward of every part of the works; and its direction, unless where the internal area is small and the sea very heavy, should if possible be made to coincide with that of the heaviest waves, so that they may run along with and guide vessels into the harbour.

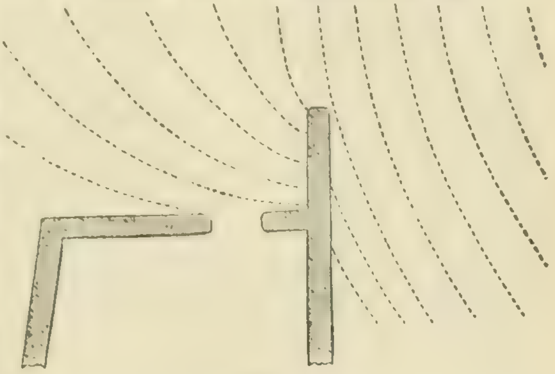

Fig. 7.

The outer pier should in such a case be extended sufficiently far seaward of the end of the inner pier head to give it a free end, as in fig. 7, thus allowing a ship plenty of sea room to shape an easy course before taking the entrance to the sheltered basin of the harbour.

There should be sufficient distance landward of a harbour mouth to allow a vessel, having full weigh on her, to shorten sail. For this Minard recommends that, where vessels of ordinary size require to alter their course in order to reach the inner basin, no circle with a less radius than 200 yards in smooth water should, if possible, be adopted, and it should not be forgotten that a vessel requires a larger radius in turning where the water is shoal than where it is deep.

If the beach consist of travelling detritus, the entrance must be so devised as not to form a trap for the passing shingle. This danger is most to be dreaded on the coasts where heavy waves strike obliquely upon the shore. Finally, there must be a good "loose," so that vessels on leaving the harbour shall be able to shape their course free of rocks or a lee-shore; and Minard very properly remarks that the mouths of harbours should be designed rather to suit the entering, which is far more important, than the exit of vessels.

Piers of horizontal curvature preferable to long straight piers

Preference should generally be given to a pier of horizontal convex outline, or a polygonal form, than to one long straight pier. The principal objection to a straight pier does not, however, extend to cases where the heaviest waves strike upon it obliquely, and roll landwards along the sea-wall. Especial care, however, must in all cases be taken that a sea-work nowhere presents to the sea a surface of concave horizontal outline, or, what is still worse, abrupt faces which form a re-entrant angle; for the waves will then act with an almost explosive violence, the breaking of a free wave being a very different thing from the breaking of a wave confined by a barrier of masonry. While the first may be compared to the harmless ignition of a loose heap of gunpowder, the other resembles the dangerous explosion produced by the discharge of a cannon.

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[1] Mr D. A. Stevenson has lately shown that a funnel-shaped depression in the sea-bottom extends from the ocean in the direction of, and nearly as far as, the Dhu Heartach rock, a geological formation which must certainly admit the heaviest class of waves to come nearer to the rock (*Min. of Proc. of the Inst. of Civil Engineers*, vol. xlvi.).

It may in some cases be found better, in designing a sea-wall for protecting a sinuous coast, to carry the bulwark straight across ledges of rock which extend landwards, than to follow the line of the high water margin. For although with the straight wall we may have to encounter a greater depth of water and a heavier surf, still with the other we may have to oppose the waves with a wall which has at some places a concave horizontal curvature, by which the force is concentrated and rendered more destructive. Moreover, the straight wall may be considerably shorter than the curved.

Vertical profile of walls.

The general gradient of a fragmentary beach depends upon the size and nature of the particles, and the force of the sea. The dissimilarity between its slopes near the levels of high and low water arises from a decrease in the force of the waves, caused by their being broken before they reach the high water mark. The great object, therefore, is to design the profile of the wall so as to alter as little as possible the symmetry of the beach. For the reasons already stated, it is plain that unless near high water mark a vertical wall is in most cases unsuitable for a sandy beach. Instead of altering the direction of the wave at a distance from its foundation, the whole change is produced at that very point; and, unless the wall be founded at a considerable depth, its destruction is all but certain. A curved profile will prevent to a considerable extent the danger of reaction, by causing the alteration in the direction of the wave to take place at that part where the wall is strongest, and which is also at the greatest possible distance from the toe or curb course. But a very serious objection to all forms of curved walls, unless the radius be large, is the weakness which results from the use of wedge-shaped face-stones. The impact of the sea on materials of that form may be compared to a blow directed upwards against the intrados of a stone arch—the direction of all others in which the voussoirs are most easily dislocated. This action can only be resisted by very careful workmanship in the dressing and setting of the backing. Another objection, applicable to all except tideless seas, such as the Mediterranean, arises from the varying level of the surface of the water; for what may be best at one time of the tide cannot be equally suitable at another.

Reduction of waves by lateral deflexion.

When a wave encounters an obstacle such as a breakwater, the portion which strikes it is either entirely destroyed or reflected seawards; while the portion which is not so intercepted passes onwards, and spreading laterally under lee of the barrier suffers a reduction of its height. From a very few observations in the sea under lee of the breakwater at Wick, and from some experiments made in a brewer's cooling vat by Mr Thomas Stevenson, it appeared that after passing an obstruction the reduction in the height of a wave varies as the square root of the angle of deflexion. When x represents the ratio of the reduced to the unreduced wave and a the angle of deflexion, the formula, which must however, be regarded as only approximate, is

$$x = 1{\cdot}00 - {\cdot}06\sqrt{a}.$$

The measurements of the distances of high water mark from the centre of divergence, in sandy bays which are under lee of promontories, seem to show that this formula, or one for a logarithmic spiral, represents the effect of lateral divergence very fairly. Providing the materials of the beach are homogeneous and easily moved, the incursions of the waves into the land will be measures of the forces, all of which become equal at the high water mark. The following table shows measurements of the finely curved storm and tide marks traced out on the sandy beach under the lee of the promontory at North Berwick, and the results of the formula.

Angles of Deflexion.	Distances from centre of Divergence at end of Promontory to High Water Mark.	Ratios of Measurements.	Results of Formula.
0°	1150	1·00	1·00
10°	1000	·87	·87
20°	920	·80	·73
30°	840	·73	·67
40°	735	·64	·62
45°	700	·61	·60
50°	675	·59	·58
60°	600	·52	·53
70°	570	·50	·50
80°	565	·49	·46
90°	530	·46	·43

Reduction of waves after passing into close harbours.

The tranquillity of close harbours with the same exposure depends on the relative widths of the entrance and the interior, the depth of water, and the form and direction of the entrance in relation to the line of maximum exposure. A formula for the reductive power of harbours has been given by Mr Thomas Stevenson (*Edin. Phil. Journal* for 1853).

Where the piers are high enough to protect the enclosed area from the wind, and the width of entrance not very great in comparison with the breadth of the wave, the quay walls nearly vertical, and the distance from the entrance to place of observation not less than 50 feet, then

$$x = H\sqrt{\frac{b}{B}} - \frac{1}{50}\left(H + H\sqrt{\frac{b}{B}}\right)\sqrt[4]{D},$$

where H = height of wave at entrance, b = breadth of entrance, B = breadth of harbour at place of observation, D = distance from mouth of harbour to place of observation, x = height of reduced or residual wave at place of observation,—all in feet. If H be taken as unity, x will be a fraction representing the reductive power of the harbour.

Actual measurements at the harbours of Kingstown, Sunderland, Macduff, Fisherrow, and Buckie gave the mean of observations (which at Buckie alone numbered upwards of 2000) = 2·64 feet, while that of results calculated by the formula gave 2·62 feet.

Size of harbour must be proportionate to magnitude of waves.

The size as well as the ratio of widths of entrance and basin must also bear a proper relation to the height of waves to which the harbour is exposed. The formula for the reductive power assumes that the waves after being reduced by lateral expansion shall have time to sink and be ultimately destroyed. But if instead of this they are again reflected towards the entrance, such recoil will destroy the tranquillity of the basin and prevent vessels from answering their helm when taking the entrance. Also where a spending beach which is only partially effective in destroying the waves is formed very near the entrance, it may do little or no good by causing a back wash or recoil wave which will injuriously affect vessels when entering.

Stilling basins.

As before mentioned, it is essential when the exposure is great that there be either a considerable internal area, or else a separate basin opposite the entrance to the inner basin, for the waves to destroy or spend themselves. Such a basin should, if possible, enclose a portion of the original shore for the waves to break upon, and when circumstances preclude this there should be a flat talus wall of at least 3 or 4 to 1, as recommended by the late Mr Bremner of Wick. Mr Scott Russell has found that talus walls of 1 to 1, or steeper, will not allow the waves to break fully, but will reflect them in such a manner as might in some cases make the entrance difficult or even dangerous of access, and the berthage within unsafe.

Places where unprotected quays may be used.

The following cases in which traffic has been successfully carried on at quays unprotected by covering piers, may be found useful as a guide:—

At [illegible] the quays are at right angles to a fetch of 6 miles. At Invergordon there is a fetch of 5 miles; at Burntisland, 6; Kilcreggan, 4; Londonderry, 1½; Greenock, 5½; Albert Quay, Greenock, 7 miles. The last two are, however, somewhat sheltered by the low water banks near Greenock.

Five miles is probably not far from the limit that should be observed, which by the ordinary formula, $h = 1{\cdot}5\sqrt{D}$, gives a wave of [illegible] feet, but the formula for distances so short as these would give [illegible] perhaps waves not [illegible] may exist, but [illegible] vessels could not [illegible].

Booms. In order to tranquillize harbours of small reductive power, logs of timber called booms, having their ends secured by projecting into grooves cut in the masonry on each side, are placed across the entrance of the inner basin or dock. From 15 to 25 logs are usually dropped into these grooves, or as many more as will insure close contact of the lowest log with a sill piece placed in the bottom of the harbour. They are also warped down or fixed with an iron hasp at the coping course, without which precaution the swell is found to enter the harbour from underneath. By this contrivance, which forms a temporary wall, the waves are checked, and completely prevented from spreading into the interior basin.

Twelve inch booms of pine timber about 33 feet long have been broken at the small fishing village of Mousehole, near Penzance, and elm logs have in consequence been substituted. At Hynish in Argyllshire, booms of the same timber and scantling and 20 feet long have been very frequently broken. The marine dynamometer at this place gave 1¼ ton per square foot.

Capacity of harbours for commerce. The capacity of commercial harbours for trade varies so much with the exposure and size of vessels, that it is difficult to approximate to the truth. At Ramsgate, for instance, there were found to be about 6 vessels to an acre in the outer harbour, while there were about 14 in the inner and better protected basin, where too there was perhaps a greater proportion of small vessels. In the Scotch fishing harbours the number of boats used to be reckoned at from 85 to 115 per acre; but of late their size has been much increased, and probably not more than from 80 to 90 could be accommodated. The Cornish boats at New Lynn, according to the Channel pilot, vary from 60 to 80 per acre.

Timber structures. The employment of timber in harbour works is of great antiquity. It seems first to have been used in forming boxes which were filled with stones, and at a more recent period in the formation of open frameworks through which the current could pass freely. Vitruvius mentions moles, consisting of timber filled with stones and cement, as having been used by the harbour-builders in his days.[1] The earliest drawing of timber piers that we have met with is that of the ancient port of Dunkirk in 1699, a cross section of which from Belidor's *Architecture Hydraulique* is given in Plate VIII., fig. 4. This kind of structure is still not uncommon on the coasts of the English Channel.

Destruction by marine insects. In sheltered bays where a deep-water landing-place is all that is required, and where the bottom is sandy or soft, timber may be employed with great advantage. Even in somewhat exposed situations it can also be used for tidal harbours; but the fatal evil in places where there is no admixture of fresh water is its rapid destruction by marine insects. In the Atlantic Ocean the *Teredo navalis*, and at many places in the German Ocean the *Limnoria terebrans*, which was first discovered by the late Mr Robert Stevenson at the Bell Rock Lighthouse in 1810, are very destructive of most kinds of timber. Mr Stevenson found that memel was destroyed by the *Limnoria* at the rate of about 1 inch inwards per annum. He found that greenheart, beefwood, African oak, and bullet tree were scarcely attacked, while teak stood remarkably well and locust tolerably well, though suffering at last. Greenheart timber, though not absolutely impenetrable, as appears from Mr Stevenson's experiments, is the great specific in seas where the worms are destructive. But subsequent experience has proved that on the coasts of Scotland it is, in some cases, readily attacked, and at these places creosoting is of comparatively little use, as the worm manifests no repugnance to timber which has been even very recently impregnated.

Durability of iron. In addition to the experiments on timber, twenty-five different kinds and combinations of iron were tried at the Bell Rock, including specimens of galvanized irons. All the ungalvanized irons were found to oxidize with much the same readiness. The galvanized specimens resisted oxidation for three or four years, after which the chemical action went on as quickly as in the others. Although the association of zinc with iron protects, so long as it lasts, the metal with which it is in contact, it must be remembered that this immunity is obtained at the expense of the zinc, the tendency of which to oxidization is proportionally exalted so soon as any part of the iron is exposed.

The important experiments of Mr Mallet on specimens sunk in the sea showed that the amount of corrosion decreased with the thickness of the casting, and that from $\frac{1}{10}$th to $\frac{4}{10}$th inch in depth, in castings 1 inch thick, and about $\frac{6}{10}$th inch of wrought iron will be destroyed in a century in clear salt water. But there is reason to believe from a cannon ball which was picked up on the shores of the island of Inchkeith that the decay was in that case $\frac{3}{4}$th inch to the century. Cast-iron gratings periodically immersed by the tide at the Bell Rock lost at the rate of 1 inch in a century. Even when the castings were externally sound their strength was reduced one-half in about 50 years.

Materials of construction. In judging of the qualities of different quarries for harbour purposes the importance of a high specific gravity ought not to be overlooked, as appears from the table given on page 464.

The superiority of granite to greenstone is proved by the following experiments on the times required to abrade $\frac{1}{10}$th inch of each kind of stone, made with the same weights and grinding agents, and with equal cubes of each material:—30 minutes were required for Queensferry (Carlin Nose) greenstone; 40 minutes for greenstone from Barnton near Edinburgh; 60 minutes for Peterhead granite. Mr Murray of Sunderland also established, many years ago, the superior power of resistance to attrition possessed by granite over greenstone.

Portland cement rubble and concrete. Portland cement rubble and concrete, a most valuable material, now very commonly used in Britain as well as on the Continent, may be said to have to a large extent revolutionized harbour building; for it admits of being employed in many different ways, and can, if due care be taken as to the quality of the cement and purity of the sand and gravel, be used with perfect confidence.

The following specification has been followed extensively at different places:—

> The Portland cement is to be obtained from the best manufacturers. It is to be ground extremely fine, and is to weigh not less than 115 lb per bushel; and each cargo will, on its arrival at the works, be tested in the following manner. The cement is to be made into small blocks 1 inch square and 8 inches long. After being made, these blocks are to be immersed in water for 7 days and then tested by being placed on two supports 6 inches apart, when they must stand the transverse strain produced by a weight of 70 lb placed in the centre. Slabs or cakes are also to be made and placed in water, and after immersion for 24 hours they are not to show any signs of cracking or any softness on the surface.
>
> The cement is to be tested before any of it is used, and if it be found unsatisfactory it must be removed from the works. When a cargo is landed it must be tested from four different bags, and it must also be tested weekly as the works proceed, and the results forwarded to the engineers. The cement must be brought direct

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[1] It was probably to some such work that Horace refers in Ode 1, Book iii.—

"Contracta pisces aequora sentiunt,
Jactis in altum molibus; huc frequens
Caementa demittit redemptor"

A harbour contract dated 1394, in all probability the earliest which has been preserved, appears in the *Registrum Nigrum de Aberbrothoc*—a collection of ancient documents printed by the Bannatyne Club, and edited by the late Professor Cosmo Innes.

Table of Properties of different kinds of Rocks.

Name of Rocks	S	$S \times 62{\cdot}5$	$\frac{2240}{S \times 62{\cdot}5}$	$\frac{2240}{(S-1{\cdot}028)\,62{\cdot}5}$	[illegible]	[illegible]	Side of a Cube weighing One Ton in Air.	Loss of Weight by immersion in Sea Water.
	Specific Gravity.	Weight of a Cubic Foot in Air.	No. of Feet to a Ton in Air.	No. of Feet to a Ton in Sea Water, Sp. Gr. 1·028.	Side of Cube corresponding to last column.	Weight of a Ton Block in Sea Water, Sp. Gr. 1·028.		
		lb.	Cubic feet.	Cubic feet.	Lineal feet.	Ton.	Feet.	
Basalt porphyritic ...	2·99	186·87	11·9	18·26	2·63	·658	2·282	·342
Greenstone ...	2·92	182·50	12·2	18·94	2·66	·650	2·292	·350
Syenite ...	2·91	181·9	12·3	19·04	2·67	·648	2·305	·352
Clay-slate ...	2·90	181·25	12·3	19·15	2·67	·647	2·308	·353
Mica-schist ...	2·89	180·6	12·4	19·24	2·68	·644	2·315	·356
Gneiss ...	2·82	176·2	12·7	20·00	2·71	·635	2·333	·365
Amygdaloidal greenstone ...	2·75	171·87	13·0	20·81	2·75	·627	2·351	·373
Chlorite schist ...	2·74	171·25	13·0	20·93	2·75	·627	2·351	·373
Greywacke ...	2·73	170·62	13·1	21·06	2·76	·624	2·357	·376
Clinkstone ...	2·73	170·62	13·1	21·05	2·76	·624	2·357	·376
Red granite ...	2·71	169·37	13·2	21·30	2·77	·621	2·362	·379
Stone, Old Red Sandstone formation ...	2·71	169·37	13·2	21·30	2·77	·621	2·362	·379
Chalk ...	2·70	168·75	13·2	21·43	2·77	·621	2·362	·379
White Primary limestone (marble) ...	2·70	168·75	13·2	21·43	2·77	·621	2·362	·379
Red Primary limestone (marble), with crystals of augite imbedded ...	2·66	166·25	13·4	21·96	2·80	·615	2·375	·385
Chlorite slate ...	2·64	165·00	13·5	22·23	2·81	·612	2·381	·388
Granular quartz rock ...	2·63	164·37	13·6	22·37	2·82	·610	2·387	·390
Grey granite ...	2·61	163·12	13·6	22·65	2·83	·610	2·387	·390
Flinty slate ...	2·57	160·62	13·9	23·24	2·85	·601	2·405	·399
Red felspar porphyry ...	2·55	159·37	14·0	23·55	2·86	·598	2·410	·402
Pitchstone ...	2·53	158·12	14·1	23·86	2·88	·595	2·416	·405
Serpentine ...	2·46	153·75	14·5	25·02	2·92	·584	2·438	·416
Compact felspar ...	2·45	153·12	14·6	25·20	2·93	·581	2·444	·419
Sandstone ...	2·41	150·62	14·8	26·00	2·96	·575	2·455	·425
Roestone (Oolite) ...	2·36	147·50	15·1	26·88	2·99	·567	2·472	·433
Beton ...	2·2	137·5	16·3	30·6	3·13	·532	2·535	·468
Magnesian limestone ...	2·18	136·25	16·4	31·11	3·14	·529	2·541	·471
Oolite ...	2·05	128·12	17·4	35·07	3·27	·501	2·591	·499
Parrot coal (American) ...	1·54	96·25	23·3	70·00	4·12	·331	2·876	·669
Bituminous shale ...	1·50	93·75	23·8	75·93	4·23	·317	2·876	·683
Cannel coal ...	1·24	77·50	28·9	169·05	5·53	·171	3·029	·829

NOTE.—This table is calculated for sea water of the specific gravity of 1·028 or 64¼ lb to the cubic foot.

from the manufactory and kept at the works in a dry and well-ventilated storehouse with dry wooden floor and side walls, properly roofed in and completely protected from the weather.

The concrete to be used is to consist of one part of Portland cement, two of sand, and five of gravel, to be thoroughly mixed with a proper quantity of pure water; after it is deposited, large angular stones are to be added, care being taken that all the stones are completely surrounded by concrete for a thickness of not less than 4 inches. All stones to be clean and quite free from sea-weed or other vegetable matter likely to prevent the adhesion of the concrete. No concrete to be made during frost. The sand and gravel used must be sharp and clean, being perfectly free from clay or earthy matter.

There are different kinds of machines by which the concrete is thoroughly mixed, and a saving of cost effected. In that of Mr Messent the number of revolutions to mix the concrete thoroughly is twelve.

Continuous building.

The walls of harbours may be constructed of continuous building of concrete and stones, protected by temporary piling and close planking. The best mode of keeping out the water, as adopted by Mr Palmer at the duke of Richmond's harbour of Port Gordon, is to make a saw draft in each plank, and to place a thin plate of iron between the planks. An example of this continuous or monolithic building is shown in Plate VIII., fig. 6.

Mr B. B. Stoney has deposited at Dublin the largest blocks that have as yet been attempted to be moved.

Each block is 27 feet high, 21 feet 4 inches wide at base, and 12 feet long in the direction of wall, contains nearly 5000 cubic feet, and weighs 350 tons; [illegible] up to ordinary low water level. No cofferdam, staging, or pumping is required. [illegible] The blocks are built on land, and when [illegible] are raised by floating shears, the barge or pontoon of which is 130 feet long and 48 feet wide, and of this 130 feet 50 form a tank at the aft end; and, when filled with water, this balances the weight of the block hanging from the shears at the other end. A block can be raised with the flood tide, and is generally set the following low water.

Depositing pierres perdues.

The late Mr J. M. Rendel introduced the improved and very valuable method of depositing the *pierres perdues* or rubble, which is now generally used in the construction of large breakwaters. This method he employed first at Millbay pier, near Plymouth, in 1838, in a depth of 38 feet, and afterwards, on a still larger scale, in the construction of the breakwaters at Holyhead and Portland.

The improvement consists in depositing the rough materials from stagings erected to a considerable height above high water. The stones are brought on the staging in waggons, through the bottoms of which they are discharged into the sea. The principle on which these stagings are designed is that of offering the smallest possible resistance to the sea, the under structure consisting of nothing more than single upright piles for supporting each railway. At Wick harbour works, as already stated, it was found that the piles of the staging for depositing the rubble required to be of greenheart timber, but even these were broken in large numbers. The piles were invariably broken by the waves at about the level of high water.

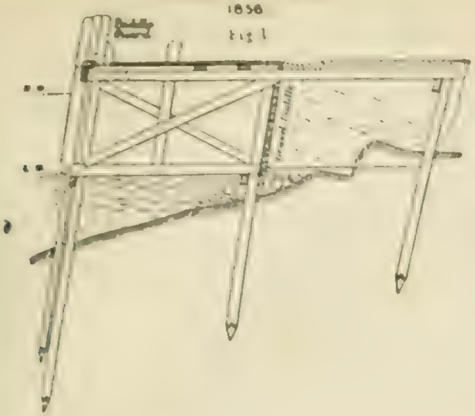
Level of [illegible] rubble.

A depth of from 12 to 15 feet under low water was pointed out by Mr Rendel as the level below which the waves did little or no damage to *pierres perdues*. Sir John Rennie indeed considered that there was little or no effect at a fathom and a half. But at Wick, as already stated, the rubble was moved as low as 15 feet, and at Alderney 20 feet.

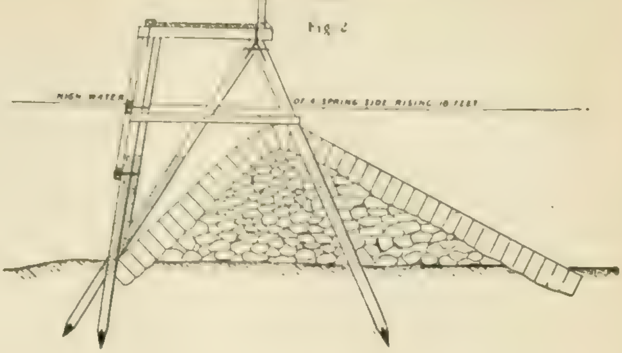
Test of fine dressing.

If the beds of the stones in a sea wall were polished, the power of resistance would be reduced by about one fourth, or in other words, roughly dressed materials of three-fourths the weight of polished materials will be equally safe.

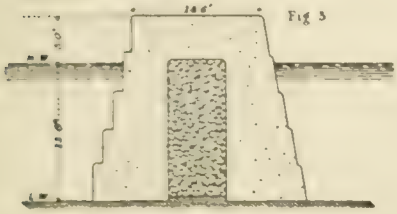
LONDONDERRY QUAY
1856
Fig 1



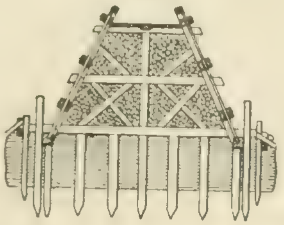
EASTERN PIER, LEITH
1824
Fig 2



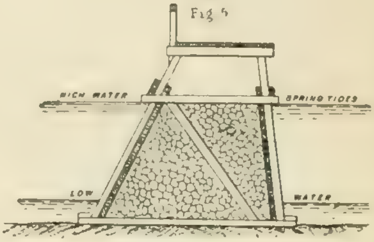
ANSTRUTHER BREAKWATER
Fig 3



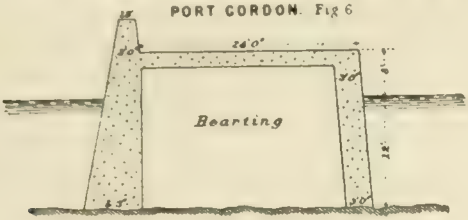
JETTY OF ANCIENT PORT OF DUNKIRK
1699
Fig 4



BLYTH BREAKWATER
1856
Fig 5

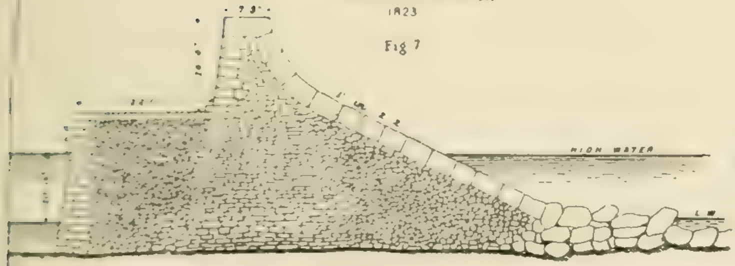


PORT GORDON. Fig 6

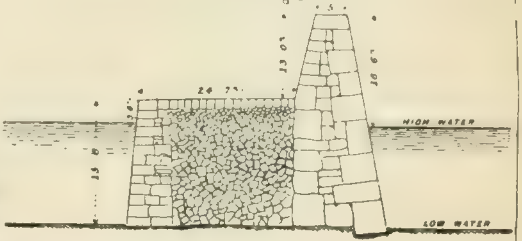


Scale for Figs 1,2,3,4,5 & 6.

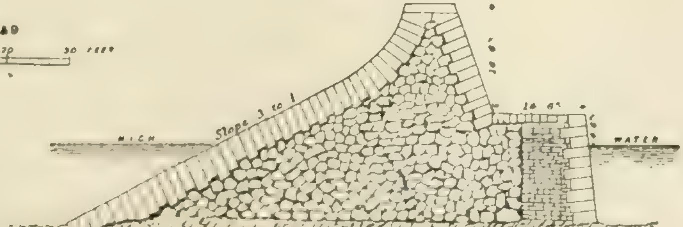
OLD PIER OF WICK
1823
Fig 7



NETHER BUCKIE
1855
Fig 8



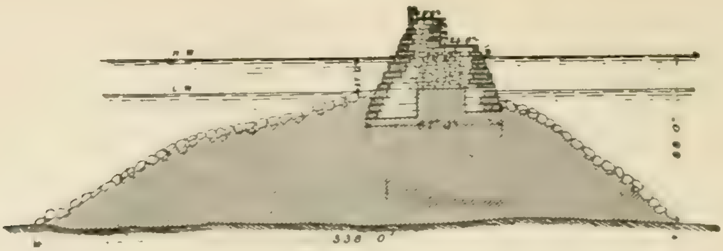
SARCLET-Co CAITHNESS
1833
Fig 9



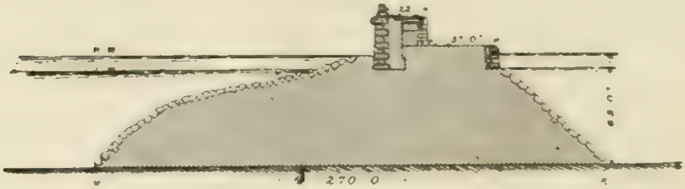
Scale for Figs 7,8 & 9

HARBOURS

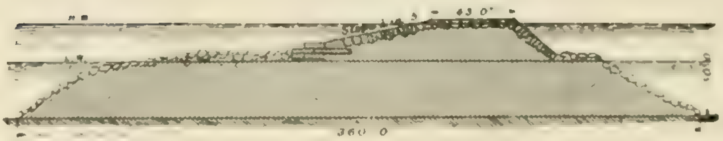
ALDERNEY.



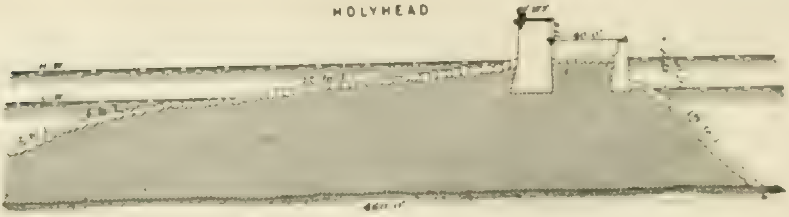
PORTLAND



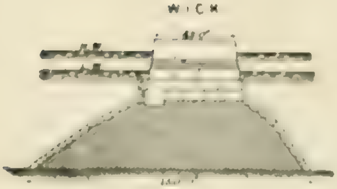
PLYMOUTH



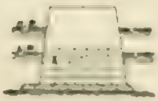
HOLYHEAD



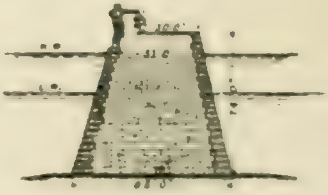
WICK



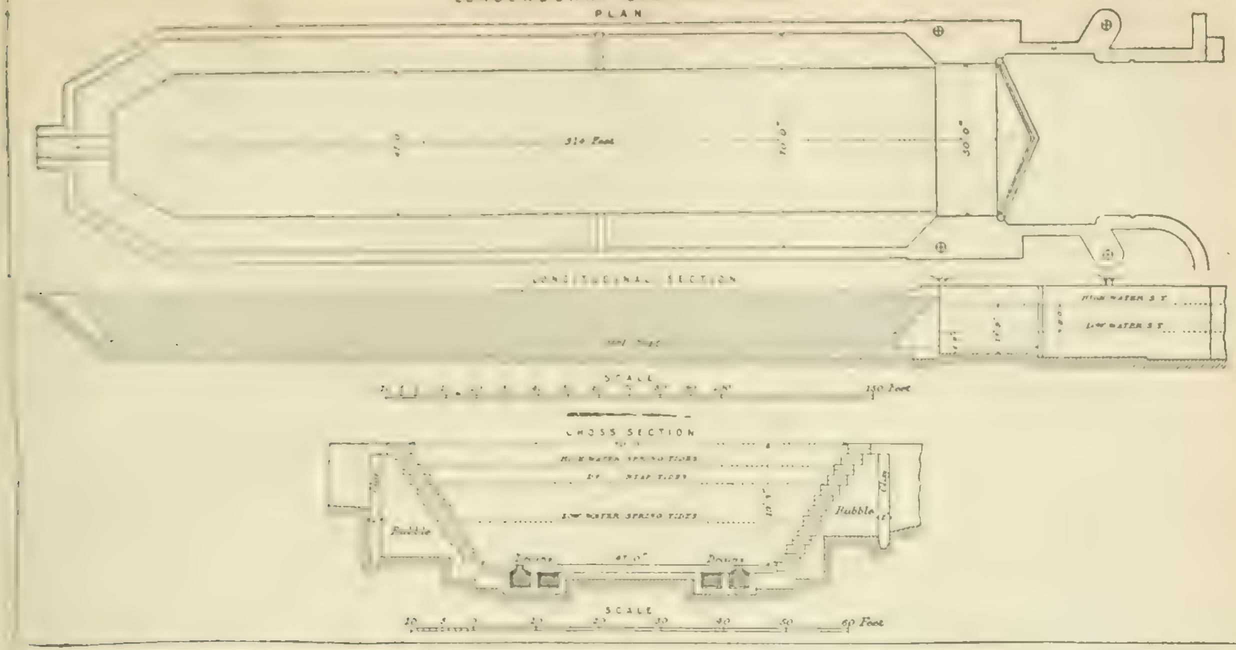
ABERDEEN



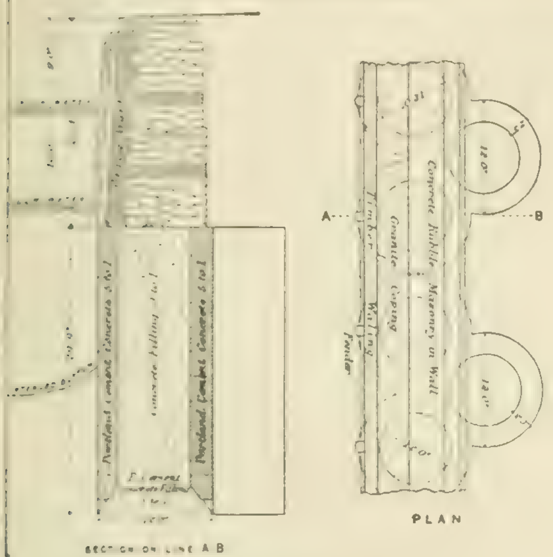
DOVER



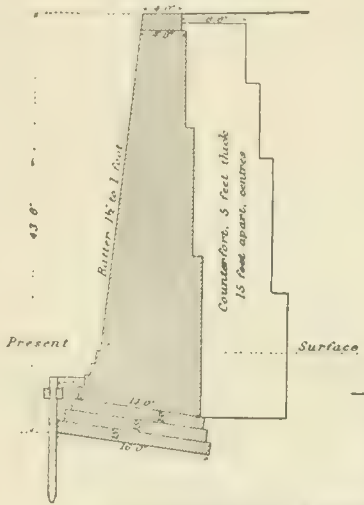
LONDONDERRY GRAVING DOCK



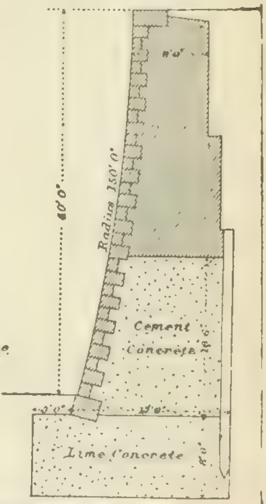
PLANTATION QUAY, GLASGOW


Portland Cement Concrete 8 to 1
Concrete Filling
Portland Cement Concrete 8 to 1
A
B
12' 0"
12' 0"
Concrete Rubble Masonry in Wall
Granite Coping
Timber Waling
Fender
PLAN
SECTION ON LINE A B

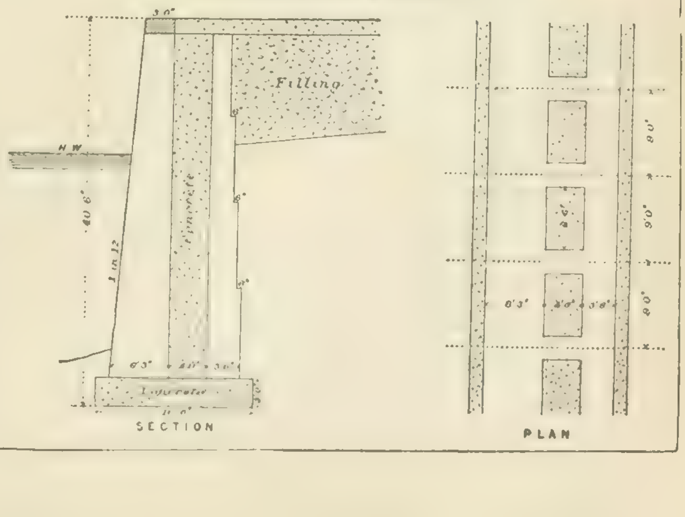
MORECAMBE QUAY



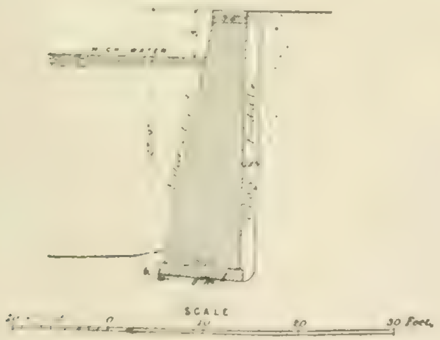
AVONMOUTH DOCK WALL



QUEENS DOCK, WHITEHAVEN.



GLASSON DOCK



There is also good reason to believe that slopes of large *pierres perdues* are preferable to slopes of dressed masonry. The great object to be attained is the maximum amount and uniform distribution of friction.

Piers of cast and of malleable iron are now frequently employed. Examples of these may be seen at Scarborough, Southport, Portobello, and at many other parts of the English coast, and have been found to answer even where there is a considerable sea.

The pier at Southport, described[1] by Mr H. Hooper, is of cast iron, and the mode of sinking the piles was peculiar. The piles proper or lowest lengths of the columns are cast in lengths of 8 feet and 10 feet, and are sunk into the sand to the depth of 7 feet and 9 feet respectively. They were provided with circular disks 1 foot 6 inches in diameter, to form a bearing surface; and, a small hole being left in the centre, a wrought-iron tube 2 inches in diameter was passed down the inside of the pile, and forced about four inches into the sand, a connexion being made by means of a flexible hose between the top of the tube and a temporary pipe connected with the Water Company's mains, and extended as the sinking of the piles proceeded. A pressure of water of about 50 lb per inch was thus obtained, and this was found to be sufficient to force the sand from under the disk. Each disk was provided on the lower side with cutters, which, on an alternating motion being given to the pile loosened the sand. The piles were gradually lowered, and guided by a small ordinary piling engine. When the pressure of water had been removed about 5 minutes, the piles settled down to so firm a bearing that when tested with a load of 12 tons each no signs of settlement could be perceived. The cast-iron columns are 7 inches in external and 5¾ inches in internal diameter. All the piles, to the number of 257, were sunk in six weeks, being at the rate of between 6 and 7 in twenty-four hours.

The Clevedon pier is of malleable iron. Mr J. W. Grover[2] states that each upright consists of two Barlow rails weighing 50 lb to the yard, riveted back to back, and having a total section for each 100 feet span of 64 inches. They are braced together by diagonal tie-rods from 1¾ to 2¼ inches in diameter. The lower portions of the piles below low water are of solid wrought iron 5 inches in diameter, shod with cast-iron screws 2 feet in diameter, and were screwed down till a 4½ inch rope passed round 6-feet capstan bars parted with the strain. They penetrated the ground to depths varying from 7 to 17 feet, and though made with a thread of 5 inches in pitch seldom descended more than 2½ inches or 3 inches in a turn. The solid pile-stems are connected with the Barlow rail piles by cast-iron shoes. Where rock occurred holes were jumped, and a 4-inch wrought-iron bar was inserted and secured by a jagged key. A shoe to receive the Barlow rail was fitted and keyed on this, and the remaining space was caulked with iron cement. The length of the longest pile is 76 feet. The level of roadway is 18 feet above extreme high water, and the height above the ground at the pier-head is about 68 feet.

Deposits and Scouring.

Deposits arise from two essentially opposite causes, viz., commotion and stagnation of the water. They are also of different kinds of material:—(1) those lighter matters, such as mud, silt, and fine sand, which are held for a time in mechanical suspension, and which, as the water approaches stagnation, are gradually dropped in the order of their specific gravity and mass; and (2) those grosser matters, such as different kinds of sand and gravel, which are rolled along the bottom or driven forward with the water by the action of waves and currents. The first-named are deposited on the lee side of piers or groins which obstruct the progress of the waves or currents, while the second accumulate on their *weather* sides. But the amount and the positions assumed by the deposits of the second kind depend on the direction and force of the waves or currents in relation to the foreshore and to obstructions. The amount of deposits of the first kind are little dependent on the direction of the stroke of the waves outside of the basin or sheltered place in which they are deposited.

The preservation of the depth of harbours at a level lower than that of the original bottom involves both uncertainty and expense. Where the deposit is confined to the space between high and low water-marks, the scouring by means of salt or fresh water is comparatively easy; but where it forms a bar outside of the entrance, the possibility of maintaining permanently a greater depth becomes very doubtful. The efficacy of the scour, so long as it is not impeded by enlargements of the channel, may be kept up for great distances, but it soon comes to an end after it meets the sea. When the volume of water liberated is great compared with the *alveus* or channel through which it has to pass, the stagnant water which originally occupied the channel does not to the same extent destroy the momentum as where the scouring has to be produced by a sudden finite impulse. In the one case the scouring power depends, *cæteris paribus*, simply on the relation subsisting between the quantity liberated in a given space of time and the sectional area of the channel through which it has to pass; while in the other it depends on the propelling head, and the direction in which the water leaves the sluice. Mr Rendel's scheme for Birkenhead was on the former principle, which it must be recollected is only applicable where the soil is easily stirred up.

The first example of artificial scouring in England seems to be due to Smeaton, who used it effectively at Ramsgate in 1779. At Bute Docks, Cardiff, designed by the late Sir W. Cubitt, the access to the outer basin is kept open most successfully by means of artificial scouring on a large scale.

Minard holds that when a channel has to be maintained by regular and habitual scouring, the whole effect is generally produced in the course of the first quarter of an hour. This was made the subject of particular investigation at Dunkirk, where sections of the channel were made before and during the scour; and it was found that there was no alteration in the sectional area after the first quarter of an hour.

Causes of Increase of Height of Waves

The following causes increase the height of waves in a harbour:—(1) the removal of a spending beach either at the entrance channel or within the harbour by building a quay or talus wall across it; (2) deepening the entrance channel or the basin of the harbour itself,—thus the difficulty of keeping vessels to their moorings at the quays of a harbour increases during flood tide, just as the tide rises and the depth is thereby increased; (3) removal of an artificial breakwater or a protecting point of land or spit of gravel outside of the harbour; (4) filling up side creeks or lateral basins in a harbour or its entrance channel; (5) shortening the distance between the sea and the entrance to an inner basin or dock by projecting the basin or dock farther out from the shore-line so as to bring the gates nearer the sea entrance, or projecting the mouth of a harbour farther seawards; (6) removal of a jetty or filling up an artificial side chamber or converting talus into plumb walls; (7) straightening an entrance channel or an outer side breakwater or walls within a harbour; (8) widening the entrance or the entrance channel; (9) reduction of the area of the basin of the harbour; (10) making smoother the surface of a natural sloping beach either within or outside of a harbour by pitching its surface; (11) lowering the top of a protecting outside breakwater over which the sea breaks; (12) converting an open timber quay into a close quay; (13) lengthening a breakwater so as to intercept a greater portion of the waves which come in certain directions.

II. DOCKS.

Docks are of two kinds, viz., dry or graving docks, and wet or floating docks. The dry or graving dock is a small water-tight chamber, fitted with gates of timber or iron, which are shut against the rising tide after a vessel has entered for the purpose of being repaired. The water below low tide level is pumped out generally by steam power.

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[1] *Min. Inst. Civ. Eng.*, vol. xx.

[2] *Min. Inst. Civ. Eng.*, vol. xxxii.

Wet docks.

The wet dock or tide basin is a large water-tight inclosure, usually several acres in extent, which is also fitted with gates which are closed, not, however, during the flowing but the ebbing tide, so that the vessels lying at the quays within the basin may remain constantly afloat and nearly at the same level while being loaded and unloaded.

Locks.

In order to extend the time during which vessels can enter or leave a wet dock there are two additional works which are often connected with it. These are the entrance-lock and the outer or half-tide basin. The lock is a narrow chamber of just sufficient length and breadth to admit a ship of the greatest length and breadth of beam that is expected to frequent the port. Such a lock can, in absence of the largest class of ships, accommodate simultaneously three or four vessels of smaller tonnage. Locks are sometime made with double gates, so that when only one vessel of small size has to enter, she is shut up within a compartment of the lock, by which means some of the water is saved which would have been expended had the whole of the chamber been filled. Shortly after the tide has begun to ebb, and when the gates of the wet dock have been shut, in order to prevent the water from falling too low in the dock, a vessel can still enter or leave by means of the lock. She is first passed into the lock from the sea; and, the lower or sea gates being closed, the sluices in the upper or dock gates are opened, which raises the water in the lock chamber to the same level as the water in the dock, when the upper gates are opened to let the vessel pass in. Ships leaving the dock after the tide has begun to fall are passed into the lock chamber, when the upper gates are closed and the sluices in the lower gates are opened, until the water in the lock has fallen to the same level as the tide outside, when the lower gates are opened and the vessel goes out to sea. This system of locking is continued so long as the level of the dock is not so much depressed as to affect the loading or unloading of vessels lying at the quays, or until the tide has ebbed so far as to prevent vessels reaching the lock from the sea. At the West Dock, Cardiff, where the level is kept up by fresh water from the river Taff, the gates, in order to suit the rise and fall of the tide, are opened one hour before and about two hours after high water.

Tide basins.

The tide basin may be described as a lock of very large dimensions capable of receiving at the same time a considerable number of vessels, which continue to run into it from the sea after the dock gates have been finally closed for that tide. Such vessels can run in, so long as they have sufficient water over the sill of the sea gates of the basin, or until the basin itself is filled with ships. The sea gates are then closed, and the sluices in the upper gates are opened till the water in the basin is on a level with the water in the dock. The ships are then passed continuously into the dock, in a string, one after the other. By means of this arrangement the traffic can be carried on to a far greater extent than is possible with a narrow lock, which has to be filled and emptied for each vessel that enters or leaves the harbour. The late Mr Jesse Hartley of Liverpool was the first to propose half-tide outer basins, as adjuncts to wet docks.

Advantages of docks.

The peculiar advantages of docks are the following. Vessels can be accommodated in the smallest possible space, and are enabled to lie constantly afloat; whereas in tidal harbours, where they take the ground, they are apt to be strained or to have their floors broken. But there are other sources of mischief than this in open harbours, for often, when the tide is ebbing, vessels, unless watched, fall against each other. In two instances where the bottom, which was muddy, had a considerable declivity, a ship which had taken the ground on the beach near low water mark was actually run down and damaged by another stranded vessel, the warps of which suddenly snapped and freed her from the moorings at the quay, thus causing a collision between vessels both of which were at the time high and dry. Then there is the chafing of the vessel's sides against the quays in exposed harbours where there is a run of sea, and the breaking of warps during stormy weather, or during land floods, where there is a river. The late Mr James Walker stated that at Sunderland damage to the extent of £40,000 was occasioned in a single day by large quantities of ice that came down the river Wear. When a vessel is in dock she can be easily and at all times moved from place to place, and the operation of discharging and loading can go regularly on during all times of tide. Her level, too, is never much affected, so that the cargo does not require, when being discharged, to be hoisted so high as would otherwise be necessary. Timber vessels can be unloaded through their ports into the water at all times of tide, while in harbours which are dry at low water the cargo receives injury by falling on the hard bottom.

From the general description which we have given the following conclusions may be drawn as to the best localities for docks:—

Best localities for docks.

(1) Where the rise of tide is considerable, a dock is more required than where the rise is small. In rivers such as the Clyde and the Foyle, for example, where the tide rises only from 9 to 10 feet, the inducement to construct docks is not so great as at the Mersey or the Bristol Channel, where the tide rises from 20 to 50 feet.

(2) Where the nature of the trade requires ships of great length, which are therefore very liable to injury from taking the ground, a dock is more needed than at places where the vessels are of smaller size, and therefore less liable to be strained when not water borne.

(3) Where the bottom is soft and muddy, there is less need for a dock than where the bottom is hard and uneven, unless where strong currents are likely to burrow out the soft soil so as to make the bottom irregular by forming deep ruts.

(4) Where the harbour is open to the entrance of surface waves of considerable height, or of a ground swell, there is more need for a dock than where there is better protection.

(5) Where there is sufficient fresh water, free from mud or silt, for supplying the basin, a dock will be more suitable than where the supply is from the tide, especially if the sea at the place be much loaded with matter in mechanical suspension.

Sea exposure.

In designing a dock the first subject to which the engineer must give his attention is the seaward exposure of his proposed work. Of course no precaution is needed on this head if the place be a land-locked bay, or a narrow river or estuary. But if there be a considerable fetch of open sea, the waves generated during gales may be of such height as to endanger the sea gates or to interfere with their being worked in stormy weather. The formula already given at page 457 for short lengths of fetch will be the most suitable for calculating the exposure of docks, where the fetch ought never to be great.

Having calculated by means of this formula the height of waves that may be expected to reach the dock gates, the engineer must then determine whether such waves are too high for the strength of the gates, or for their being properly worked in stormy weather. Now we have unfortunately but few facts on this subject to guide us, and these not very consistent with each other.

Height of Waves in which Gates can be Worked.

Name.	Width of Entrance in Feet.	Height of Waves in which Gates are worked in Feet.	Authority.
Ardrossan	40	2	Mr Moffat, C.E.
Seaham ...	36	2	
Sunderland, North	50	3	Mr Meik, C.E.
Do. South .	60	2½	Do.
Silloth .	60	2	Mr Boyd, C.E.

It might at first sight be expected that the strain would increase as the squares of the breadth of the gate, but, owing to the manner in which the forces are distributed, this does not seem to be the case.

Where b = the width of opening of the entrance in feet, and h = the height of the waves at the place, the formula $b = \frac{60}{h}$ may perhaps be regarded as safe; or, where h has not been observed, and D is length of fetch in miles,

$$b = \frac{60}{1·5\sqrt{D} + (2·5 - \sqrt[4]{D})}.$$

Should the calculation by the formula give higher waves than are compatible with safety or convenience, the proper course will be to provide an outer harbour or covering breakwater, so as to reduce the height of the waves. For this purpose the formula given at page 462 is applicable. In cases where the course now recommended cannot be adopted, from motives of economy or from other causes, recourse may be had to protecting booms such as are described at page 463. If the traffic be considerable and the interruption caused by the shipping and unshipping of the booms be regarded a formidable objection, the gates may in some cases be protected by fastening together the tops of the mitre posts by chains. Another mode of securing gates against the sea was adopted at Ramsgate by Mr Ramsay, and is stated by Sir John Coode to be perfectly satisfactory. It consisted of the following arrangement :—

> "One end of a stout beam or stay of greenheart timber was connected, by means of a massive iron movable joint, to the fore part of each gate, near the middle posts on the inner or basin side, and at about the level of high water of equinoctial spring tides; the opposite end of this beam passed into an opening in the masonry of the side walls of the entrance. The inner end of this beam was supported by a small bogie truck running upon a pair of rails laid in a horizontal plane. On the vertical face of the beam nearest the gate there was a strong toothed rack working into a pinion at the end of a train of gearing, the first motion of which was a screw-and-worm wheel. By means of this gearing the power of the men was communicated to the gate through the beam or stay just described."

Docks should be sheltered from wind.

After the engineer has succeeded in designing a dock which is sufficient in so far as the sea is concerned, it may after all not prove safe and convenient if it be exposed fully to the force of the wind, which, acting on the rigging and hulls of the shipping, causes vessels to break their moorings or produces a grinding action of the vessels against the quays. At Sunderland south dock and at the docks in the Tyne, for example, the gales of October 1863 occasioned very considerable damage, from vessels breaking adrift from their moorings and coming into collision with other vessels.

Capacity of docks and harbours for trade.

The number of vessels that can be accommodated in each acre of a harbour may be termed its "available capacity." This must obviously vary with the sizes of the craft which frequent the port and with the ratio of sheltered to unsheltered acreage; or in other words, with the exposure, depth, and reductive power. It will therefore be highest for a dock with gates, less for a tide-basin into which the waves have access, and least of all for an anchorage breakwater or roadstead. But it also depends on the form of the basin and on its depth.

The following table contains the greatest number of vessels that can be accommodated at one time per acre for several docks :—

Name.	Tonnage of Vessels.	Number of Vessels per Acre.	Authority.
Ardrossan	100 to 1000	15	Mr Moffat, C.E.
Avonmouth........	2000	0·75	Mr Brunlees, C.E.
King's Lynn	1500 aver.	6	Do.
Silloth	50 to 800	7·50	Mr Boyd, C.E.

If n represents the number of vessels per acre, and t their average tonnage, and a is a coefficient which may be taken at from 3 to 4 according to the tonnage inversely, the formula $n = \frac{1000}{t} + a$ may perhaps be convenient for showing, though necessarily in a very approximate way, the relative capacity for mixed shipping of proposed docks of symmetrical proportions. But the capacity will very largely depend on whether both large and small vessels frequent the port, or only vessels of one size.

The capacity for *tonnage* per acre is shown in the following table :—

Name	Depth of Water in Feet.	Tonnage per Acre at one time.	Tonnage shipped and unshipped per Acre per annum.	Authority.
Ardrossan....	18½	3400	90,000	Mr Moffat.
Belfast	22	3074	10,307	Mr Salmond.
King's Lynn	25	9000	22,650	Mr Brunlees.
Silloth..	22	6000	40,718	Mr Boyd.

Form of dock.

The general form of a dock will in most cases be dependent on local peculiarities. Where the nature of the ground and other circumstances admit of it, the width of the basin should, in order to provide for the largest amount of traffic, be greater near the entrance than at a distance from it. The diagram (fig. 8) may perhaps be regarded as an approach to the form of maximum capacity which should be kept in view as a general guide in making a design. But in most situations the form will, as we have said, be mainly if not entirely dependent on the outline of the land and depth of water, on the position of adjoining streets and buildings, and on the geological formation and nature of the subsoil. The serrated outline of the jetties shown in the diagram affords a larger amount of accommodation for shipping than when the quays are continuously straight. Sir John Hawkshaw was, we believe, the first to adopt these indented jetties, which are specially suited for the coal trade; but the radiating form shown in the diagram has not, so far as we know, been adopted. Not only are numerous cross sections of the ground required for fixing on the best site for a dock, but borings of the subsoil are essential, as, upon a careful comparison of these, the position of the entrance must be determined. It is always of the greatest importance to place the foundations of the lock or entrance gates at a place where the bottom is rock, or, where that is not to be found, on the hardest and most impervious part of the subsoil, or, failing that, on a place where the bottom though soft, is of uniform consistency.

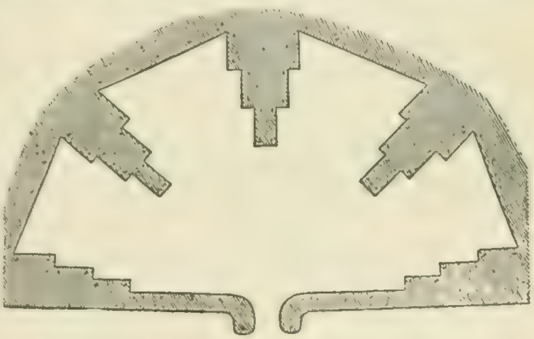

Fig. 8.

Amount of work per yard of quay.

Mr Ure, in a report on Glasgow harbour, gives the following table showing the amount of work per yard per annum :—

Port.	Tonnage per Acre of Water.	Tonnage per Lineal Yard of Quay.	Remarks.
Glasgow, including steamers	30,670	440	Fully worked.
Glasgow, excluding steamers	20,361	293	
Southampton Tidal Harbour.	20,000	350	Could do more.
Liverpool Docks................	21,200	185	Fully worked.
Hull Docks.....................	19,000	143	During ten months
St Catherine's Docks..........	20,500	142	Fully worked.

Armstrong's hydraulic machinery.

A great increase in the amount of trade, with the same size of dock and length of quay, may be effected by Sir William Armstrong's patent hydraulic machinery. This principle of applying hydraulic pressure for opening gates, bridges, and sluices, or to the capstans for hauling vessels out and into dock and waggons on and off the coal tips, and for turning them on the turntables, the discharging of ballast and loading of coals, and the shipment and discharging of general cargoes, has now been successfully adopted at many harbours. Its use is, however, only warrantable where there is a great amount of traffic, and especially at places where the spring tides remain only a short time at the same level.

At the Victoria Docks, London, the late Mr Bidder mentions that 41 craft and 17 ships, or 11,711 tons, came in at one tide. In one month the number of craft entering the harbour was 1229; craft leaving, 1288; ships entering, 250; ships leaving, 258; or an aggregate of 2517 craft and 508 ships during the month. The gates, which are 80 feet span, are opened in less than 1½ minutes. At Sunderland the accumulators are equivalent to a head of 600 feet, and the engine is 30 horse-power. A wrought-iron bridge 16 feet wide, and including counterweights equal to nearly 200 tons, is raised vertically 15 inches, and drawn back in about 2½ minutes. At Swansea the accumulators are equivalent to an effective pressure of 750 lb per square inch, and there are three high-pressure engines of 80, 30, and 12 horse-power respectively. The time employed in either opening or closing the gates is about 2½ minutes, which is the shortest period consistent with safety. The wrought-iron swing-bridge can be opened or shut in 1½ minutes. The ballast cranes, which are distributed round the dock, can each discharge from 350 to 400 tons in the day. The quantity of coal that can be shipped is about 1000 tons per day, and the effective quantity of water required for the port is 21,600 cubic feet per week. The large new bridge at Leith, designed by Messrs Rendel & Robertson, and worked by the Armstrong apparatus, is 120 feet span,—length of girder 214 feet, weight moved 750 tons,—and is opened in 1½ minutes. The saving of time effected by this method is very great, for at Liverpool, according to Mr A. Giles, gates of 70 feet require 20 minutes, and six men on each side to open them.

Proportion of water to quays and land area.

The proportion of water area to length of quays will obviously depend on the form of the docks. The following table, deduced from information kindly supplied by Mr Lyster, C.E., gives examples on this head at Liverpool :—

Total Water Area and Quay Space at Liverpool and Birkenhead.

	Water Area.		Length of Quayage.		Lineal Yards of Quay per Acre.
	Acres.	Yards.	Miles.	Yards.	Yards.
Liverpool Docks........	252	1721	17	1472	124·4
Liverpool Basins.	16	4411	1	1088	168·3
Liverpool Docks & Basins	269	1292	19	800	127·2
Birkenhead Docks	150	4545	9	[illegible]	99·7
„ Docks and Basins	164	2558	9	779	101·0

In order to utilize the area of a dock to the best advantage, a certain amount of land space dependent on the kind of trade should be provided around it; for without this space, which is needed for giving room for railway sidings, warehouses, and the like, the traffic would be cramped. As an illustration of the large extent of railway which is required in a coal port, we may refer to Cardiff, where Mr M'Connochie says, "The extent of sidings provided and maintained by the Bute trustees, in connexion with the docks, amounts to 16 miles in length, the whole of which is at times fully occupied."

Proportion of tide basin to dock.

The proportion of the area of outer tide basin to that of the dock to which it forms the access varies necessarily with the requirements of the trade, as is shown in the following table :—

	Dock.	Outer Basin.	Ratio.
	Acres.	Acres.	
Bute Dock (East)	42·33	2·15	19·69 : 1
Bute Dock (West)	16·86	1·40	12·04 : 1
Penarth Dock	17·11	2·68	6·39 : 1
Tyne Dock	50·	9·50	5·27 : 1
Liverpool generally......	107·	13·	8·23 : 1

Depth of dock.

The level of the bottom of a dock is always kept lower than that of the sill of the entrance gates, in order to admit of a certain amount of deposit taking place without injuriously affecting the depth of water in which the vessels lie, or interfering with the working of the gates. There should never be less than 1 foot of greater depth over the bottom of the dock than over the entrance sill.

Commercial advantages proportional to cubes of depths.

The commercial advantage of a great depth of water over the sill has been well shown by Mr George Robertson in his report on the Albert Dock at Leith. By increasing the depth to the extent of 2 feet he found there would be 396 tides in the year giving a depth of 23 feet over the sill, as against only 102 tides in the year when that depth could be had if the sill were only 2 feet high. But besides the advantage of availing ourselves of a greater number of tides, Mr T. Stevenson found, from an examination of the draughts and tonnage of a large number of sailing vessels, that the commercial advantages in a navigable river, dock, or harbour *are proportional to the cubes of the depths.*

The relation subsisting between the depth of a dock or channel and the tonnage of sailing vessels which can use it is given by the formula $t = \cdot 13d^3$, or $d = \sqrt[3]{7 \cdot 7\, t}$, from which the following table has been calculated :—

Feet.	Tons.	Feet.	Tons.	Feet.	Tons.
5	16	12	225	19	892
6	28	13	286	20	1040
7	44·5	14	357	21	12[illegible]1
8	66·5	15	439	22	1384
9	95	16	532	23	1581
10	130	17	639	24	1797
11	173	18	758	25	2031

Width of entrance.

In fixing the minimum width that will admit vessels of the size which are expected to trade at the harbour, the engineer must take care to preserve a proper relation between the area of the dock and the width of the entrance; for if this relation be neglected, a current may be generated through the entrance when the tide begins to ebb, which would be incompatible with the safe working of the gates. A very small current is sufficient to act injuriously in this way, especially if the gates be of great width. Whenever the internal area of the proposed basin is considerable, it will be a safe precaution to calculate the velocity of the outgoing current, at different periods of time, after the tide has begun to ebb; and for this purpose observations of the fall of the tide must be carefully made and compared with the proposed transverse sectional area of the passage through the lock chamber. If the velocity thus obtained be thought too great for the safe working of gates of the size required, the only alternative is to provide an additional lock. But a double outlet will at any rate be in all probability needed, or will at least prove a great convenience in all cases where a large internal basin is required.

Lockage.

The late Dr Rankine in his *Manual of Civil Engineering* gives the following table for the expenditure of water due to the passage of vessels through the lock:—

Let L denote a lockful of water, that is, the volume contained in the lock chamber between the upper and lower water levels, and B the volume displaced by a ship, then the quantities of water discharged from the dock are shown in the table. The sign − prefixed to a quantity of water denotes that it is displaced from the lock into the dock.

Single Lock.	Lock found.	Water Discharged.	Lock left.
A descending ship	Empty.	$L - B$	Empty.
Do. do.	Full.	$-B$	Empty.
An ascending ship	Empty or full.	$L + B$	Full.
2n ships descending and ascending alternately	Descending full, ascending empty	nL and $(n+1)L$	Descending empty, ascending full
Train of n ships descending	Empty.	$nL - nB$	Empty.
Do. do.	Full.	$(n-1)L - nB$	
Train of n ships ascending	Empty or full.	$nL + nB$	Full.
Two trains of n ships—the 1st descending, the 2d ascending	Full.	$(2n-1)L$	Full.

From these calculations it appears that ships ascending and descending alternately cause less expenditure of water than equal numbers of ships in train.

Depression of dock-land.

The level of the surface of the water in a dock will of course sink in proportion to the number of times the lock has to be filled during each tide, and may also be affected to a small extent by leakage. In order to provide for this depression of level, the old dock of Grimsby, and also the Bute Docks, Cardiff, are supplied by land streams, while at Penarth Sir John Hawkshaw was unable to get a supply of pure water, and the dock at that port is supplied from the tide water of the Bristol Channel, which holds in suspension a large amount of alluvial matter. In the old London docks the level is kept up by pumping.

If the masonry of the walls has been properly constructed, and if the gates and lock are kept in proper repair, and especially if the basin be of large area, the depression of the water level due to leakage, will, as appears from the following table, be comparatively trifling:—

Name of Dock.	Area in Acres.	Leakage.	Authority.
Ardrossan	4	18 in. per tide.	Mr Moffat, C.E.
Belfast	3½	At first 1 to 2 in., now 6 in. springs, and 4 in. neaps.	Mr Salmond, C.E.
Whitehaven	4½	3 in.	Mr Brunlees, C.E.
Avonmouth	16	½ in. in 24 hours.	Do.
King's Lynn	6½	1½ in.	
Silloth	4	12 in. per tide.	Mr Boyd, C.E.

Works of construction.

The principal works required in the construction of docks are—*first*, cofferdams for excluding the tide, and pumps for keeping the basin dry while the works are going on; *second*, excavation of the basin and lock pit; *third*, piling for the foundations of quay walls and lock, where the bottom is soft; *fourth*, the building of the quay walls, lock, and outer tide basin; *fifth*, entrance gates, gangway, and dolphins in the channel outside of the dock for facilitating the entry and departure of vessels.

As to the *first* of these works, namely, the cofferdam and pumping apparatus, reference is made to the articles on these subjects in this work; and as to the *second* and *third*, there is nothing requiring special notice, as no peculiarity attaches to the mode of carrying on excavation or piling for docks more than for any other engineering undertaking where these are needed. It is only necessary to point out that when the bottom is soft a large amount of piling is required, more especially at the lock pit, where rows of sheeting piles should be driven across the lock, at least at the entrance, and in the lines of the clap or pointing sills against which the gates shut.

Proportions of quay walls.

The *fourth* class of works, namely, quays and lock, are in all cases most important features in a dock. Different rules have been given by engineers for the proportions of quay walls. Mr A. Giles recommends that they should be made strong enough to resist the pressure of a head of water equal to their own height; and Minard recommends their thickness at bottom to be $\frac{4}{10}$ths of their height.

Quay walls of concrete.

The recent use of Portland cement concrete in the construction of harbours has led to its introduction at dock works. In the small dock erected in 1875 at Berwick-on-Tweed, Messrs Stevenson had the dock walls and gate chamber constructed entirely of Portland cement concrete, excepting a small portion at and above the high water level, against which the vessels might rub; and Mr Rendel at the new Victoria Docks, London, which are the longest in the world, is making the whole masonry of cement concrete.

Graving docks.

Graving docks are basins sometimes 600 feet long and 60 or 70 feet wide, fitted with gates, from which the tide-water which floats the vessel into the dock is pumped out, so as to let the carpenters get access to the ship's bottom. The sides of graving docks consist of a series of steps of masonry, called "altars," against which small timber props, generally of Gulf of Bothnia timber, are placed, for supporting the vessel's sides as she ceases to be water-borne. Her keel is supported on blocks, generally of hard wood, but of late years they have in some places been made of cast iron. The sides, in order to save pumping, are in some places made of a curved form, so as to suit the shape of the vessel's sides. The advantages are, however, more than counterbalanced by the undue contraction of the space allotted for the carpenters, who are unable to move about easily on the sloping surface of the masonry.

Of all the different kinds of masonry which enter into the construction of marine works, there is none which requires greater accuracy of workmanship, or more careful circumspection, than the graving dock. Leakage in a wet dock, provided it does not originate at a place where it is liable to increase through time, and is of no greater extent than to depress the surface of the water a few inches, cannot be regarded as a serious evil. But in a graving dock, where the requirements are different, there should be no leakage. A very little water, accumulating on the platform of a dry dock, interferes to a serious extent with the comfort and convenience of the carpenters. Although it may occasion considerable additional expense, there ought to be in all cases, especially where the soil is full of springs, an ample underground storage provided by a system of drains for receiving the leakage, which can then be pumped out periodically, as required, without ever allowing the water to rise above the platform.

Mr G. B. Rennie's floating dock.

Mr. G. B. Rennie's docks are stated to be the first of the kind that have been made of iron. They consist of floating caissons for holding the vessel to be repaired. They are sunk by allowing them to fill with water, and are raised by pumping. The caissons are made with water-tight compartments, and they are carried up as high as the vessel's bulwarks, excepting that through which the vessel enters and leaves. Among several advantages that have been claimed for this kind of dock may be mentioned—its independence of the rise and fall of the tide, the power of applying breast shores as in an ordinary graving dock, and the stiffness produced by the side walls. As the upper parts of the side walls or altars are always full of air, this dock may be used in deep water, and is therefore independent of the nature of the bottom.

Mr E. Clark's hydraulic lift.

Mr Edwin Clark's hydraulic lift, at the Victoria Docks, London, consists of a pontoon which is filled with water and sunk between two rows of iron columns. After a vessel has been floated and steadied upon the pontoon, the whole is raised by twelve hydraulic force-pumps of 2 feet diameter, acting on the pontoon by means of chains. After the pontoon has been brought about the tide-level, the water is allowed to escape, when there is sufficient floating power to admit of the whole being removed to any place where the repairs can be conveniently made. The pontoons, which can accommodate vessels of a length of 350 feet, are about 320 feet long and 59½ feet broad. "The power of the hydraulic lift is 6400 tons. The largest pontoon will carry a dead load of 3200 tons in addition to its own weight."

Slip

Slips are the contrivance of the late Mr Thomas Morton of Leith, and consist of a carriage or cradle working on an inclined railway, falling generally at the rate of about 1 in 17, and extending above high water to a sufficient distance for the class of vessels which are expected to use them to several feet below the level of low water, and a truck or carriage which moves on it. When the carriage is let down under the water, the vessel is floated above the place, and the carriage is drawn up till the vessel catches it forwards. When the ship is placed truly above the line of the carriage, a powerful crab-purchase at the top of the slip, which is generally worked by steam, is set in motion, and raises the truck and ship out of the water.

Gridiron.

The gridiron is a simple framework of timber placed at a level sufficient to admit of vessels being floated above it during the flood-tide, and grounded upon it during the ebb, and when thus left high and dry the vessel's bottom can be examined to ascertain if it be necessary to take her into the graving dock, and trifling repairs can also be made. The gridirons at Liverpool vary from 25 feet to 36 feet 3 inches in breadth, and from 228 feet 3 inches to 313½ feet in length.[1]

Hydraulic and screw docks.

The hydraulic and screw docks used in America are chambers into which vessels are floated during the flood-tide, above a cradle which is drawn up above the high water level, either by means of Bramah's press worked by a steam-engine, or by a powerful apparatus of screws.

Relative advantages of slips and graving docks.

The patent slip possesses the following advantages over the graving dock. (1) The cost of its construction is less. (2) When the fall of tide is languid, a vessel can generally be more quickly laid dry. (3) When so laid dry she can be more easily examined, and, from the duration of the daylight being greater than in a deep graving dock, the time in which work can be done is considerably extended during winter. (4) There is more perfect ventilation, by which the vessel's sides are sooner dried, which is of some moment with an iron ship. (5) A vessel can be hauled up long before high water, and the repairs can be begun at once; whereas with a dock the pumping occasions considerable delay. (6) While the upper part of the slip is occupied, an additional vessel may be taken up for a shorter time than its predecessor, without interrupting the workmen.

The advantages afforded by a graving dock, on the other hand, are these. (1) Although its construction is more costly, it is nevertheless, if properly built, unquestionably a more durable structure—the rails, rollers, carriages, and chains connected with the slip being liable to derangement, which entails occasional repair. (2) The management of the graving dock is simple, and involves comparatively little superintendence; whereas that of a slip is intricate, and requires more than mere nautical skill. (3) The working of a graving dock is equally simple for large or small vessels, while it is undeniable that the raising of a large vessel on a slip is a delicate operation, and should be attempted only under the direction of persons thoroughly versed in such matters, and having ample mechanical resources at command. (4) The graving dock possesses the advantage, which is sometimes important, of affording the means of more easily filling a vessel with water, so as to detect leaks which may not be discoverable by other means. For this purpose a nozzle to receive a flexible tube should be fixed into the dock-gates. (5) Where double gates are provided the water contained in the dock affords a certain limited power of scouring the forebay and entrance, an advantage which is of course not possessed by a slip. (6) In any rapid land current, or strong tideway, it is a much easier process to dock a vessel than to land her safely on the cradle of a slip—an operation which, when incautiously gone about, has been in some cases attended with serious consequences even in sheltered situations. (7) The graving dock need not interfere with the set of the currents, whereas a slip which projects a long way seaward of low water may deflect them and produce shoals in the channel. (8) Mr Mallet has remarked that the strains on a ship's timbers are more direct than when she is on a slip, especially when she is leaving the cradle. The late Mr J. M. Balfour suggested, in order to meet this objection, that the cradle for a slip might be made of a wedge shape, so that its upper surface shall be parallel with the horizon, or that the back end should even be tilted slightly, so as to give a bite on the vessel and prevent her from slipping.

The relative advantages of the other contrivances for the repair of ships already described may be judged of by comparing them with each other in a similar manner.

Dock-gates.

Mr P. W. Barlow has given the following formulæ for the strength of dock-gates:—

Formula for Straight Gates.

If ϕ = horizontal angle (or "sally") between pointing sill and line joining heel-posts of the two leaves; W = pressure on the length of the gate with any head and for a given depth of the gate: and S = whole transverse strain at angle ϕ; then

$$S = \tfrac{1}{2}W \sec\phi + \tfrac{1}{25}\cos\phi.$$

From this Mr Barlow has deduced that the salient angle, where the strain is the minimum, is 24° 54′, but as the length of the gate increases with the secant, the strength will not at this angle be the greatest with a given section of timber. The "sally" or angle which gives the greatest strength, with a given section of timber, is stated by him as 19° 25′.

Formula for Curved Gates.

When θ is the salient angle, or camber of the beam, formed by a chord line drawn from the heel to the mitre-post, with the tangent to the curve of the gate—

$$S = \tfrac{1}{2}W\left\{1 - \frac{\sin\theta}{\sin(2\phi-\theta)}\right\}.$$

There is great difference of opinion among engineers as to the strain to which dock gates are subjected, and the reader is referred for further information to the 18th and 31st volumes of the *Minutes of Proceedings of the Institution of Civil Engineers*. In these discussions Mr Brown pointed out an error in Mr P. W. Barlow's paper, which stated that the line of pressure at the mitre-posts would always be a tangent to the curve of the separate gates, whereas that line must always be at right angles to the centre line of the lock, and could only be a tangent to the curve when the two gates formed a segment of a circle, or, as Mr Bramwell says, at all events when their junction at the mitre-posts formed at that point part of a continuous curve. Mr Brown gives elaborate formulæ suited to meet a yielding or deflexion of the structure, which he alleges must always take place. Mr Bramwell states, and we think justly, that, when the gates form when closed a segment of a circle, they cannot be subject to transverse strain, and that the whole of the gates would be subjected simply to compression. Mr E. P. Brereton very properly suggests that when the gates are of malleable iron the lowest plate should never be less than ½ inch thick, whatever the [illegible] may be.

When l represents the length of one-half of a straight or cambered malleable iron gate, w the distributed pressure over the length of the leaf taken on a given element of the gate, bounded by two horizontal planes 1 foot apart, t the thickness of framework of gate or distance between the two skins, s the transverse strain in malleable gate, θ half of the mitring angle—*i.e.*, the angle formed by meeting of gates—all the dimensions being in feet, and weight in tons,—then

$$s = \frac{\tfrac{1}{2}wl}{4t};$$

$\frac{s}{4}$ = sectional area of metal on compressed side in inches;
$\frac{s}{5}$ = do do on extended side do. ;
$\frac{1}{2}w\tan\theta$ = compressive strain produced by other leaf of gate.

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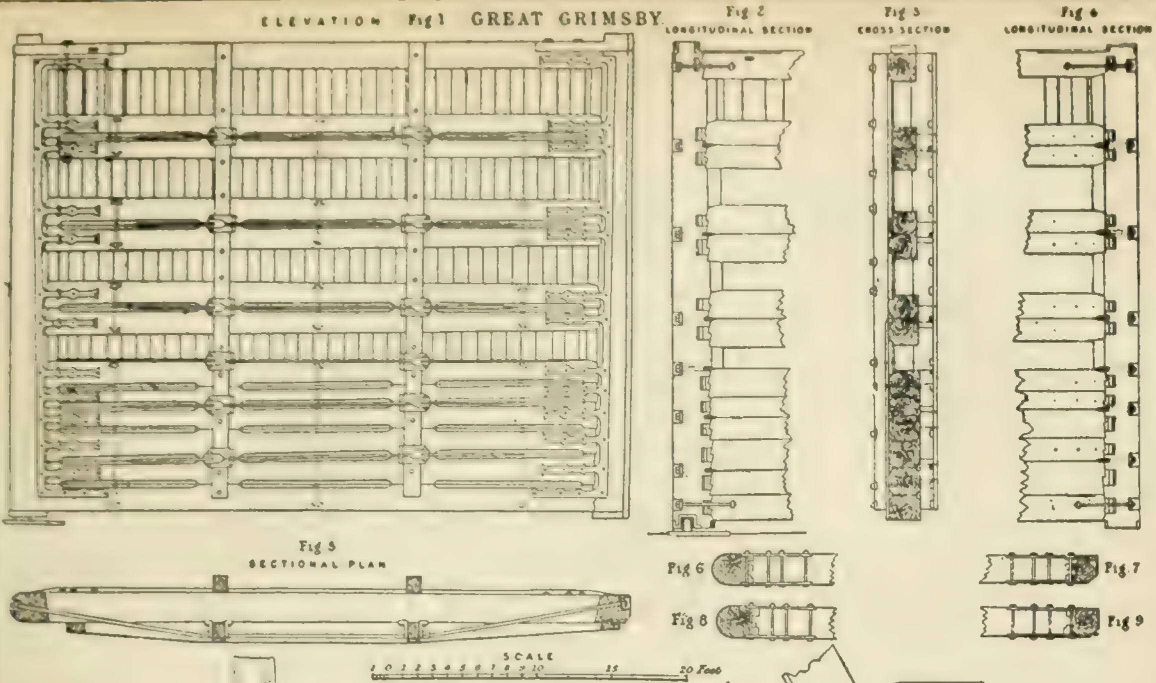
[1] "Historical and Descriptive Sketch of the Mersey Docks and Harbour," by J. J. [illegible], in the *Artizan* for 1864.


ELEVATION Fig 1 GREAT GRIMSBY
Fig 2 LONGITUDINAL SECTION
Fig 3 CROSS SECTION
Fig 4 LONGITUDINAL SECTION
Fig 5 SECTIONAL PLAN
Fig 6
Fig 7
Fig 8
Fig 9
SCALE
1 0 1 2 3 4 5 6 7 8 9 10 15 20 Feet

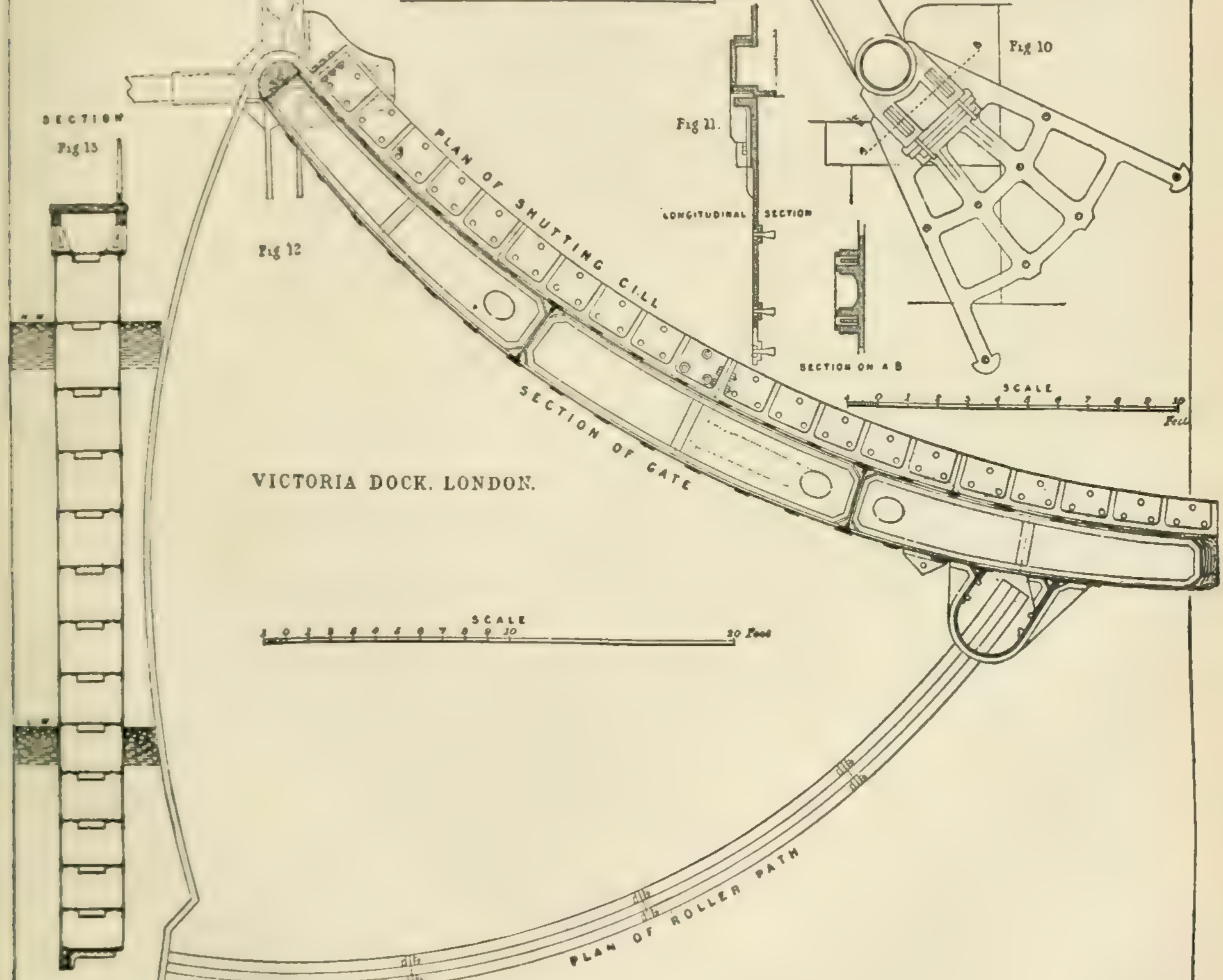
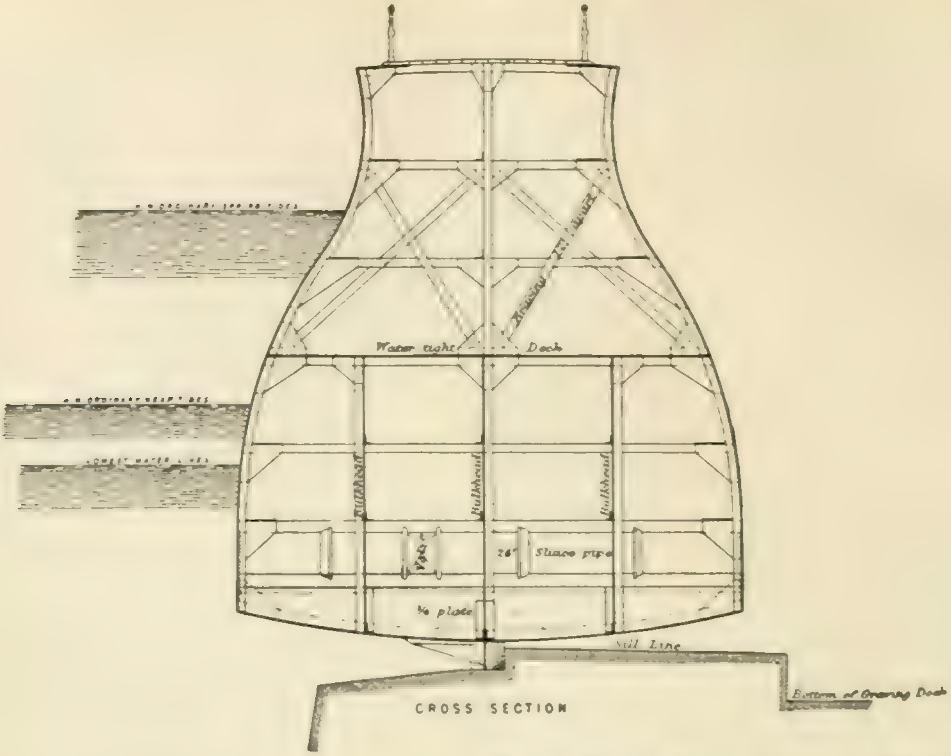


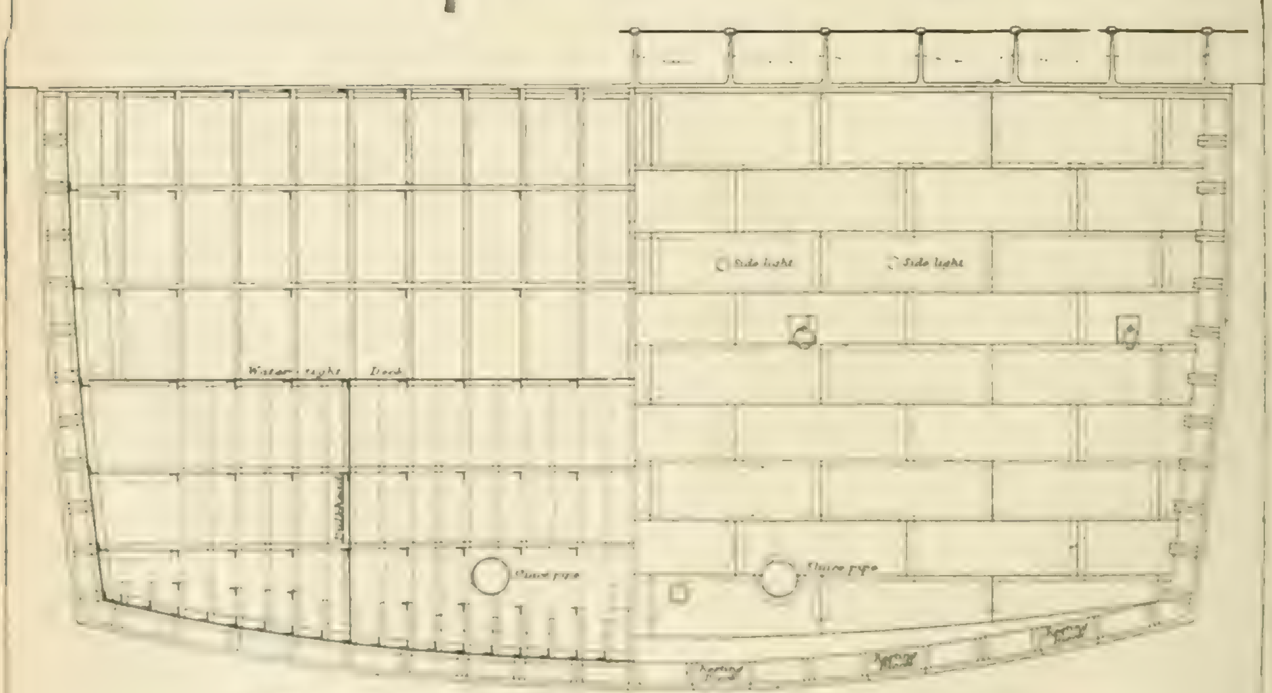
Fig 10
Fig 11.
LONGITUDINAL SECTION
SECTION ON A B
SCALE
1 0 1 2 3 4 5 6 7 8 9 10 Feet
SECTION
Fig 13
Fig 12
PLAN OF SHUTTING CILL
SECTION OF GATE
VICTORIA DOCK. LONDON.
SCALE
1 0 1 2 3 4 5 6 7 8 9 10 20 Feet
PLAN OF ROLLER PATH

CARDIFF DOCKS

CAISSON FOR GRAVING DOCK



CROSS SECTION



HALF LONGITUDINAL SECTION

HALF ELEVATION

SCALE

0 5 10 15 20 Feet

Mr Kingsbury adds half of this compressive strain to the strain representing the compression due to the transverse pressure, and deducts it from the same amount for the extension; and these results being divided as before by 4 and 5 respectively, being the allowances per square inch of metal for compression and extension, give the areas for each. He, however, expresses a doubt whether the whole of the compressive strain from the other gate may not perhaps come upon the compressed section. The sections close to the posts he takes as requiring to resist the compression due to transmitted pressure only, or $=\frac{\frac{1}{2}r\tan\theta}{4}$.

For cylindrical gates Mr Kingsbury gives the formula,—when p = pressure per unit of surface, and r = radius of curvature,—

$\frac{pr}{4}$ = sectional area of metal in square inches.

It must be remembered in designing gates which are exposed to the waves that they should be made stronger than these formulæ require. And the gates for graving or dry docks sustain a greater pressure with the same rise of tides than those of wet docks, and should therefore be made correspondingly stronger.

Caissons. Caissons are sometimes employed instead of gates, and are the invention of the late General Bentham. They are constructed of malleable iron plates and are sometimes made in the form of a ship's hull, and sometimes have vertical sides. The caisson fits into checks made for its reception in the side walls of the entrance to the dock. They require to be very carefully ballasted, and to be most accurately fitted to the masonry on the sides and bottom, and even when they are faced with timber which has been finely dressed and fitted, coal cinders are often needed to make the joints water tight. At high water they are floated into the grooves, and are then scuttled by admitting the water into the interior chamber. When a vessel has to leave the dock, the water is again pumped out, and the caisson is then floated out of its place and taken into the river or harbour, so as to be out of the way of the vessel which is leaving. General Bentham says caissons are cheaper than gates, occupy less room, are more easily repaired, and the same caisson may be used for different places at different times, while they answer for roadways, and require less labour for opening.

The caisson at Keyham was designed by Mr Scamp, deputy-director of the Admiralty works, and is 80 feet wide and 43 feet deep, with an air-chamber at the bottom. When raised a few inches above the bottom, the caisson is drawn back into a recess or chamber in the side walls. The total weight is 290 tons, and the deflexion was ⅜ inch near the bottom, when the pressure of the whole surface was 2000 tons. The time for opening and closing the entrance at Keyham is 10 minutes and 8 minutes respectively. The cost was about £10,000.

Mr M'Connochie says that the iron caisson at Cardiff is 60 feet long, 23 feet greatest width, and 30½ feet deep, with a total weight of 152 tons.

Outer gangway and direction of entrance. The outer gangway at entrance to docks is generally a structure of open timber work, erected in the line which will best suit the entrance of vessels when under the influence of currents. This gangway is sometimes useful for a vessel discharging her passengers or completing her cargo while the gates are shut. Mr Redman remarks that "the practice in the port of London is to dock a ship upon the flood just before the high water, and to undock her at about the same period of tide. . . . The directions as apparently the most desirable are an angle of about 45° pointing up the streams for graving docks, an angle of about 60° in a similar direction for wet docks, and a right angle for building slips."

Coal staiths. It is of importance in discharging coal into ships that the fall should be as small as possible.

At Bramley Moor Dock, Liverpool, the Wigan coal is discharged by railway 18 feet above the quay. At Sunderland Mr Meik finds that 20 feet above the quays, as at the south dock, is too small for the shoots, and prefers 36 feet. At Penarth the height is 22, and they are able to lift 180 tons per hour. At Greenock, where steam cranes are used, they load about 500 tons a day. At Middlesboro' they can discharge 150 tons per hour, but 106 tons are as much as can be trimmed on board. At Cardiff, where there is no hydraulic machinery, they load 100 tons an hour. The distance between the staiths is 180 feet. At the Tyne Docks, Mr Harrison states that on one occasion, when a vessel had very long hatchways admitting of several waggons being simultaneously discharged, 420 tons of coal have been shipped in 55 minutes, a feat which shows the admirable mechanism employed.

Ballast cranes. At Swansea, with hydraulic machinery, they can discharge from 350 to 400 tons a day, and those at Penarth load at the rate of 60 tons an hour

The Law of Harbours and Ports.

The power of appointing suitable places to be ports or havens in England is one of the ancient prerogatives of the crown, founded, as Blackstone thinks, partly upon the rights of the king as conservator of the kingdom, partly upon his interest in the marine revenues. "In England it hath always been holden that the sovereign is lord of the whole shore, and particularly is guardian of the ports and havens which are the inlets and gates of the realm, and therefore, so early as the reign of King John, we find ships seized by the king's officers for putting in at a place that was not a legal port." The right of the king to make a harbour, and to grant the dues arising from the use thereof, in any suitable place, although the ownership of the soil may be in another, is subject to any vested rights of harbour already existing; and in the recent case of Foreman *v.* the Free Fishers of Whitstable, it was said that the right of the public freely to navigate the high seas is a paramount right to which the right of the crown in the soil is necessarily subservient, and therefore, as the right of navigation must include the right of anchorage, the crown or its grantee could not impose a toll on this use of its soil. To justify such a toll some facts must be shown proving that the soil was originally within the precincts of a port or harbour, or that some service or aid to navigation was rendered, in respect of which the alleged right of toll was granted. The crown having once granted a harbour could not afterwards narrow its limits, but by 16 and 17 Vict. c. 107 the crown is enabled to ascertain the limits of all ports, and to assign quays thereon for the enclosure, loading, and landing of merchandize, so that frauds on the revenue may be prevented.

The Act 10 and 11 Vict. c. 27 consolidates the clauses usually inserted in private acts authorizing the construction of harbours; 24 and 25 Vict. c. 45 facilitates the formation and improvement of piers and harbours in Great Britain and Ireland; and 25 and 26 Vict. c. 69 and 28 and 29 Vict. c. 100 transfer from the Admiralty to the Board of Trade certain powers and duties relative to harbours. Besides these general Acts, there are many special Acts relating to particular harbours.

Reference may be made to *Brit. Asso. Reports*, 1848 (J. S. Russell), and 1850 (Scoresby); Smeaton's *Reports*; J. S. Russell, "Researches on Hydrodynamics," *Trans. Roy. Soc. Edin.*, vol. xiv., 1837; Thomas Stevenson, "Account of Experiments on Force of Waves of Atlantic and German Oceans," *Trans. Roy. Soc. Edin.*, vol. xvi., 1845; T. Stevenson, "On Reduction of Height of Waves after passing into Harbours," *Edin. New Phil. Journ.*, 1852; J. Bremner, *Treatise on Planning and Constructing Harbours*, Wick, 1845; Sir J. Rennie, *Theory, Formation, and Construction of British and Foreign Harbours*, Lond., 1854; Belidor's *Architecture Hydraulique*, Paris; Capt. Washington, *Royal Tidal Harbour Com. Reps.*, Lond., 1845-46; the article on "Tides and Waves," in the *Encyclopædia Metropolitana*, by G. B. Airy, Astronomer Royal; *Minutes of Proceedings of Institution of Civil Engineers*; A. Cialdi's writings on Waves and Harbours; *Report of the Committees on Harbours of Refuge*, 1857-58; *Report of the Royal Commission on Harbours of Refuge*, 1858-59; C. J. Minard, *Cours de construction des ouvrages hydrauliques des ports de mer*, Liége, 1852; Thomas Stevenson, *Design and Construction of Harbours* (2d ed.), Edin., 1874; Professor Mitchell's American *Reports*.

The gates figured in Plate XI. are those at Great Grimsby and Victoria Dock, London; and the caisson, Plate XII., is that in use at Cardiff Docks. (T. ST.)

HARBURG, a seaport town of Hanover, Prussia, at the head of a circle in the district of Luneburg, is situated on the left bank of the southern branch of the Elbe opposite Hamburg, which stands on the right bank of the northern branch of that river. The distance between the two towns is about 4½ miles, and there is railway communication between them by means of a bridge over both rivers, completed in 1871. The town is also connected with Hanover by railway. It is the seat of a local court, a superintendent-general, a head custom house, and a chamber of commerce; and it possesses an old castle, which from 1524-1642 was the residence of the Harburg line of the house of Luneburg, a real school of the first order, a commercial school, and a trade school. The industries include shipbuilding and the manufacture of india rubber and gutta percha wares, oil, soda, starch, alum, cigars, yarn, cast iron, machines, and leather. There are also horse and cattle markets, and some shipping trade, which, however, has considerably declined since better communication was opened up with Hamburg. In 1878 there entered 469 sea-going vessels with a burthen of 38,110 tons, and 7677 iron vessels with a burthen of 175,643; while the corresponding averages during the previous twelve years (1866-1877) were 633 sea-going vessels and 7669 of iron craft, with burthens respectively of 43,036 and 168,082 tons. Harburg belonged originally to the bishopric of Bremen, and received town rights in 1297. In 1376 it was united to the principality of Lüneburg, along with which it fell in 1705 to Hanover, and in 1866 to Prussia. In 1813 and 1814 it suffered considerably from the French, who then held Hamburg, and who built a bridge between the two towns, which remained standing till 1816. The population in 1875 was 17,131.

HARDENBERG, Friedrich von (1772-1801), German poet and philosopher, best known as Novalis, was born on his father's estate in the county of Mansfeld, in Prussian Saxony, May 2, 1772. He was of a shy, retiring, and thoughtful disposition, and was deeply influenced by his parents, who were strict members of the sect of Moravian Brethren. After attending the gymnasium of Eisleben he went as a youth of eighteen to the university of Jena, where he studied philosophy, mathematics, and the natural sciences. There he was treated with great kindness by Schiller, of whom he was a warm admirer. He studied law in Leipsic and Wittenberg, and in 1794 settled for a time in Tennstedt in order to perfect himself in the practical work of the legal profession. During his residence in Tennstedt he formed a passionate attachment to Sophie von Kühn, a beautiful but delicate girl of thirteen, and with her consent obtained a promise from her parents that when she reached womanhood she should become his wife. In 1795 he was made auditor at the salt works of Weissenfels, where his father was director. Two years afterwards his betrothed died, and for some time he seemed to be inconsolable and to have lost all interest in life. In a few months, however, he went to the academy of mines at Freiberg, where he studied with a view to a higher appointment in connexion with the salt works; and in the midst of his studies he became engaged for a second time, and [illegible]. He returned to Weissenfels in 1799, and was appointed assessor with the directorate of the salt works. As he was preparing for his marriage in the autumn of 1800 he was alarmed by the sudden appearance of blood from the lungs. Consumption was pronounced, and although he hoped to the last that he might yet recover, the disease made rapid progress, and he died on the 25th of March 1801. He was of a tall, slight, and graceful figure, with light brown hair and hazel eyes, and a face expressive of a calm, gentle, and contemplative spirit. After his death his writings were issued in two volumes by his friends Ludwig Tieck and Friedrich Schlegel, and were rapidly recognized as important contributions to German literature. They are for the most part composed of fragments, of which the chief is *Heinrich von Ofterdingen*, an unfinished romance. Hardenberg is often spoken of as "the prophet of the Romantic school;" and the phrase sufficiently marks his leading peculiarities. He took no part in the literary warfare carried on by his friends, but he shared to the full their strongest sympathies. Like them he intensely disliked those "enlightened" writers of the 18th century who had claimed to say the last word about human life through mere logic; he was penetrated by the conviction that there are elements in the world which cannot be grasped by the understanding, and which must be felt rather than reasoned about. Although he was fond of science and history, he moved most freely in the borderland between religion, philosophy, and poetry; and his prose writings are full of sayings which, although not easily intelligible, are impressive and stimulating. His diction is often simple and unostentatious, but it is rendered difficult both by the abstruseness of his themes and the remoteness of his allusions. As a poet he lacked definiteness of conception; his lyrics, however, especially those of a religious nature, have a certain tender beauty which gives them high rank in the serious literature of Germany. They are marked by deep feeling and by sweetness and grace of expression. He himself regarded a series of *Hymns to Night* as his best achievement, but it is in *Heinrich von Ofterdingen* that the majority of his admirers find the fullest utterance of his mystic aspirations, his passion for spiritual beauty, and his idealist philosophy.

See his *Schriften* (5th ed., Berlin, 1837, vol. iii., 1846), and R. Haym, *Die Romantische Schule* (1870), and *Friedrich von Hardenberg* (1873).

HARDENBERG, Karl August (1750-1822), Prussian statesman, was born at Essenrode in Hanover, May 31, 1750. Having studied at Leipsic and Göttingen, he entered the Hanoverian civil service as chamber councillor (Kammerrath) in 1770, and afterwards spent some time in Wetzlar, Ratisbon, Vienna, and Berlin, and travelled in France, Holland, and England. He was made privy chamber councillor (Geheim-Kammerrath) and raised to the rank of count in 1778, but a private quarrel with the prince of Wales compelled him four years afterwards to give up his appointments in Hanover and seek a new career. In 1787 he received the office of president of the board of domains (Kammercollegium) in Brunswick; and he was entrusted with the duty of delivering to Frederick William II of Prussia the will of Frederick the Great, who had deposited it with the duke of Brunswick. Frederick William II was so impressed by Hardenberg's appearance and character that in 1790 he recommended him as a minister to the margrave of Anspach and Baireuth. These principalities being united to Prussia in 1791, Hardenberg was appointed a Prussian cabinet minister, but continued to perform his duties as chief administrator of the new province. In the war with the French republic he acted as minister of war, and in 1795 signed on behalf of Prussia the treaty of peace concluded at Basel. When Frederick William III mounted the throne in 1797, Hardenberg was transferred from Anspach-Baireuth to Berlin, where he received high offices in the cabinet, being also soon afterwards nominated chief of the departments for Magdeburg and Halberstadt, for Westphalia, and for Neuchâtel. At this time the foreign policy of Prussia was determined by Haugwitz, who was on all occasions subservient to Napoleon. When in 1803 Prussian interests seemed to be threatened by the French occupation of Hanover, Haugwitz fell into disrepute, and in the following year his place at the head of the cabinet was taken by Hardenberg. The latter was anxious to maintain peace, but when in 1805 Napoleon's troops marched through Anspach he strongly protested, and entered into a convention with Russia. The victory of the French at Austerlitz, however, made it difficult for Prussia to proceed to hostilities; and on the 15th December 1805 Haugwitz signed a convention with Napoleon, whereby in return for Hanover Prussia conceded Anspach, Cleves, and Neuchâtel to the French. Hardenberg then retired, and Haugwitz returned to power. The policy of Haugwitz was exceedingly unpopular, and led to the war in which his country was prostrated at the feet of Napoleon. After the battle of Jena Hardenberg undertook the office of foreign minister; but when the treaty of Tilsit was signed he withdrew and watched from a distance the vigorous and enlightened efforts of Stein to restore new life to the fallen and humiliated state. Stein being compelled to retire in 1810, Hardenberg was recognized as the only possible successor of the great minister, and he amply justified the confidence with which he was honoured. The circumstances of the time did not admit of his pursuing an independent foreign policy; but he steadily prepared for the inevitable struggle with France by carrying out Stein's far-reaching schemes of social and political reorganization. The military system was completely reformed, serfdom was abolished, municipal institutions were fostered, the civil service was thrown open to all classes, and great attention was devoted to the educational needs of every section of the community. In the war of liberation Hardenberg was one of those who did most to stimulate the patriotic enthusiasm not only of the Prussians but of all Germans; and so important were his services that on the 3d June 1814, after he had signed the first treaty of Paris, he was raised to the rank of a Fürst or Prince. He accompanied the allied sovereigns to London, was one of the chief plenipotentiaries at the congress of Vienna, and took a leading part in the negotiations which led to the second treaty of Paris. After the restoration of peace he retained his place at the head of the Prussian cabinet, but his conduct of affairs was no longer marked by energy and foresight. He was accused of being too submissive to the papacy, and, although a man of liberal sentiments, he had not the courage to resist his royal master's dislike of constitutional government. He died at Genoa, November 26, 1822.

Hardenberg wrote memoirs of the time between 1801 and the conclusion of the treaty of Tilsit, and entrusted them before his death to his friend Schöll, a councillor of state. They were sealed by Frederick William III. and placed in the state archives, with directions that they should not be published until after the lapse of fifty years. At the end of this time they were entrusted by Prince Bismarck to Leopold von Ranke, who issued them accompanied by a biography of the author (*Denkwürdigkeiten des Staatskanzlers Fürsten von Hardenberg*, 5 vols., 1877). See also Klose, *Leben Karl August's, Fürsten von Hardenberg*, 1851; and Seeley, *Life and Times of Stein*, 1879.

HARDERWIJK, a town of the Netherlands, in the province of Guelderland, on the coast of the Zuyder Zee, about 28 miles N.E. of Utrecht. Its principal buildings are the town-house, the Reformed church rebuilt in the 15th century, the Nassau Veluwe gymnasium, the colonial dockyard depôt, formerly the mint, and the municipal orphanage. Agriculture, fishing, and a few trifling domestic industries form the sole employment of the inhabitants, who in 1872 numbered 5941.

Formerly the town was much more important. Having been surrounded with walls by Count Otto II. in 1229, and gifted with municipal privileges in 1231, Harderwijk rapidly extended its commerce, which it carried on directly not only with Holstein and Hamburg but with England, Denmark, and Sweden. In 1522 the town was captured by Charles V.; in 1572 it became subject to the United Netherlands; and in 1672-73 it was besieged for seventeen months by the bishop of Munster and his French allies.

HARDICANUTE, HARTHACNUT, or HARDIKNUT (c. 1018-1042), the last of the Danish sovereigns of England, son of Canute king of England, and his wife Alfgiva Emma, the sister of Richard duke of Normandy, and widow of King Ethelred,was born most probably in 1018 or 1019. When Canute died in 1035 Hardicanute was ruler of Denmark, and Swend, the elder reputed son of Canute by Alfgiva of Northampton, one of his concubines, was ruler of Norway. It is said to have been the wish of his father that Hardicanute should be ruler of both England and Denmark, but his connexion with Denmark seems to have been prejudicial to his English interests; and though his claims were supported by Godwine and the West Saxons, the witenagemot which met at Oxford decided that his government should not extend further north than the Thames, and that Harold, Canute's younger son by Alfgiva of Northampton, should reign over the northern provinces, being also in all probability overlord of the whole kingdom. Hardicanute refused, however, to come to England on such conditions, and in 1039 the witan of Wessex deposed him, and chose Harold also for their king. On the death of Harold in 1040, Hardicanute, who was about to invade England, had his hostile intentions disarmed by the message which reached him at Bruges, making him an offer of the crown for which he was preparing to do battle. The witan's choice of him seems to have been spontaneous, and not at all due to the threatening attitude he had assumed; but apparently he had not forgotten the former slight he had received, and his short reign was marked by great oppression and cruelty. He caused the dead body of Harold to be dug up from its place of sepulture at Westminster, and thrown into a marsh or, according to another account, into the Thames; he exacted so heavy a *danegeld* for the support of his foreign fleet that great discontent was created throughout the kingdom, and in Worcestershire a general uprising took place against the earls sent to collect the tax, upon which he burned the city of Worcester to the ground and devastated the surrounding country; in 1041 he permitted Eadwulf, earl of Northumbria, to be treacherously murdered after having granted him his full friendship. It would appear that Hardicanute was greatly given to excess in eating and drinking; and while carousing at the marriage feast of one of his thegns he was suddenly seized with an epileptic fit, from which he died a few days afterwards, June 8, 1042. He had no children, and though the line of Danish sovereigns might have been continued by Swend, the choice of the kingdom was unanimous for Edward Atheling, son of Ethelred.

See Freeman's *Norman Conquest*, vol. i.; Palgrave's *History of the Anglo-Saxons*; and Green's *History of the English People*, vol. i.

HARDING, JAMES DUFFIELD (1798-1863), a landscape painter, was the son of an artist, and took to the same vocation at an early age, although he had originally been destined for the law. He was in the main a water-colour painter, but he produced various oil-paintings both at the beginning and towards the end of his career. He frequently contributed to the exhibitions of the Water-Colour Society, of which he became an associate in 1818, and a full member in 1822. He was also very largely engaged in teaching, and published several books developing his views of art,—amongst others, *The Tourist in Italy*, 1831; *The Tourist in France*, 1834; *The Park and the Forest*, 1841; *The Principles and the Practice of Art*, 1845; *Elementary Art*, 1846; *Scotland Delineated in a Series of Views*, 1847; *Lessons on Art*, 1849. He died at Barnes on 4th December 1863. Harding was noted for facility, sureness of hand, nicety of touch, and the various qualities which go to make up an elegant, highly trained, and accomplished sketcher from nature, and composer of picturesque landscape material; he was particularly skilful in the treatment of foliage, and had for many years a leading position among those landscapists who carry on the miscellaneous work of the art to the satisfaction of their own generation, without establishing an ultimate claim to the higher kind of posthumous renown.

HARDING, JOHN. See HARDYNG.

HARDINGE, HENRY HARDINGE, VISCOUNT (1785–1856), field-marshal and governor-general of India, was born at Wrotham in Kent, March 30, 1785. After passing a short time at Eton college, he entered the army in 1798 as an ensign in the Queen's Rangers, with whom he served in Canada. In the Peninsular War he served for a time on Wellington's staff, and received an appointment as deputy-quartermaster-general in the Portuguese army from Marshal Beresford, whose approval and subsequent influence he had won by his gallantry at Corunna in 1809. Hardinge was present at nearly all the battles of the campaign; he was wounded at Vimiera and Vittoria. At Albuera he saved the day for the British by taking the responsibility at a critical moment of ordering General Cole's division to advance. When peace was again broken in 1815 by Napoleon's escape from Elba, Hardinge hastened into active service, and was appointed to the important post of commissioner at the Prussian headquarters. In this capacity he was present at the battle of Ligny, June 16, 1815, where he lost his left hand by a shot, and thus was not present at Waterloo fought two days later. For the loss of his hand he received a pension of £300; and in the same year was made a K.C.B. In 1820 and 1826 Sir Henry Hardinge was returned to parliament as member for Durham; and in 1828 he accepted the office of secretary at war in Wellington's ministry, a post which he also filled in Peel's cabinet in 1841-43. In 1830 and 1834 he was chief secretary for Ireland. In 1844 he succeeded Lord Ellenborough as governor-general of India, a position which he retained till January 1848. During his term of office the Sikh War broke out; and the governor-general after the battle of Mudki magnanimously offered to serve as second in command under Lord Gough. He manifested all his old courage and skill, and at the peace, for his services in the campaign, he was created Viscount Hardinge of Lahore, and of King's Newton in Derbyshire, with a Government pension of £3000 for three lives; while the East India Company voted him an annuity of £5000. He returned to England in 1848, and in 1852 succeeded the duke of Wellington as commander-in-chief of the British army. While in this position he had the home management of the Crimean War, which he endeavoured to conduct on Wellington's principles—a system not altogether suited to the changed mode of warfare. In 1855 he was promoted to the rank of field-marshal. Viscount Hardinge resigned his office of commander-in-chief in July 1856 owing to failing health, and died on September 24th of the same year at his house near Tunbridge Wells.

HARDOI, a British district of Oudh, India, under the jurisdiction of the lieutenant-governor of the North-Western Provinces, lying between 26° 53′ and 27° 47′ N. lat., and between 79° 44′ and 80° 52′ E. long., with an area in 1878 of 2285·64 square miles. The district is an irregular parallelogram between the Gumti and Ganges; its greatest length from north-west to south-east is 78 miles; and the average breadth is 46 miles. It is bounded on the N. by Shahjahanpur and Kheri; E. by Sitapur, the Gumti forming the boundary line; S. by Lucknow and Unao; and W. by Farukhabad, the Ganges marking the boundary. It is a level district watered by the Ganges, Rámganga, Garra, Sukheta, Sai, Baita, and Gumti,—the three rivers first named being navigable by boats of 500 *maunds*, or about 17 tons burden. Towards the Ganges, the land is uneven, and often rises into hillocks of sand cultivated at the base, and their slopes covered with lofty *munj* grass. The soil of Hardoi is lighter than that of perhaps any other district of Oudh, 27 per cent. being sand, 56 per cent. loam, and 17 per cent. clay. Several large *jhils* or lakes are scattered throughout the district, the largest being that of Sandi, which is 3 miles long by from 1 to 2 miles broad. These *jhils* are largely used for irrigation, 126,000 acres being watered from them. Large tracts of forest jungle still exist. Leopards, black buck, spotted deer, and *nilgai* are common; the mallard, teal, grey duck, common goose, and all kinds of waterfowl abound.

The inhabitants of Hardoi district in 1869 numbered 931,317, of whom 500,994 were males and 430,323 females (Hindus, 845,093; Mahometans, 85,824; Christians, 48; "others," 352). The nine largest towns are,—Shahabad, 18,254 inhabitants; Sandila, 15,511; Bilgram, 11,534; Mallanwan, 11,670; Sandi, 11,123; Pihani, 7582; Hardoi (the administrative headquarters of the district), 7156; Gopamau, 5942; and Pali, 5122. The principal religious fairs are the following:—At Bilgram, in September, on the occasion of the *Ram Lila* festival, lasting ten days and attended by about 40,000 persons; at Hatia Haran, during the whole month of Bhadra (August and September), attended by 100,000 persons; at Barsuia, in April and November, the [illegible] festival, lasting for only a single day on each occasion, and attended by from 15,000 to 20,000 persons. These, together with several other smaller fairs, are held for religious purposes, and have no commercial importance. Rice, wheat, and other food-grains form the great staples of agriculture. The area under crops is 844,500 acres or 1319 square miles, being more than one half the entire area. The Oudh and Rohilkhand Railway from Lucknow to Shahjahanpur runs through Hardoi for a distance of 62 miles. There are also 329 miles of raised and bridged roads, and 73 miles of minor roads, intersecting the district. The principal imports are cotton, salt, country cloth, and European piece goods; the chief exports,—food-grains, sugar, tobacco, horned cattle, and hides. The value of the imports in 1875 was £102,862; of the exports, £92,977. The gross revenue of the district in 1875 amounted to £170,952, the expenditure to £18,475. The regular police (1873) consisted of 456 officers and men, costing £6610. The number of schools in 1875 was 112, with 3877 pupils. The average rainfall for the ten years ending 1872 was 32 inches. Malarious fevers, epidemic cholera, and smallpox prevail.

History.—The first authentic records of Hardoi are connected with the Mussulman colonization. Bawan was occupied by Sayyid Salar Masaud in 1028, but the permanent Moslem occupation did not commence till 1217. Owing to the situation of the district, Hardoi formed the scene of many sanguinary battles between the rival Afghan and Mughal empires. Between Bilgram and Sandi was fought the great battle between Humayun and Sher Shah, in which the former was utterly defeated. Hardoi, along with the rest of Oudh, became British territory under Lord Dalhousie's proclamation of February 1856.

HARDOUIN, JEAN, was a classical scholar of the 17th century, at once singularly learned and learnedly singular. He was born at Quimper in Brittany in 1646, and died at Paris in 1727. Having acquired a taste for literature in his father's book-shop, he sought and obtained about his sixteenth year admission into the learned society of the Jesuits. In Paris, where he went to study theology, he ultimately became librarian of the College Louis le Grand. The life of laborious authorship inaugurated by his edition of Themistius (Paris, 1684), which included no less than thirteen new orations, was continued with wonderful perseverance and success. At the advice of Garnier he undertook to edit the *Natural History* of Pliny for the Delphin series, and five years saw the completion of a task which, in the opinion of Huet, would have taken any ordinary scholar fifty years. His attention having been turned to numismatics as auxiliary to his great editorial labours, he published several learned works in that department, marred, however, as almost everything he did was marred, by a determination to be at all hazards different from other interpreters. It is sufficient to mention his *Nummi antiqui populorum et urbium illustrati* (Paris, 1684), *Antirrheticus de nummis antiquis coloniarum et municipiorum* (Paris, 1689), and *Chronologia Vet. Test. ad vulgatam versionem exacta et nummis illustrata* (Paris, 1696). By the ecclesiastical authorities Hardouin was appointed to supervise the *Conciliorum collectio regia maxima* (Greek and Latin, Paris, 1715, 12 vols.); but he was accused of suppressing important documents and foisting in apocryphal matter, and by order of the parliament of Paris the publication of the work was delayed till some of its deficiencies were remedied. It is, however, as the originator of a variety of paradoxical theories that the learned father is now best remembered. The most remarkable, contained in his *Chronologie expliquée par les médailles* (Paris, 1696), was to the effect that, with the exception of the works of Homer, Herodotus, and Cicero, the *Natural History* of Pliny, the *Georgics* of Virgil, and the *Satires* and *Epistles* of Horace, all the ancient classics of Greece and Rome were spurious, having been manufactured by monks of the 13th century.

In 1733 Jean Louis de Lorme published at Amsterdam an edition of Harduin's *Opera Varia*, and though he made many corrections at the author's suggestion, he refused to admit the wholesale cancelling of the passages condemned by the Jesuits. Details in regard to Harduin's labours, controversies, and whimsies may be found in Bayle and Moreri; in Lacombe, *Dict. des portraits historiques*; Lambert, *Hist. litt. du règne de Louis XIV.*; Dupin, *Bibliothèque des auteurs ecclésiastiques*; Levot, *Biographie bretonne* (Vannes, 1852-57); and, more particularly, Augustin and Alois de Backer, *Bibliothèque des Écrivains de la Comp. de Jésus* (Liege, 1853).

HARDT, Hermann von der (1660–1746), Orientalist, descended from an old Dutch family, was born at Melle, in Westphalia, on 15th November 1660. His father, who was treasurer of the county of Tecklenburg, appreciating his son's abilities, gave him a good education at Osnabruck, and sent him afterwards to Jena and Leipsic. Young Hardt, gifted with a quick disposition and a powerful memory, soon gained renown for his fluency in carrying on learned discussions in Latin; but the study of the Oriental languages diverted him from all other pursuits, and in no long time he made himself master of Hebrew, Syriac, and Chaldee. The duke of Brunswick, hearing of Hardt's fame, appointed him his librarian shortly after the Orientalist had founded at Leipsic a philobiblical society, with the object of determining the sacred text. In 1690 Hardt was called to the chair of Oriental languages at Helmstadt; and his late master was prevailed upon to present to that university his valuable library, of which Hardt was again appointed to take charge in 1702. Seven years later he was named rector of the gymnasium of Marienberg, a post which he held till his death on 28th of February 1746.

Among his numerous writings, the following deserve mention:—*Autographa Lutheri aliorumque celebrium Virorum, ab anno* 1517 *ad annum* 1546, *Reformationis Ætatem et Historiam egregie illustrantia*, 1690-91; *Magnum Œcumenicum Constantiense Concilium*, 1697; *Hebrææ linguæ Fundamenta*, 1694; *Syriacæ linguæ Fundamenta*, 1694; *Elementa Chaldaica*, 1693; *Historia litteraria Reformationis*, 1717; *Ænigmata prisci orbis*, 1723. The last is a collection of pieces previously published separately, all of which had been condemned by the church. This republication was ordered to be suppressed. Hardt left a *History of the Reformation* in manuscript, which is preserved in the Helmstadt Juleum.

HARDWÁR, or Hurdwar, an ancient town of India and place of pilgrimage, in Sahāranpur district, North-Western Provinces, situated on the right bank of the Ganges at the foot of the Siwálik Hills, in 29° 57′ 30″ N. lat., 78° 12′ 52″ E. long. Population (1872), 4800. The town is of great antiquity, and has borne many names. It was originally known as Kapila from the sage Kapila. Hwen Thsang, the Chinese Buddhist pilgrim, in the 7th century A.D. visited a city which he calls Mo-yu-lo, the remains of which still exist at Máyapur, a little to the south of the modern town. Among the ruins are a fort and three temples, decorated with broken stone sculptures. The great object of attraction at present is the Hari-ke-charan, or bathing *ghát*, with the adjoining temple of Gangadwára. The *charan*, or foot-mark of Vishnu, is imprinted on a stone let into the upper wall of the *ghát*, and forms an object of special reverence. A great assemblage of people takes place annually, and every twelfth year a feast of peculiar sanctity occurs, known as a *Kumbh-mela*. The ordinary number of pilgrims at the annual fair amounts to 100,000, and at the *Kumbh-mela* to 300,000. The Hardwár meeting also possesses considerable mercantile importance, being one of the principal horse fairs in Upper India. Commodities of all kinds, Indian and European, find a ready sale, and the trade in grain and food-stuffs forms a lucrative traffic. The Ganges canal draws its supply of water from a branch channel close to the town. Hardwár is a police station, with post and telegraph offices.

HARDY, Alexandre (1560–1631), the most fertile of all dramatic authors, next to Lope de Vega and Calderon, merits a place in dramatic literature on that account alone. He is said to have written upwards of six hundred plays, of which forty-one were printed in his own edition of 1624–28, and may still be read. It cannot be charged upon modern writers that they are slow to see merit in early French authors, but it has been found impossible by any to admire the hasty works of a man who wrote a tragedy in eight days, and did not scruple to borrow situations from any quarter where he could find them. He at first followed a strolling company as its author, and ended by becoming the dramatist of the Théâtre du Marais. He knew how to make the most of his situations; he, evidently by constant practice, became a master of stage business and stage effects; he knew the kind of dialogue—coarse and rough—which would please his audience; his art, compared with that of Molière, his successor, is the art of a carpenter compared with that of a sculptor. To the student of the drama Hardy will always be an interesting figure, appearing as he does between the degraded morality and the modern comedy, an imitator alike of Italian pastoral and Spanish tragedy. He had no sympathy with the classical pretensions of Jodelle; he gave little heed to art; he thought entirely of what would succeed for the moment. One piece alone of Hardy's has succeeded in arresting the attention of critics, the tragedy of *Mariamne*. Hardy lived long enough to witness the first successes of Corneille.

HARDYNG, or Harding, John, an English rhyming chronicler of the 15th century, was born in 1378. Having been admitted at the age of twelve to the household of Henry Hotspur, son of the earl of Northumberland, he was afterwards present with his patron at the battles of Homildon (1402) and Cokelawe, and saw him fall in the fatal field of Shrewsbury (1402). He next entered the service of Sir Robert Umfraville, and held for some time the post of constable of the castle of Warkworth. In the beginning of the reign of King Henry V. he was commissioned to recover as many as possible of the deeds connected with the homage of the Scottish kings to the English crown: and we find him some time after presenting the results of his search to Henry at Bois de Vincennes. In recognition of his exertions he was promised the manor of Gedyngton in Northamptonshire (worth in the money of the time from £32 to £36), but the king dying before he obtained possession he was left, as he tells us, "without reward or lyfelode any wise." Beyond a stray notice in the Lansdowne MS. of his chronicle, to the effect that Hardyng was in 1424 at Rome consulting and transcribing the chronicle of Trogus Pompeius, there is little trace of his proceedings till 1434, when he received a safe conduct from James of Scotland, that he might bring with him "the thynges which we spake to you at Coldingham of, for which we binde us by this letters to pay you a thousand marks of English nobles." A contract preserved in the Exchequer bears that in 1457 he delivered to the earl of Shrewsbury the letters in which David and Robert of Scotland recognized the English supremacy, and a number of less important documents of similar tendency; and in the same year letters patent were issued granting him a pension of £20 per annum for life. The leisure of his old age appears to have been occupied with a revision of his chronicle, which he presented to Edward IV. It could not have been finished before 1465, but it only comes down to the flight of Henry VI. to Scotland. The purpose of the writer being "that Englishe men might have understanding of all affairs touching their own countree Even to his dayes from all antiquitee," he starts his narrative with Brutus the Trojan, and details the history of all the mythical kings. When he comes down to his own time a considerable part of the material is derived from his own experience. The Scottish portions are animated by strong national hostility: "unto the Scots he could never be friend."

The most important MSS. of Hardyng's Chronicle are the Lansdowne (204) and the Harleian (661) in the British Museum, the Bodleian (*Arch. Seld.*, B 10), and the Ashmolean. Richard Grafton printed two editions in January 1543, which differ in almost every page from each other. Grafton's abridgment was printed by Tottel in 1562, and again in 1564. Mr Ellis in 1812 edited the work from the Lansdowne MS., and prefixed a life of the author.

HARE, the common name of all the species, excepting the rabbit, of *Leporidæ*, a family of rodent mammals, distinguished from the rest of that order by the possession of four incisor teeth in the upper jaw, two in front, which are well developed and longitudinally grooved, and two exceedingly small ones behind. The molars are formed for the mastication of vegetable food, an uneven surface being produced by the presence of transverse enamel plates which are worn down more slowly than the intermediate dentine. The teeth are without permanent roots, and thus the constant waste at the surface is compensated for by continuous growth at the opposite extremity. Hares all possess long ears, and in most species the hind legs are much longer than those in front. They are without exception timid, defenceless animals, although during the breeding season two males have been known to fight together for possession of the female until one was killed; while all the species are protectively coloured. They form a single genus (*Lepus*), containing from thirty-five to forty species according as certain forms are regarded as distinct species, or merely as geographical varieties. They occur in all the great zoological regions of the world, but are especially characteristic of the northern and temperate areas of both hemispheres.

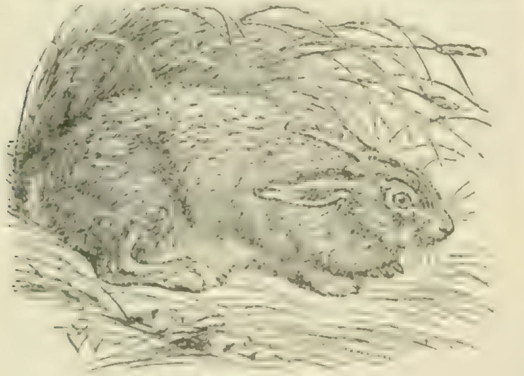


Fig. 1.—Common Hare.

The common hare (*Lepus timidus*, fig. 1) is a typical example of the family. The ears in this species are longer than the head, and its hind legs are so long in comparison with those in front, that it is only by descending a hill diagonally that it can avoid overbalancing itself. It is found in all parts of Europe except the north of Russia, the Scandinavian peninsula, and Ireland, and is specially abundant in those countries in which it enjoys the protection of game laws. Its fur is usually of a tawny grey colour above and white beneath, with the upper surface of the short tail and the tips of the ears black. The colour of the fur, however, differs considerably in different latitudes and at different seasons of the year, showing, for example, a tendency to become white during winter in northern countries, while assuming a reddish-yellow hue in the more genial climate of southern Europe. On the strength mainly of such outward differences various species have been described, but these have been found to be so linked together by intermediate forms as to satisfy most naturalists that they are merely climatal varieties of one species. The hare is a night-feeding animal, remaining during the day on its "form," as the slight depression is called which it makes in the open field, usually among grass. This it leaves at nightfall to seek the fields of young wheat and other cereals whose tender herbage forms its favourite food. It is also fond of gnawing the bark of young trees, and thus often does great damage to plantations. In the morning it returns to its form, where it finds considerable protection in the close approach which the colour of its fur makes to that of its surroundings; should it thus fail, however, to elude observation it depends for safety on its extraordinary fleetness. On the first alarm of danger it is said to sit erect and to reconnoitre, when it either seeks concealment by clapping close to the ground, or takes to instant flight. In the latter case its great speed, and the cunning endeavours it makes to outwit its canine pursuers, form the chief attractions of coursing. The hare takes readily to the water, where it swims well; and Yarrell records an instance in which one was observed crossing an arm of the sea about a mile in width. Hares are remarkably prolific. They pair when scarcely a year old, and the female brings forth several broods in the year, each consisting of from two to five leverets (from the French *lièvre*), as the young are called. These have their sight at birth, and after being suckled for a month they are able to look after themselves. In Europe this species has never been known to breed in confinement. The hare was well known to the ancient Greeks and Romans.

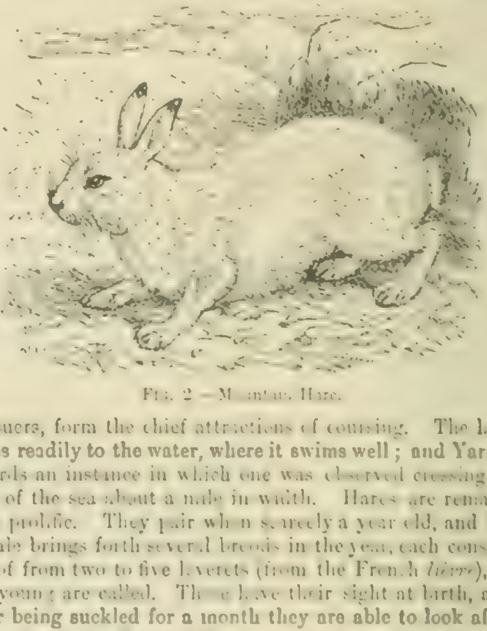


Fig. 2.—Mountain Hare.

In those parts where the common hare does not occur, its place is taken by the varying or mountain hare (*Lepus variabilis*, fig. 2). It is found throughout the entire northern portion of the great Palæarctic region, from Ireland eastward to Japan, while it also occurs on the Pyrenees, the Alps, the highlands of Bavaria and the Caucasus, although altogether absent in the less elevated regions which connect those mountain ranges. Its presence in such isolated situations in company with many truly arctic plants is regarded as one of the many proofs of a former glacial epoch, during which boreal plants and animals were spread all over southern and central Europe. On the advent, however, of milder climatic conditions, this northern flora and fauna retreated towards the Arctic circle, leaving a few species, such as the varying hare, is found on the various mountain ranges, where by ascending to a sufficient altitude the necessary boreal conditions could be obtained. The mountain hare differs from the preceding species in its ears being shorter than its head, and in its fur becoming in most cases white in winter,—a change of colour which renders it almost invisible in the snow. Along the southern limit of its range, or in districts where the temperature is from any cause exceptionally mild, this change of colour either does not take place at all, as in Ireland, or is only partial, as in many parts of Scotland. In this respect it resembles the ermine, which it further resembles in having a part of its fur always remaining black; in the hare, however, it is the tips of the ears, and not the point of the tail, which thus remain unaltered. In Scotland, where it is known as the "blue hare," it occurs plentifully throughout the hilly regions north of the Forth, whence it descends to the low grounds in winter, while in Ireland it is the only hare found. Owing to the mildness of the climate, however, in the "Green Isle," the colour of the fur undergoes little or no alteration in winter, and on this account it was until recently regarded by many as a distinct species (*Lepus hibernicus*). Throughout the Arctic regions of North America a closely allied species, the polar hare (*Lepus glacialis*), occurs. Naturalists have hitherto had considerable difficulty in distinguishing this from the preceding species, the chief difference being in the colour of the fur, which in the Polar hare is white all the year round, with the exception of the tips of the ears. Considerable light has, however, been thrown on this point by the observations of the naturalists attached to the late Arctic Expedition under Sir George Nares, who found this species inhabiting the shores of Grinnell Land, and obtained evidence in foot prints on the snow of its existence in latitude 83° 10′, about 20 miles north of the nearest land. Unlike all other hares, and resembling in this respect the rabbit, the polar hare would seem to occupy a burrow—"a hole," says Captain Feilden, "4 feet in length, scraped horizontally into a snow drift." "I have no doubt," he continues, "the same burrow is regularly occupied, as this one was discoloured by the feet of the animal, and a quantity of hair was sticking to the sides." Another point of importance in establishing the specific distinctness of this species from the former lies in the difference in the number of young composing a brood in each of these species. The number of young found in gravid females by the naturalists already referred to varied from seven to eight, while in the varying hare of Europe the number does not exceed five. According to Captain Lyon, the polar hare is by no means a shy animal, as during his cruise in the Arctic seas hares were in the habit of coming out on the ice to his ships to feed on the tea leaves which were thrown overboard. This species has thus been found inhabiting the highest northern lands yet visited by man, where it also attains its normal weight of from 8 to 10 lb., subsisting on the stoneworts and other hardy plants which form the scanty vegetation of circumpolar valleys. The American varying hare (*Lepus americanus*) is one of the most widely distributed species of this family, extending, in one or other of its four geographical varieties, from the borders of the Arctic barren grounds southwards to New Mexico. It differs from the mountain hare of Europe in its smaller size and relatively smaller ears, but resembles it in the change of colour in the fur, especially of the northern varieties, during winter. It is exceedingly abundant on the banks of the Mackenzie River, where it is killed in great numbers by the Hare Indians. A favourite device among the Indians for catching it, according to Darwin, is to walk spirally round and round it, when on its form, especially at midday when the shadow of the hunter is shortest. It has still more implacable enemies, however, in the wolves, gluttons, and lynxes of those regions, of the last of which it is said to form the principal food. The fur of this species is imported into Great Britain, but it is of little value. In the swampy district of the south eastern portion of the United States, the swamp hare (*Lepus aquaticus*) and the marsh hare (*Lepus palustris*) occur. These take readily to the water, and are said to dive for some distance, their legs being less thickly clothed with hair than are those of the less amphibious species. They feed chiefly on aquatic plants. Only one species of hare (*Lepus brasiliensis*) occurs in South America. It is found throughout Brazil, and on various parts of the Andes in Bolivia and Peru. Fossil remains of several species of *Leporidæ* have been found in the Post Glacial deposits and the bone-caves of Europe, while the remains of many extinct species have been lately discovered in the Miocene deposits of Dakota and Colorado. (J. GI.)

HARE, JULIUS CHARLES (1795-1855), theological writer, was born at Valdagno, near Vicenza, in Italy, on the 13th of September 1795. He came to England with his parents in 1798, but in 1804-5 spent a winter with them at Weimar, where he met Goethe and Schiller, and received a bias to German literature which influenced his style and sentiments throughout his whole career. On the death of his mother in 1806, Julius was sent home to the Charterhouse in London, where he remained till 1812, when he entered Trinity College, Cambridge. There he became fellow in 1818, and after some time spent abroad he began to read law in London in the following year. In 1822 he was appointed assistant-tutor at Trinity College, which position he retained for ten years. Turning his attention from law to divinity, Hare took priest's orders in 1826; and, on the death of his uncle in 1832, he succeeded to the rich family living of Hurstmonceaux in Sussex, where he accumulated a library of some 12,000 volumes, especially rich in German literature. Before taking up residence on his parish he once more went abroad, and made in Rome the acquaintance of the Chevalier Bunsen, who afterwards dedicated to him part of his work, *Hippolytus and his Age*. In 1840 Hare was appointed archdeacon of Lewes, and in the same year preached a course of sermons at Cambridge (*The Victory of Faith*), followed in 1846 by a second, *The Mission of the Comforter*. Neither series when published attained any great popularity. Archdeacon Hare married in 1844. In 1851 he was collated to a prebend in Chichester; and in 1853 he became one of the queen's chaplains. He died January 23, 1855.

Julius Hare belonged to what has been called the "Broad Church party," though some of his opinions approach very closely to those of the Evangelical Arminian school, while others again seem vague and undecided. He was one of the first of his countrymen to recognize and come under the influence of German thought and speculation, and, amidst an exaggerated alarm of German heresy, did much to vindicate the authority of the sounder German critics. His writings, which are chiefly theological and controversial, are largely formed of charges to his clergy, and sermons on different topics; but, though valuable and full of thought, they lose some of their force by the cumbrous German structure of the sentences, and by certain orthographical peculiarities in which the author indulged. In 1827 *Guesses at Truth by Two Brothers*[1] appeared. Hare assisted Thirlwall, afterwards bishop of St David's, in the translation of the 1st and 2d volumes of Niebuhr's *History of Rome* (1828 and 1832), and published a *Vindication of Niebuhr's History* in 1829. He wrote many similar works, among which is a *Vindication of Luther against his recent English Assailants*, 1854. In 1848 he edited the *Remains of John Sterling*, who had formerly been his curate. Carlyle's *Life of John Sterling* was written through dissatisfaction with the "Life" prefixed to Archdeacon Hare's book. *Memorials of a Quiet Life*, published in 1872, contain accounts of the Hare family.

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[1] Julius Hare's co-worker in this book was his brother Augustus William Hare (1792-1834), who, after a distinguished career at Oxford, was appointed rector of Alton Barnes, Wiltshire. He died prematurely at Rome in 1834. He was the author of *Sermons to a Country Congregation*, published in 1837.

HAREBELL, or, as the name is often written, HAIRBELL, known also as the Blue-bell of Scotland, and Witches' Thimbles, a well-known perennial wild flower, *Campanula rotundifolia*, L., a member of the natural order *Campanulaceæ*. The harebell has a very slender slightly creeping rootstock, and a wiry, erect stem. The radical leaves, to which the specific name refers, have long stalks, and are roundish or cordate, crenate or serrate; the lower stem leaves are ovate or lanceolate, and the upper ones linear, subsessile, acute and entire, rarely pubescent. The flowers are slightly drooping, arranged in a panicle, or in small specimens single, having the calyx-tube glabrous, with subulate and erect segments, the corolla campanulate, with slightly recurved segments, and the capsule nodding, and opening by pores at the base of the calyx-tube. There are two varieties:—(*a*) *genuina*, with slender stem leaves, and (*b*) *montana*, in which the lower stem-leaves are elliptical-oblanceolate. The plant is found on heaths and pastures throughout Great Britain and North America, and flowers in late summer and autumn. The harebell has ever been a great favourite with poets, and on account of its delicate blue colour has been considered as an emblem of purity.

Harebell (*Campanula rotundifolia*).

HAREM, or less frequently HARAM, the recognized European title for that portion of a polygamist's house which is devoted to the exclusive occupancy of his wives and their attendants, or, by a simple metonymy, for the female portion of his household. The word *harem* is Arabic for anything forbidden or not to be touched. It is generally applied in Moslem law to such things as games of chance, draughts, chess, witchcraft, and portrait-taking, which are inconsistent with the religious code, and under the form of haram it is well known even to Europeans as designating the sacred enclosure of the principal mosque at Cairo and at Jerusalem (*Haram esch-Scherif*). The word seraglio, which is not unfrequently employed as equivalent to harem, is an Italian modification (usually spelled *serraglio* from assimilation to serrare, to shut in) of the Persian term *serai*, which simply means a palace or large building, as in the familiar compound caravanserai. Wherever polygamy is maintained in the midst of a developed social life, the harem appears to be an almost inevitable institution. We consequently find it after a more or less rigid type among the Jews, the Babylonians, the Siamese, the ancient Persians, the Peruvians, &c. But it is among the modern Mahometan peoples that it has attained its most perfect development; and the harems of the sultan of Turkey and the shah of Persia may be taken as the most elaborate and best known specimens of the type.

According to the Koran, the Musulman is required to satisfy himself with four wives, but the sultan may possess as many as seven. Each of these has her own suite of apartments, her own garden and bath-room, and her own body of servants, male and female. They are not called by their names, but distinguished as *Kadin* (or Lady) Number One, Kadin Number Two, and so on. The title of sultana is bestowed only on the mother, the sister, or the daughter of a sultan; and consequently it is the kadin who first gives birth to an heir to the empire who alone can have this distinction. She further obtains the title of *hasseky* or *kasseki*, but this is lost if the child dies. All the female slaves, or as they are called odalisks (a European corruption of the word odalik, from *oda* a chamber, and *lik* belonging to), are at the absolute disposal of the sultan, and if, in spite of the natural endeavours of the kadins to prevent such a contingency, one of them becomes the mother of her lord and master's first-born, she is advanced to the rank of sultana hasseky. It is contrary to etiquette for the sultan to select his own favourites among the odalisks; he is expected to accept the choice made for him by his mother, who bears the title of validé, and exercises great influence not only in the affairs of the harem but even in political matters. Every odalisk who has been promoted to the royal couch is henceforth considered sacred from all meaner patronage, and receives apartments and attendants of her own; but she has no further claim to the sultan's attention, and may have to console a life-long widowhood with the memory of the honour which was once bestowed on her. The ranks of the odalisks are ever and anon recruited by slaves presented to the sultan by his female relatives or the state officials. The latter, for example, are accustomed to make acknowledgment of their allegiance in this way every year on the evening before the 15th of Ramazan. An old and devoted favourite of the sultan occupies the post of *kehaya chatun*, or lady-superintendent of the harem. A large body of eunuchs, both black and white, are employed as guards and gate-keepers. The white eunuchs have charge of the outer gates of the seraglio, but they are not allowed to approach the women's apartments, and obtain no posts of distinction. Their chief, however, the *kapou aghassi*, or master of the gates, has part control over the ecclesiastical possessions, and even the vizier cannot enter the royal apartments without his permission. The black eunuchs have the right of entering the gardens and chambers of the harem. Their chief, usually called the *kislaer aghassi*, or master of the maidens, though his true title is *darus seadet aga*, or chief of the abode of felicity, is an official of high importance. His appointment is for life. If he is deprived of his post he receives his freedom; and if he resigns of his own accord he is generally sent to Egypt with a pension of 100 francs a day. His secretary keeps count of the revenues of the mosques built by the sultans. He is usually succeeded by the second eunuch, who bears the title of treasurer or khaznah-dar, and has charge of the jewels, &c., of the women. The number of eunuchs is always a large one. The sultana validé and the sultana hasseky have each fifty at their service, and others are assigned to the kadins and the favourite odalisks.

Further details on the Sultan's harem will be found in an anonymous paper in the *[illegible]* (London, 18[illegible]), in the elaborate article by Hoffmann in Ersch and Gruber's *Encyclopädie*, and the *Serraglio del gran signore descritto* (Venice, 1865) by Ottaviano Bon, Venetian ambassador in 16[illegible]. An account of a visit to the harem of the Persian prince Malek Kasim Mirza was given by M. Flandin in the *Revue des Deux Mondes* (1852), and at the time created a great sensation in Persia. Sketches of harem interiors are common in our popular literature from Lady Mary Wortley Montague's *Letters* and Lemprière's *Tour to Morocco* (1793) down to Mrs S. Harvey's *Turkish Harems and Circassian Homes* (Lond., 1871). The Count de Beauvoir gives a picture of the harems of the sultan of Java and the Siamese mandarins in his *Voyage round the World* (Lond., 1870). Much interesting information on harem life in general is supplied by Dr Hantzsche (who as a physician was [illegible] admissible to the harem) in *Zeitschrift für allgemeine Erdkunde* (Berlin, 1864).

HARFLEUR, the Harflew of our older historians, a maritime town of France in the department of Seine Inférieure and arrondissement of Havre, about 6 miles E. of Havre on the railway between that city and Rouen. It lies in the fertile valley of the Lézarde, at the foot of wooded hills not far from the northern bank of the

Seine; and the steeple of St Martin's, 280 feet high, forms an excellent landmark for the pilots of the river. Its old ramparts are now replaced by bleach-works, chemical factories, and other industrial establishments, and the fosses are transformed into vegetable gardens. St Martin's is the most remarkable building in the town, and ranks as an "historical monument." It dates from the 15th and 16th centuries, but the great portal is the work of the 17th, and the whole has undergone the process of modern restoration. Of the old castle there are but insignificant ruins, and the present castle, situated in a fine park to the northward, is a building of the 18th century. The hôtel de ville belongs to the 16th. In 1872 the population was only 1966, and though for its size Harfleur is still a busy place with its fishers and traders, it has greatly fallen from its ancient importance.

In the Middle Ages, when its name, Herosfleth, Harofluet, or Harefleu, was still sufficiently uncorrupted to indicate its Norman origin, it was the principal seaport of north-western France. In 1415 it was captured by Henry V. of England, but when in 1435 the people of the district of Caux rose against the English, 104 of the inhabitants opened the gates of the town to the insurgents, and thus got rid of the foreign yoke. The memory of the deed was long perpetuated by the bells of St Martin's tolling 104 strokes. Between 1440 and 1449 the English were again in possession; but the town was recovered for the French by Dunois. In 1562 the Huguenots put Harfleur to pillage, and its registers and charters perished in the confusion; but its privileges were restored by Charles IX. in 1568, and it was not till 1710 that it was subjected to the "taille." By common consent Harfleur is now identified with the Caracotinum of the *Itinerary* of Antoninus,—M. Fallue's explorations since 1839 having proved conclusively that the neighbourhood is rich in Roman remains.

See Le Moine, *Antiquitez de la ville de Harfleur*, Havre de Grâce, 1677; [illegible] *Harfleur*, 1841; M. Fallue's papers in *Archives de* [illegible] 1839, *Mém. de la Soc. des Antiquaires de la Normandie*, and *Revue Archéologique*, [illegible]; M. l'Abbé Cochet, *La Seine Inférieure*, Paris, 1864; E. [illegible], *Hist. de la ville de Harfleur*, 1868.

HARGREAVES, JAMES. See COTTON, vol. vi. p. 490.

HARIÁNÁ, or HURREEANAH, a tract of country in the Punjab, India, consisting of a level upland plain, interspersed with patches of sandy soil, and largely overgrown with brushwood. The Western Jumna Canal now fertilizes the grounds of a large number of its villages. Since the 14th century Hissar has been the local capital. During the troublous period which followed on the decline of the Mughal empire, Hariáná formed the battlefield where the Marhattas, Bhattis, and Sikhs met to settle their territorial quarrels. The whole surrounding country was devastated by the famine of 1783. Since the conquest of the Punjab, Hariáná has been broken up into the districts of Hissar, Rohtak, and Sirsa.

HARING, WILHELM (1797–1871), German novelist, known as Wilibald Alexis, was born at Breslau, June 23, 1797. He attended the Werder gymnasium in Berlin, and served as a volunteer in the campaign of 1815. On his return he studied law for some time at the universities of Berlin and Breslau, but he soon gave up the legal profession and devoted himself to literature. He made some attempt to add to his income by practical undertakings, but they were rarely successful. He was fond of travel, and happened to be in Italy with his wife during the Revolution of 1848, the progress of which he had an opportunity of watching in Rome, Florence, and Naples. In 1852 he transferred his residence from Berlin to Arnstadt in Thuringia. Here he was laid low by paralysis of the brain, and after many years of suffering died on the 16th September 1871. Haring began his literary career in 1823 with a historical romance, *Walladmor*, which was given out as the work of Sir Walter Scott.[1] It rapidly became popular, and was translated into several languages, including English. He next published *Schloss Avalon*, which he attributed to the same author. Soon afterwards he issued a number of very successful short stories and several books of travel, and for a time he indicated a preference for the polemical tendencies of the school of Young Germany. In *Cabanis*, however, which appeared in 1832, he entered the special field of historical romance in which he was destined to achieve his highest fame. From 1840 onwards he published at short intervals a series of romances, each of which deals with some particular epoch in the history of Brandenburg. Among them may be named *Der Roland von Berlin* (1840), *Der falsche Waldemar* (1842), *Der Werwolf* (1848), *Ruhe ist die erste Bürgerpflicht* (1852), *Isegrimm* (1854), and *Dorothe* (1856). These tales are not only full of patriotic feeling, but in all of them the interest is well sustained and the characters are drawn with a bold and firm hand. His *Gesammelte Werke* have been issued in Berlin in 20 volumes.

HARINGTON, SIR JOHN (1561–1612), was the son of Mr John Harington, of Kelston, near Bath, who had been imprisoned in the Tower by Queen Mary for forwarding a letter to Elizabeth. Harington, born in 1561, was Elizabeth's godson. He studied at Eton and at Christ's College, Cambridge, where he took the degree of M.A., his tutor being Bishop Still, the famous author of *Gammer Gurton's Needle*. He came up to London about 1583 and studied law, but Queen Elizabeth seems to have removed him to a place at court. Tradition relates that it was at her command that he undertook the translation of Ariosto's *Orlando Furioso*, a work that saw the light in 1591 and was reprinted in 1607 and 1634. Soon after this first date Harington retired to the family mansion at Kelston. In 1596 he published in succession *The Metamorphosis of Ajax*, *An Apology*, and *Ulysses upon Ajax*, the three forming collectively a very absurd and indecorous work of a Pantagruelistic kind. In 1599 he served in Ireland under Essex, and was knighted on the field, to the annoyance, it is said, of Elizabeth. He married a lady of title, who bore him eight children, and who survived until 1634. In 1608 he wrote a personal satire against the bishops, which he read to James I., but which was first published, by a Presbyterian printer, as late as 1653, under the title of *A Brief View of the State of the Church*. This is a somewhat scandalous production. In the spring of 1612, Harington was suffering heavily from the dropsy, and in December of that year he died. In 1613 his *Epigrams* which had circulated widely in MS., were printed in a collection of the verse of various writers entitled *Alcilia*, and separately in 1615. They became very popular, and were often reprinted. The miscellaneous writings of Harington existing in MS. in his family were first collected by the Rev. Henry Harington in 1779, in 2 volumes, under the title of *Nugæ Antiquæ*. The *Nugæ* include some very elegant pieces of the poet's father.

The translation of the *Orlando Furioso* was a very important labour, and it was carried out with skill and perseverance. Harington, however, was neither a very exact scholar nor a very poetical translator, and he cannot be named in the same breath with Fairfax. The *Orlando Furioso* was a sumptuous book, illustrated in the best taste of the day, and to it were appended a prose critique of the poem, and a life of Ariosto compiled by Harington from various Italian sources. Harington's Rabelaisian pamphlets show that he was almost equally endowed with wit and indelicacy, while of his epigrams little can be said but that they are sometimes smart and always easy.

HARÍRÍ. Abu Mohammed al Kasim ibn 'Alí Ibn Mohammed ibn 'Othman, surnamed EL HARÍRÍ, was born at Bussorah 1054–55 A.D. and died in 1121 or 1123, being therefore contemporary with the first crusade. His native city was renowned for its school of grammar, a most important science amongst a people whose every rule of religion and of life depended upon the accurate interpretation of some word or passage of the Koran, or some saying of the prophet. The rival school of Kufa was the only one that approached it in fame or glory, and in all the numerous disputes that took place between the two academies Bussorah is generally allowed to have had the advantage. His name Harírí signifies silk-merchant, and was probably derived from his father's occupation, as, in spite of the assertion of his biographers to that effect, he appears not to have ever engaged in trade, but to have devoted himself exclusively to literary pursuits. His great object was to investigate the niceties of the Arabic language, and he composed several treatises on the subject, amongst which the best known are *Mulhat el 'Irab* (Beauties of Desinential Syntax) and *Durrat el Ghawwás* (The Diver's Pearl), in which he criticizes certain common faults of language in vogue amongst the educated. Portions of both these works have been published by De Sacy in his *Chrestomathie*, and the *Durrat el Ghawwás* has been edited by H. Thorbecke (Leipsic, 1871). But his great work is the *Makámát*, or "Assemblies," in which a series of anecdotes of a very slight character in the career of an imaginary learned vagabond afford the opportunity for the display of vast philological and literary learning. The plan was not original, having been already invented and used by Badí' az Zamán el Hamadani, who died about 1008. The composition of Harírí's own *Makámát* is attributed to the following circumstance. Being one day in the mosque of the Beni Haram, in the quarter of Bussorah in which he resided, he noticed an old man enter, shabby and worn with travel, who in answer to the questions of the persons present gave his name as Abu Zeid, and said that he came from Serúj, a city near Edessa, which had recently been devastated by the crusaders. The old man related the incidents of the destruction of his native city and his own domestic losses and exile in so eloquent a strain as to excite general admiration and compassion. On reaching his home Harírí wrote out the incident in the form of a makámeh or assembly, in the style of El Hamadani's work, and it now forms the 48th of his book. When subsequently elaborating the idea he modelled the successive chapters on the same theme; a simple-minded Arab gentleman, El Harith ibn el Hammám, on his travels constantly meets with a vagabond old improvisatore, Abu Zeid, who, under different characters and disguises, always succeeds in eliciting the sympathy and alms of his audience and the approbation of El Harith himself. Abu Zeid is always poor, ill-dressed, and crafty, but eloquent in the extreme, and his fraudulently-obtained gains are always spent in some forbidden enjoyment; yet there is ever a good side to his character, and he is not without an exhibition of true feeling, especially when he alludes to the circumstances of his expulsion from his home, and the loss of his daughter, who had been made captive by the marauding Franks. The improvised speeches of Abu Zeid are masterpieces of Arabic learning, every sentence being made to introduce some allusion to Arab history, poetry, or tradition, or the discussion and elucidation of some difficult point of rhetoric or grammar. It is this that gives the value to the book and makes it with its commentary a complete encyclopædia of classical Arabic literature and philology. It is written in rhymed and rhythmical prose, such as is used in the Koran itself, interspersed with verses of poetry of which the merit is more often in the language than the thought.

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[1] One of the interlocutors in the jocular "Introduction" to Scott's *Betrothed* (1825) supposes *Walladmor* "to have been the work of Dousterswivel, by the help of the steam-engine."

The *Makámát* has been edited by Silvestre de Sacy, with a select Arabic commentary (Paris, 1822), and a new edition of this edition, with additional French notes, was issued by MM. Reinaud and Derenbourg (Paris, 1847–53). An English translation of some twenty "Assemblies" was made by Theodore Preston for the Oriental Translation Fund (London, 1850), and an admirable translation of the first twenty-six assemblies by T. Chenery (London, 1867), containing an introduction and notes, and a resumé of all the literature of the subject. Of the numerous imitations of the *Makámát* of Harírí, the best known are the *Machbereth Ithiel*, a Hebrew work by Yehudah ben Shelomoh al Kharizi, edited by T. Chenery (London, 1872), and the *Majma 'al Bahrain* (Confluence of the Two Seas), by Nasyf el Yazeji (Beyrout, 1856), an excellent work in Arabic, displaying an immense acquaintance with the ancient literature of the language. (E. H. P.)

HARLEQUIN. See PANTOMIME.

HARLEY. See OXFORD, EARL OF.

HARLINGEN, or HAARLINGEN, in Frisian *Harns*, an important trading town and seaport in the province of Friesland in the Netherlands, is situated 17 miles W. of Leeuwarden with which it has been connected by rail since 1863. Besides its dilapidated fortifications, and the town-house, which was erected between 1730 and 1733 and is adorned with a statue of the historian Simon Stijl, the only noteworthy buildings are the Great or New church, the West church, which was formerly part of the castle, the Roman Catholic church, and the Jewish synagogue. The school of navigation and school of design may also be mentioned. Harlingen is the seat of the Frisian Navigation Company, and it has regular steam communication, not only with Amsterdam and Nieuwe Diep, but also with London and Hull. Besides an inner harbour protected from the high tides by powerful sluices, it has an outer harbour of modern construction for the accommodation of large vessels. One of the chief departments of its trade is the export to England of Frisian produce—corn, cattle, butter, cheese, and flax. Wharves, saw-mills, anchor forges, rope-yards, and a canvas factory represent the auxiliary industries of the place. In the middle of the last century, Harlingen had 7000 inhabitants, which increased in the course of the next hundred years to about 8000. In 1860, before the new harbour works, they numbered 9800, and in 1878 they were 10,800.

Originally Harlingen was only a part of the village of Almenum, and lay at some distance inland, but the Zuyder Zee, which had already in 1134 destroyed an intervening town, made another inroad in 1566 and attained its present limits. The Spanish lieutenant Caspar Robles de Billy, whose monument, the "Man of Stone," now stands on the sea-dyke, took care to protect the site of the town by further embankments. In 1579 it was surrounded by walls and fosses; a new castle had been built in 1502. During the civil broils of 1787 Harlingen was bombarded by the patriots of Franeker. In November 1775 and February 1825 it suffered from severe inundations.

HARMODIUS, a beautiful Athenian of the tribe Gephyræi, was the intimate friend of Aristogiton, a citizen of the middle rank. Hipparchus, younger brother of the tyrant Hippias, was also a lover of Harmodius. He tried to attract Harmodius to himself, and failing in the attempt, revenged himself by putting a public affront on his sister at a solemn festival. Thereupon the two friends conspired with a few others to murder both the tyrants during the armed procession at the Panathenaic festival (514 B.C.). But in a sudden alarm they prematurely attacked and slew Hipparchus alone. Harmodius was cut down on the spot by the guards, and Aristogiton was soon captured and tortured to death. When Hippias was expelled (510 B.C.), Harmodius and Aristogiton became the most popular of Athenian heroes; their statues were set up in the agora, their descendants were exempted from public burdens, and their names were celebrated in popular songs and scolia as the deliverers of fair Athens. Thucydides (vi. 54) alludes to the falseness of the popular belief about them, and gives the story in detail.

HARMONIA, wife of Cadmus. The Theban legends (see CADMUS) have been so modified and systematized by poets and logographers that we must look to Samothrace with its old religious rites for an explanation of the myth. There Harmonia is said to have been the daughter of Zeus and Electra, while her brother Iasion was the founder of the mystic rites which were celebrated annually on the island. When Cadmus came to Samothrace, and was initiated, he received Harmonia as his wife. The gods honoured the wedding with their presence, Athene presented the bride with a peplos and necklace, Electra gave the mystic rites of the mother of the gods. According to the scholiast on Euripides (*Phœn.*, 7) Cadmus with the aid of Athene carried off Harmonia; and in the mysteries the lost Harmonia is regularly sought for. We have here an exact parallel to the Eleusinian legends. Electra and Harmonia are mere varieties of Demeter and Core. Cadmus like Pluto carries off the bright daughter of the goddess to the world below to spend there the dreary winter. Hence in the Theban tale Cadmus and Harmonia leave Thebes to go away among the Encheleis, the snake people, are themselves changed into serpents, and are finally translated to the Elysian fields. We then understand, too, why (according to Pausanias, ix. 16, 5) Cadmus dwelt at Thebes in the temple of Demeter Thesmophoros. The necklace, wrought by Hephæstus, which Harmonia received as a marriage gift, may be compared with the cestus of Aphrodite; for it is impossible to draw a fast line between Harmonia or Core and Aphrodite. Then it is seen to be the mythic representative of some phenomenon like the halo of dawn or the rainbow. Like the works of the German dwarfs, this necklace carried with it ill-luck, and the legends give it a history of woe. With it Polynices bribed Eriphyle to betray her husband Amphiaraus. It brought death at last to her son Alcmæon. Dedicated in the temple of Athene Pronoia at Delphi, it was given by the tyrant Phayllus (352 B.C.) to his mistress; her son going mad set fire to the house, and she perished in the conflagration.

HARMONICA is the technical name for the "musical glasses," with the learned conversation about which the fine ladies from town astonish the simple-minded vicar of Wakefield. An instrument for producing musical sounds by means of drinking glasses touched with the moistened fingers was, however, known 100 years before Goldsmith's novel. What its exact nature may have been cannot now be ascertained, but its mode of playing must have been far from perfect; for as late as the middle of the 18th century the musical glasses played by Mr Puckeridge were placed on a table and their pitch was fixed by the quantity of water they contained, naturally a very uncertain mode of determination. It was to this instrument that the great Benjamin Franklin applied his improvements described in his letter to Father Beccaria of Turin. Instead of fixing the glasses he made them rotate round a spindle set in motion by the player's foot by means of a treadle. The edge of the glasses by the same means passed through a basin of water, the pitch henceforth being determined by the size of the glasses alone. The player touched the brims of the revolving glasses with his finger, his task being further facilitated by the scale of colour which Franklin adopted in accordance with the musical gamut. Thus C was red, D orange, E yellow, F green, G blue, A indigo, and B violet. The black keys of the piano were represented by white glasses. The instrument thus improved became very fashionable in England, and a Miss Davis, a relation of Franklin's, became a celebrated harmonica player, who performed at numerous concerts with great applause. It is interesting to know that the great composer Gluck was a virtuoso on the musical glasses in their earlier form, which he played, according to a contemporary advertisement, at the Haymarket Theatre, April 23, 1746. He even seems to have claimed the instrument as his own invention, and promises to "perform upon it whatever may be done on a violin or harpsichord." Nowadays the idea of a composer of repute—for such Gluck was at the time—playing on the musical glasses would appear grotesque. But the notions of artistic dignity were different in the 18th century. Many attempts have been made to increase the power and flexibility of the harmonica, and also to avoid the nervous irritability said to be caused by the friction of the vibrating glasses. Thus harmonicas played with the bow or by means of a keyboard, like that of the pianoforte, have been invented. But none of these has met with permanent success, and in all essential points the modern harmonica is such as Franklin left it.

HARMONIC ANALYSIS is the name given by Sir William Thomson and Professor Tait in their treatise on *Natural Philosophy* to a general method of investigating physical questions, the earliest applications of which seem to have been suggested by the study of the vibrations of strings and the analysis of these vibrations into their fundamental tone and its harmonics or overtones.

The motion of a uniform stretched string fixed at both ends is a periodic motion; that is to say, after a certain interval of time, called the fundamental period of the motion, the form of the string and the velocity of every part of it are the same as before, provided that the energy of the motion has not been sensibly dissipated during the period.

There are two distinct methods of investigating the motion of a uniform stretched string. One of these may be called the wave method, and the other the harmonic method. The wave method is founded on the theorem that in a stretched string of infinite length a wave of any form may be propagated in either direction with a certain velocity, V, which we may define as the "velocity of propagation." If a wave of any form travelling in the positive direction meets another travelling in the opposite direction, the form of which is such that the lines joining corresponding points of the two waves are all bisected in a fixed point in the line of the string, then the point of the string corresponding to this point will remain fixed, while the two waves pass it in opposite directions. If we now suppose that the form of the waves travelling in the positive direction is periodic, that is to say, that after the wave has travelled forward a distance l, the position of every particle of the string is the same as it was at first, then l is called the wave-length, and the time of travelling a wave-length is called the periodic time, which we shall denote by T, so that

$$l = VT.$$

If we now suppose a set of waves similar to these, but reversed in position, to be travelling in the opposite direction, there will be a series of points, distant $\frac{1}{2}l$ from each other, at which there will be no motion of the string; it will therefore make no difference to the motion of the string if we suppose the string fastened to fixed supports at any two of these points, and we may then suppose the parts of the string beyond these points to be removed, as it cannot affect the motion of the part which is between them. We have thus arrived at the case of a uniform string stretched between two fixed supports, and we conclude that the motion of the string may be completely represented as the resultant of two sets of periodic waves travelling in opposite directions, their wave-lengths being either twice the distance between the fixed points or a submultiple of this wave-length, and the form of these waves, subject to this condition, being perfectly arbitrary.

To make the problem a definite one, we may suppose the initial displacement and velocity of every particle of the string given in terms of its distance from one end of the string, and from these data it is easy to calculate the form which is common to all the travelling waves. The form of the string at any subsequent time may then be deduced by calculating the positions of the two sets of waves at that time, and compounding their displacements.

Thus in the wave method the actual motion of the string is considered as the resultant of two wave motions, neither of which is of itself, and without the other, consistent with the condition that the ends of the string are fixed. Each of the wave motions is periodic with a wave-length equal to twice the distance between the fixed points, and the one set of waves is the reverse of the other in respect of displacement and velocity and direction of propagation; but, subject to these conditions, the form of the wave is perfectly arbitrary. The motion of a particle of the string, being determined by the two waves which pass over it in opposite directions, is of an equally arbitrary type.

In the harmonic method, on the other hand, the motion of the string is regarded as compounded of a series of vibratory motions which may be infinite in number, but each of which is perfectly definite in type, and is in fact a particular solution of the problem of the motion of a string with its ends fixed.

A simple harmonic motion is thus defined by Thomson and Tait (§ 53):—When a point Q moves uniformly in a circle, the perpendicular QP, drawn from its position at any instant to a fixed diameter AA′ of the circle, intersects the diameter in a point P whose position changes by a *simple harmonic motion*.

The amplitude of a simple harmonic motion is the range on one side or the other of the middle point of the course.

The period of a simple harmonic motion is the time which elapses from any instant until the moving-point again moves in the same direction through the same position.

The phase of a simple harmonic motion at any instant is the fraction of the whole period which has elapsed since the moving point last passed through its middle position in the positive direction.

In the case of the stretched string, it is only in certain particular cases that the motion of a particle of the string is a simple harmonic motion. In these particular cases the form of the string at any instant is that of a curve of sines having the line joining the fixed points for its axis, and passing through these two points, and therefore having for its wave length either twice the length of the string or some submultiple of this wave-length. The amplitude of the curve of sines is a simple harmonic function of the time, the period being either the fundamental period or some submultiple of the fundamental period. Every one of these modes of vibration is dynamically possible by itself, and any number of them may coexist independently of each other.

By a proper adjustment of the initial amplitude and phase of each of these modes of vibration, so that their resultant shall represent the initial state of the string, we obtain a new representation of the whole motion of the string, in which it is seen to be the resultant of a series of simple harmonic vibrations whose periods are the fundamental period and its submultiples. The determination of the amplitudes and phases of the several simple harmonic vibrations so as to satisfy the initial conditions is an example of harmonic analysis.

We have thus two methods of solving the partial differential equation of the motion of a string. The first, which we have called the wave method, exhibits the solution in the form containing an arbitrary function, the nature of which must be determined from the initial conditions. The second, or harmonic method, leads to a series of terms involving sines and cosines, the coefficients of which have to be determined. The harmonic method may be defined in a more general manner as a method by which the solution of any actual problem may be obtained as the sum or resultant of a number of terms, each of which is a solution of a particular case of the problem. The nature of these particular cases is defined by the condition that any one of them must be conjugate to any other.

The mathematical test of conjugacy is that the energy of the system arising from two of the harmonics existing together is equal to the sum of the energy arising from the two harmonics taken separately. In other words, no part of the energy depends on the product of the amplitudes of two different harmonics. When two modes of motion of the same system are conjugate to each other, the existence of one of them does not affect the other.

The simplest case of harmonic analysis, that of which the treatment of the vibrating string is an example, is completely investigated in what is known as Fourier's theorem.

Fourier's theorem asserts that any periodic function of a single variable period p, which does not become infinite at any phase, can be expanded in the form of a series consisting of a constant term, together with a double series of terms, one set involving cosines and the other sines of multiples of the phase.

Thus if $\phi(\xi)$ is a periodic function of the variable ξ having a period p, then it may be expanded as follows:

$$\phi(\xi) = A_0 + \Sigma_1^\infty A_i \cos\frac{2i\pi\xi}{p} + \Sigma_1^\infty B_i \sin\frac{2i\pi\xi}{p} \quad . \quad . \quad (1).$$

The part of the theorem which is most frequently required, and which also is the easiest to investigate, is the determination of the values of the coefficients A_0, A_i, B_i. These are

$$A_0 = \frac{1}{p}\int_0^p \phi(\xi)d\xi\,;$$
$$A_i = \frac{2}{p}\int_0^p \phi(\xi)\cos\frac{2i\pi\xi}{p}d\xi\,;$$
$$B_i = \frac{2}{p}\int_0^p \phi(\xi)\sin\frac{2i\pi\xi}{p}d\xi\,.$$

This part of the theorem may be verified at once by multiplying both sides of (1) by $d\xi$, by $\cos\frac{2i\pi\xi}{p}d\xi$, or by $\sin\frac{2i\pi\xi}{p}d\xi$, and in each case integrating from 0 to p.

The series is evidently single-valued for any given value of ξ. It cannot therefore represent a function of ξ which has more than one value, or which becomes imaginary for any value of ξ. It is convergent, approaching to the true value of $\phi(\xi)$ for all values of ξ such that if ξ varies infinitesimally the function also varies infinitesimally.

Sir W. Thomson, availing himself of the disk, globe, and cylinder integrating machine invented by his brother, Professor James Thomson, has constructed a machine by which eight of the integrals required for the expression of Fourier's series can be obtained simultaneously from the recorded trace of any periodically variable quantity, such as the height of the tide, the temperature or pressure of the atmosphere, or the intensity of the different components of terrestrial magnetism. If it were not on account of the waste of time, instead of having a curve drawn by the action of the tide, and the curve afterwards acted on by the machine, the time axis of the machine itself might be driven by a clock, and the tide itself might work the second variable of the machine, but this would involve the constant presence of an expensive machine at every tidal station.

It would not be devoid of interest, had we opportunity for it, to trace the analogy between these mathematical and mechanical methods of harmonic analysis and the dynamical processes which go on when a compound ray of light is analysed into its simple vibrations by a prism, when a particular overtone is selected from a complex tone by a resonator, and when the enormously complicated sound-wave of an orchestra, or even the discordant clamours of a crowd, are interpreted into intelligible music or language by the attentive listener, armed with the harp of three thousand strings, the resonance of which, as it hangs in the gateway of his ear, discriminates the multifold components of the waves of the aerial ocean. (J. C. M.)

HARMONIUM. Perhaps no musical instrument ever became in a few years so widely known and used as the harmonium. The reasons for this may at once be found in the facilities it offers for playing easy music, and, when simply constructed, its comparatively low price, which renders the purchase of a tolerable harmonium possible when the cheapest pianoforte fairly playable would be unattainable, and the real organ, although of chamber size, quite out of the question. Besides being a convenient makeshift for an organ, the harmonium can also be used in domestic concerted music, to play all or any of the wind band parts of the orchestra; it may even be employed as a substitute for the violin, and in such vicarious uses it is past all question one of the handiest of deputies.

It is true the tone of the harmonium is not in itself beautiful, the prominence in sounds from reeds of certain overtones is irreconcilable with pleasure to the ear unless by convention of habit, and the necessity of tuning according to equal temperament all major thirds too sharp leads through this harmonic peculiarity in the chords to an abnormally disagreeable quality, from which those whose nerves are very sensitive or weak are not unfrequently painfully affected. The American organ, a kind of harmonium of late years much in vogue, owes its popularity to its being less pronounced and reedy in timbre (its softer tone being nearer to that we are familiar with in the church organ), and to its being easier to play for simple domestic use. Yet the real harmonium has more independent character as an instrument, and is capable of higher treatment in performance than the American organ.

Both are known as "free-reed" instruments, the musical tones being produced by tongues of brass, technically "vibrators," set in oblong frames; the sides of these they do not quite touch, but pass, when in movement, freely downwards,—the "beating reeds" used in church organs covering the entire orifice. A reed or vibrator, set in periodic motion by impact of a current of air, produces a corresponding succession of air puffs, the rapidity of which determines the pitch of the musical note. There is an essential difference between the harmonium and the American organ in the direction of this current; in the former the wind apparatus forces the current upwards, and in the latter sucks it downwards, whence it becomes desirable to separate in description these varieties of free-reed instruments.

The *Harmonium* has a keyboard of five octaves compass when complete, from C to C, and a simple action controlling the valves, &c. The necessary pressure of wind is generated by bellows worked by the feet of the performer upon footboards or treadles. The air is thus forced up the wind-trunks into an air-chamber called the wind-chest, the pressure of it being equalized by a reservoir, which receives the excess of wind through an aperture, and permits escape, when above a certain pressure, by a discharge valve or pallet. The aperture admitting air to the reservoir may be closed by a drawstop named "expression." The character of the instrument is then entirely changed from a mechanical response to the player's touch to an expressive one, rendering what emotion may be communicated from the player by increase or diminution of sound through the greater or less pressure of wind the reeds may be submitted to. The drawstops bearing the names of the different registers in imitation of the organ, admit, when drawn, the wind from the wind-chest to the corresponding reed compartments, shutting them off when closed. These compartments are of about two octaves and a half each, there being a division in the middle of the keyboard scale dividing the stops into bass and treble. A stop being drawn and a key pressed down wind is admitted by a corresponding valve to a reed or vibrator. Above each reed in the so-called sound-board or pan is a channel, a small air-chamber or cavity, the shape and capacity of which have greatly to do with the colour of tone of the note it reinforces. The air in this resonator is highly compressed at an even or a varying pressure as the expression-stop may not be or may be drawn. The wind finally escapes by a small pallet-hole opened by pressing down the corresponding key. In Mustel and other good harmoniums, the reed compartments that form the scheme of the instrument are eight in number, four bass and four treble, of three different pitches of octave and double octave distance. The front bass and treble rows are the "diapason" of the pitch known as 8 feet, and the bourdon (double diapason), 16 feet. These may be regarded as the foundation stops, and are technically the front organ. The back organ has solo and combination stops, the principal of 4 feet (octave higher than diapason), and bassoon (bass) and oboe (treble), 8 feet. These may be mechanically combined by a stop called full organ. M. Mustel, the French maker, whose pre-eminence is universally acknowledged, has added other registers for much admired effects of tone, viz.,—"harpe eolienne," two bass rows of 2 feet pitch, the one tuned a beat too sharp, the other a beat too flat, to produce a waving tremulous tone that has a certain charm; "musette" and "voix celeste," 16 feet; and "baryton," a treble stop 32 feet, or two octaves lower than the normal note of the key. The "back organ" is usually covered by a swell box, containing louvres or shutters similar to a Venetian blind, and divided into fortes corresponding with the bass and treble division of the registers. The fortes are governed by knee pedals which act by pneumatic pressure. Tuning the reeds is effected by scraping them at the point to sharpen them, or near the shoulder or heel to flatten them in pitch. Air pressure affects the pitch but slightly, noticeable only in the larger reeds, and harmoniums long retain their tuning, a decided advantage over the organ and the pianoforte. Mechanical contrivances in the harmonium, of frequent or occasional employment, besides those already referred to, are the "percussion," a small pianoforte action of hammer and escapement which, acting upon the reeds of the diapason rows at the moment air is admitted to them, gives prompter response to the depression of the key, or quicker speech; the "double expression," a pneumatic balance in the wind reservoir of great delicacy exactly maintaining by gradation equal pressure of the wind; and the "double touch," by which the back organ registers speak sooner than those of the front that are called upon by deeper pressure of the key, thus allow prominence or accentuation of certain parts by an expert performer. "Prolongement" permits selected notes to be sustained after the fingers have quitted their keys. Dawes's "melody attachment" is to give prominence to an air or treble part by shutting off in certain registers all notes below it. This notion has been adapted by inversion to a "pedal substitute" to strengthen the lowest bass notes. The "tremolo" affects the wind in the vicinity of the reeds by small bellows which increases the pulsation in rapidity according to pressure; and the "sourdine" diminishes the supply of wind by controlling its admission to the reeds.

The *American Organ*, as already said, acts by wind exhaustion. A vacuum is practically created in the air-chamber by the exhausting power of the footboards, and a current of air thus drawn downwards passes through any reeds that are left open, setting them in vibration. This instrument has therefore exhaust instead of force bellows. Valves in the board above the air-chamber give communication to reeds, made more slender than those of the harmonium and more or less bent, while the frames in which they are fixed are also differently shaped, being hollowed rather in spoon fashion. The channels, the resonators above the reeds, are not varied in size or shape as in the harmonium; they exactly correspond with the reeds, and are collectively known as the "tube-board." The swell "fortes" are in front of the openings of these tubes, rails that open or close by the action of the knees upon what may be called knee pedals. The tone of the American organ is softer than that of the harmonium; this is sometimes aided by the use of extra resonators, as, for instance, in Clough and Warren's latest instruments (of Detroit, Michigan, U.S.), which they call pipes or qualifying tubes. The blowing being also easier, ladies find it much less fatiguing. To these differences we may attribute its increasing popularity. The expression stop can have little power in the American organ, and is generally absent; the "automatic swell" in the instruments of Mason and Hamlin (of Boston, U.S.) is a contrivance that comes the nearest to it, though far inferior. By it a swell shutter or rail is kept in constant movement, proportioned to the force of the air-current. Another very clever improvement introduced by these makers, who are the originators of the instrument itself, is the "vox humana," a smaller rail or fan, made to revolve rapidly by wind pressure; its rotation, disturbing the air near the reeds, causes interferences of vibration that produce a tremulous effect, not unlike the beatings heard from combined voices, whence the name. This vibrato stop has found general adoption. The arrangement of reed compartments in American organs does not essentially differ from that of harmoniums; but there are often two keyboards, and then the solo and combination stops are found on the upper manual. The diapason treble register is known as "melodia"—different makers occasionally vary the use of fancy names for other stops. The "subbass," however, an octave of 16 feet pitch and always apart from the other reeds, is used with great advantage for pedal effects on the manual, the compass of American organs being usually down to F (FF, 5 octaves). In large instruments there are sometimes foot pedals as in an organ, with their own reed boxes of 8 and 16 feet, the lowest note being then CC. Blowing for pedal instruments has to be done by hand a lever being attached for that purpose. The "celeste" stop is managed as in the harmonium, by rows of reeds tuned not quite in unison, or by a shade valve that alters the air-current and flattens one row of reeds thereby.

Harmoniums and American organs are the results of many experiments to play upon free reeds by a keyboard, initiated by the "orgue expressif" of Grenié, a Frenchman. During nearly the first half of this century various tentative efforts in France and Germany, and subsequently in England, came to nothing more valuable than the Viennese "physharmonica" of Hackel, the Parisian "melophone," and our own "seraphine." The inventor of the harmonium was indubitably Alexandre Debain, who took out a patent for it in Paris in 1840. He produced varied timbre registers by modifying reed channels, and brought these registers on to one keyboard. Unfortunately he patented too much, for he secured even the name harmonium, obliging contemporary and future experimenters to shelter their improvements under other names, and the venerable name of organ becoming impressed into connexion with an inferior instrument, we have now to distinguish between reed and pipe organs. The compromise of reed organ for the harmonium class of instruments must therefore be accepted. Debain's harmonium was at first quite mechanical; it gained expression by the expression-stop already described. The Alexandres, well-known French makers, by the ingenuity of one of their workmen, Martin, added the percussion and the prolongement. The melody attachment was the invention of an English engineer; the introduction of the double touch, now used in the harmoniums of Mustel, Bauer, and others—also in American organs—is due to Mr Tamplin, an English professor. Reference has already been made to the improvements of M. Mustel, a maker imbued with true artistic devotion.

The principle of the American organ originated with the Alexandres, whose earliest experiments are said to have been made with the view of constructing an instrument to exhaust air. The realization of the idea proving to be more in consonance with the genius of the American people, to whom what we may call the devotional tone of the instrument appealed, the introduction of it by Messrs Mason and Hamlin in 1861 was followed by remarkable success. They made it generally known in Europe by exhibiting it at Paris in 1867, and from that time instruments have been exported in large numbers by different makers. Harmoniums are not entirely, although chiefly, of French make. Mr Bauer, one of the best English makers, learned the trade in Paris, and employs chiefly French workmen. As keyed instruments, reed organs of either principle cannot be expected to compete musically with the older organ and pianoforte, yet the harmonium, studied for itself with something like the devotion that is given to the other keyed instruments, might be made more important than it is at present. Excepting from a few isolated students who may be told upon the fingers, it has received no true cultivation. Whether it will ever get this is a question that remains to be answered. Commercially the harmonium and American organ have taken a much more important place, although of course one not equal to that of the pianoforte. For some years the Alexandres were sending annually 7000 harmoniums to England. This afterwards, from various causes, diminished; the number, however, of their instruments made up to 1879 has reached 110,000. A general estimate of harmoniums made annually in France, Germany, and England is not forthcoming; but the yearly production of American organs in the United States has been stated at the large total of 40,000. (A. J. H.)

HARMONY. See Acoustics and Music.

HARO, said to be the ancient *Castrum Bilium*, a town of Spain, is situated in the province of Logroño, and the bishopric of Calahorra, 12 miles S.E. of Miranda, and 58 miles N. of Madrid. It occupies a beautiful site near the Ebro, in a fertile plain, bounded by a range of mountains. The town contains a fine parish church, a theatre built in 1841, a hospital, and other public buildings. Various unimportant manufactures are carried on by the inhabitants; but the chief source of wealth is the red wine produced in great abundance from the vines of the surrounding plain. There are some copper-mines in the neighbourhood. Haro was the birthplace of Diego de Leyva, the celebrated painter, about 1580. The population was estimated for 1870 at 6594.

HAROLD I., surnamed Fairhaired (Harald Haarfager), the founder of the old royal dynasty of Norway, succeeded his father, Halfdan the Black, as jarl about the year 863. His ambition to become king is said to have been awakened by the refusal of Gyda, daughter of Eric of Hadaland, to marry him until he had made himself ruler of all Norway, as Gorm had of Denmark, and Eric of Sweden; and he vowed that he would never clip nor comb his hair until he had fully achieved his task. After he had subdued all the jarls, he sent for Gyda and made her one of his wives, and had his hair cut at a feast in More by Jarl Rognwald, who then gave him the name of *Haarfager*. During the wars of Harold with the jarls many of the Norsemen left their country and settled in Iceland, the Faroe Islands, the Orkney and Shetland Islands, and even in the Hebrides of Scotland, from whence they returned and committed many sea robberies in Norway. Harold therefore fitted out a great expedition, conquered and slew the vikings, and made himself ruler over all these Norse settlements. During his absence on another expedition against Jarl Einar of Orkney his sons made war on one another, and also committed many acts of violence against his jarls. Accordingly on his return, finding it difficult to keep them in check, Harold resolved to give them separate provinces to govern, and about the year 893 called together a great "thing," at which he conferred on each the title of king, with a seat higher than that of the jarls, he himself retaining the sovereignty of the whole country. He also made Eric Bloodyaxe his heir, and took him to live with him; and about his eightieth year, when he found himself no longer able to discharge his kingly duties, he transferred the whole government to Eric and gave him the royal seat. Harold died three years afterwards about the year 933.

HAROLD II., surnamed Greyskin (Harald Graafel), son of Eric Bloodyaxe, succeeded Haco the Good in the government of Norway about the year 960, having bribed his other brothers to be satisfied with reigning as under kings in the other provinces. It would appear that Harold himself was disposed to govern peacefully and well, but his brothers now resolved to take vengeance on the friends of the late King Haco, and murdered among others Jarl Sigurd. They, however, failed of their purpose on Haco, his son, who after for some time resisting their attacks fled to Denmark, where he obtained the assistance of King Harold Bluetooth, with whose help he defeated and slew Harold Greyskin, upon which, under Harold Bluetooth, he became ruler of Norway with the title of jarl, according to some in the year 965, to others in 969, and to others in 975.

HAROLD III., surnamed Stern in Council (Harald Haardraade or Hardrada), son of Jarl Sigurd, half brother of King Olaf the Holy, and descended by his father from Harold I., was one of the most distinguished warriors among the old Norse kings. About his fifteenth year he made his escape wounded from the battle of Stiklestad (1030), where his half brother Olaf was killed; and after staying till he was cured of his wounds with a "bonde" in a forest, he made his way to Sweden, whence after the winter was over he went to Russia, where he was kindly received by King Yaroslaf of Novgorod. He remained in Russia for several years, but being refused the hand of a Russian princess, he betook himself with several companions to Constantinople, and became chief commander of the famous Byzantine life guards known as Varangians, and consisting almost wholly of Norsemen. At the head of these warriors he gained many victories over the Saracens in Sicily and Italy. It is even said that in a crusade against the infidels he penetrated as far as Jerusalem, but most probably if he entered that city it was in the peaceful character of a pilgrim. Returning after his exploits to Constantinople, he was refused the hand of a niece of the empress Zoe, because, according to the legend, the empress herself was enamoured of him, and offended at the refusal he one night made his escape with two galleys, carrying with him all his treasures, and also it is said the princess whose hand had been denied him, whom, however, he put on shore after he had passed the Bosphorus, with a message to the empress that, if he had so wished, her power would have been vain against his strategy and skill. He now set sail for Russia, where he was warmly welcomed by King Yaroslaf; and as he was now a man of great fame and wealth Yaroslaf gave him in marriage his daughter Ellisof or Elizabeth, whose hand he had formerly asked in vain. Soon after his marriage he resolved to return home and if possible to win the crown of Norway from his nephew Magnus the Good. With that purpose he about the year 1045 came to an agreement with his relative Swend of Denmark, who had been driven by Magnus into exile in Sweden; but Magnus, having obtained news of the intended joint expedition against him, entered into communication with Harold, and agreed to share with him the government of Norway, each ruling over a separate division. They now turned their united forces against Swend, drove him from Denmark, and completely prostrated his power; but just when he had resolved finally in despair to give up the contest, Magnus about the year 1047 took suddenly ill and died, bequeathing on his death-bed the whole of Norway to Harold and Denmark to Swend. Such a bequest did not however coincide with the desires of Harold, and between him and Swend a constant warfare raged for several years, until in 1064 they agreed to a peace by which each retained his dominions according to the old established boundaries. The chief motive of Harold in consenting to this arrangement was probably that he might be free to embark on a purpose of wider ambition, namely, to revive in his own person the old Scandinavian sovereignty of England which had ended with the death of Hardicanute. The story goes that he was instigated to the enterprise by a visit from Tostig, the exiled earl of Northumbria; but whether that be so or not, he in 1066 set sail for England with an immense fleet, which carried his wife Ellisof, his son Olaf, his treasures, and more than half of all his fighting men. After touching at Orkney, where he left his wife, he proceeded southwards to the Tyne, and was there joined by Tostig and by a contingent of troops from Malcolm of Scotland. From the Tyne they sailed southwards along the coast of Yorkshire, stopping at intervals to ravage the country for provisions, and after proceeding up the Humber cast anchor on the left bank of the Ouse near the village of Riccall. Leaving a detachment under his son Olaf to guard the fleet, Harold along with Tostig marched with a great force towards York, and, defeating the Northumbrians with heavy loss at Fulford on September 20th, received the surrender of the city on September 24th. Meanwhile Harold of England, having heard of the Norse invasion, was marching northwards from London day and night with an immense army; and passing through York on the day after its surrender, he appeared suddenly on the afternoon before the Norsemen encamped at Stamford Bridge. Taken by surprise, the Norsemen fought nevertheless with stubborn courage and fierce energy, but though the battle was for some time doubtful it ended at nightfall in their total overthrow, with a slaughter so enormous that the great majority of them lay dead upon the field. Tostig was slain and also Harold Hardrada himself, who, towering head and shoulders above all his warriors, was inflicting death on all who dared to meet him, till struck by an arrow in the windpipe he received the wound which laid him low. According to some writers his body ultimately found burial in Norway.

HAROLD IV., king of Norway, surnamed Gille, - said to be the short form of Gylle Kirst, that is, Servant of Christ,—came about the year 1127 to Norway with his mother, an Irishwoman, and claimed to be recognized as the son of King Magnus Barefoot and half brother of the reigning Sigurd. Sigurd consented to acknowledge the relationship on condition that Harold did not claim any share in the government during his lifetime or that of his son Magnus. This agreement Harold honourably kept during the lifetime of Sigurd, but after his death in 1130 he got himself chosen king of the half of the country, and after several battles took Magnus prisoner, put out his eyes, and confined him in a convent. Harold now reigned as sole king till 1136, when he was murdered in his sleep by Slembi diakn, another bastard son of Magnus Barefoot.

For the Norwegian Harolds, see the *Heimskringla* of Snorro Sturleson, translated into English by Samuel Laing, London, 1844; *Sturlunga Saga*, 2 vols., Oxford, 1878; Carlyle's *Early Kings of Norway*, London, 1875; and also, for Harold Hardrada, Freeman's *Norman Conquest*, vols. ii. and iii.

HAROLD I., surnamed Harefoot, king of England, illegitimate son of Canute and Alfgiva of Northampton, was on the death of Canute in 1035 chosen by the witan overlord of England and king of the provinces north of the Thames; and in 1037 he became king of England, when the people of Wessex offered him their crown on Hardicanute refusing to come to England to accept it. In the beginning of Harold's reign Alfred, son of Ethelred, landed in Wessex, with the purpose it is said of asserting his claims to its sovereignty; but, either without the knowledge of Earl Godwine, or with his connivance, he was seized by the agents of Harold and put to death with cruel tortures. Harold also banished Queen Emma from the kingdom. The only other events of importance in his reign are inroads of the Welsh and Scots, which were, however, without effectual results, and in the case of the Scots who laid siege to Durham ended in defeat with heavy loss. Harold died at Oxford, March 10, 1040. It is affirmed by some that Harold made no pretensions to a Christian belief, but this seems an exaggeration, for, whatever may have been his own private opinions, he appears to have conformed generally to the recognized religious customs, and there is one instance at least in which he redressed a wrong done by others to the church.

HAROLD II., king of the English, was the second son of Earl Godwine and his Danish wife Gytha, the sister of Earl Ulf. The year of his birth is not accurately fixed, but it must have been about 1022. The choice of his name, like that of some others of his brothers and sisters (see GODWINE), witnesses to the influence of his Danish mother. Both he and his elder brother Swegen were appointed to earldoms while still very young, seemingly about 1045. Harold's earldom was that of the East-Angles. In 1046 Swegen, having carried off Eadgifu, abbess of Leominster, and not being allowed to marry her, threw up his earldom in disgust, and his possessions were divided between his brother Harold and his cousin Earl Beorn, the nephew of Gytha. In 1049 Swegen came back and sought the recovery of his lands, which was refused by

Harold and Beorn. Harold now appears for the first time in command, holding a ship in the fleet commanded by his father. For some unknown cause his ship was transferred to Beorn, which most likely saved Harold's life; for Swegen presently came and entrapped and slew Beorn, who was buried by Harold. We next hear of Harold in 1051 as accompanying Godwine when he appeared in arms in Gloucestershire. He shared his father's outlawry and banishment in that year, but he chose a different place of shelter, going with his brother Leofwine to Ireland, while Godwine went to Flanders. In 1052 Harold and Leofwine came back. They were opposed by the men of Somerset and Devonshire, whom they defeated at Porlock, and plundered the country. Then they joined their father, and were with him at the assembly which decreed the restoration of the whole family. Harold was now restored to his earldom of the East-Angles, and, on his father's death in 1053, he succeeded him in the greater earldom of the West-Saxons.

Harold was now the chief man in the kingdom, and when the older earls Leofric and Siward died, his power increased yet more, and the latter part of Eadward's reign was virtually the reign of Harold. But he was the minister of the king rather than his personal favourite. This last place rather belonged to his younger brother Tostig, who on the death of Siward in 1055 received the earldom of the Northumbrians. Two other of Godwine's younger sons, Gyrth and Leofwine, also received earldoms in 1057. This last date would seem to have been about the time when the prospect of the crown began to open to Harold. The Ætheling Eadward, the son of Eadmund Ironside, who had been brought home from Hungary as the intended successor, died that year. So did Eadward's nephew Ralph, who, though not really of the kingly house, might possibly have been looked to for lack of a nearer candidate. There was now no one of the old stock but Eadgar son of Eadward and his sisters. If then the king should die while Eadgar was still a child, there would be no qualified candidate in the royal house. It would seem as if, from this time, men began to look to Earl Harold as a possible successor to the crown. He is spoken of in a way, and his name is joined with that of the king in a way, which is unusual in the case of an ordinary earl.

The chief events in which Harold appears personally during this time are the wars with the Welsh under their king Gruffydd ap Llywelyn. In 1055, in alliance with the banished Earl Ælfgar of Mercia, Gruffydd defeated Earl Ralph and burned Hereford. Harold now drove back the Welsh and restored Hereford, but allowed the restoration of Ælfgar to his earldom. In 1058 he made the pilgrimage to Rome; in 1060 he completed the building of his church at Waltham, and completed the foundation of the college in 1062. In 1063 came the great Welsh war, in which Harold, with the help of his brother Tostig, crushed the power of Gruffydd, who was killed by his own people. Harold now gave Wales to two vassal kings, Bleddyn and Rhiwallon. Both of his wars were accompanied by an extension of the English frontier toward Wales. In 1065 the Northumbrians revolted against their earl Tostig, and chose in his place Morkere, the son of Ælfgar. Harold now acted as mediator between the king and the insurgents, and at last, as the Northumbrians were fully prepared not to receive Tostig again, he agreed to their choice of Morkere and to the banishment of his brother.

Besides these there is one very important event in Harold's life the date of which can only be guessed at. At some time or other between William's visit to England in 1051 and Eadward's death at the beginning of 1066, Harold was the guest of Duke William in Normandy, and took some kind of oath to him. This oath the Normans represented as an act of homage, with a further oath to procure William's succession to the English crown. The tale is told only by the Norman writers, and it is told by them with such contradictions of every kind that no reliance can be placed on any detail. But that there is some truth in the story is proved by the strongest negative evidence. While the contemporary English writers take care, directly or indirectly, to deny all those Norman charges against Harold which were sheer invention, they say not a word as to his alleged oath to William. It seems on the whole most likely that Harold was wrecked on the shore of Ponthieu, imprisoned by its Count Guy, and released by the interference of William. He then helped William in a war with the Bretons, and promised to marry one of his daughters. This was most likely accompanied by an act of homage, such as was often made to any superior or benefactor. Such an oath might, in the ideas of the times, be made to mean a great deal or very little, according to circumstances. The most likely date is 1064. But there is a remarkable statement that Harold took a journey in Gaul with a political object, seemingly that of making alliances with some of the princes of the country, most likely William's enemies in France, Anjou, and Aquitaine. This was in the year of his Roman pilgrimage. And, as there is no direct evidence for the date of the oath, it is open to any one to put the two things together.

At the beginning of 1066 Eadward died. His last act was to recommend Harold for election to the crown. He was accordingly chosen on the day of Eadward's death, January 5th, and crowned the next day by Ealdred, archbishop of York. But, though he was crowned by the Northumbrian primate, the men of Northumberland at first refused to acknowledge him. They were won over by the new king, who went to York, accompanied by Saint Wulfstan, bishop of Worcester. To secure Eadwine and Morkere, he married their sister Ealdgyth, the widow of the Welsh king Gruffydd. He thus put it out of his power to comply with that part of his engagement to William which is best attested, namely, to marry one of William's daughters. The rest of Harold's reign was taken up with preparations against the attacks of two enemies at once. William challenged the crown, alleging both a bequest of Eadward in his favour and the personal engagement which Harold had contracted towards him. This was of course a mere matter of form, and William began to make ready for the invasion of England. Meanwhile the banished Tostig was trying all means to bring about his own restoration. He first, seemingly in concert with William, came in May, and attacked first the Isle of Wight and then Lindesey, but was driven to take shelter in Scotland. From May to September the king kept the coasts with a great force by sea and land; but at last provisions failed, and the land army was dispersed. Harold then went to London, ready to meet whichever enemy came first. By this time Tostig had engaged Harold Hardrada of Norway to invade England. He accordingly sailed up the Humber, defeated Eadwine and Morkere (September 20th), and received the submission of York (September 24th). Harold of England was now on his march northward; on September 25th he came on the Northmen at Stamfordbridge beyond York, and won a complete victory, in which Tostig and Harold Hardrada were slain. But two days later (September 28th) William of Normandy landed at Pevensey and (September 29th) occupied Hastings, and laid waste the land. Harold had then to march southward as fast as possible. He gathered his army in London from all southern and eastern England, but Eadwine and Morkere kept back the forces of the north. The king then marched into Sussex, occupied the hill of Senlac, now Battle, and awaited the Norman attack. After a vain exchange of messages, the decisive battle was fought on October 14th. As the English were wholly infantry, while the Normans were strongest in cavalry and archers, Harold's object was simply to hold the hill against all attack. As long as he was obeyed, his tactics were completely successful. But a part of his troops, disobeying his orders, left the hill to pursue, and the English array was broken. The Normans could now get up the hill, and, after a fight which lasted from morning till evening, they had the victory. The king and his brothers Gyrth and Leofwine were killed. As Harold was condemned by the pope, William at first refused him Christian burial, and caused him to be buried on the rocks at Hastings. But it seems most likely that he afterwards allowed the body to be removed to Harold's own church at Waltham. The tale which represents Harold as escaping from the battle, living a life of penitence, and at last dying at Chester, is a mere romance.

Harold left several children, but there is a good deal of uncertainty as to his marriage or marriages. He had two sons by Ealdgyth, Harold and Wulf; but they must have been twins born after their father's death. He had also three sons, Godwine, Eadmund, and Magnus, and two daughters, Gytha and Gunhild. It will be seen how strong the Scandinavian element is in these names. These five were not children of Ealdgyth, and the sons were grown up, or nearly so, when their father died. They may have been the children of an unrecorded first wife. But the local history of Waltham represented Harold's body as being found after the battle by a former mistress of his, Eadgyth Swanneshals (Swansneck). Some have thought that this Eadgyth is the "Eddeva pulcra" of Domesday, who appears as the former holder of great estates in the east of England. This, though not unlikely, is quite uncertain; but there seems evidence enough to show that Eadgyth Swanneshals is a real person, and to connect her with Harold's East-Anglian earldom. It seems most likely that she was the mother of Harold's earlier children, and that the connexion between them was that intermediate state between marriage and concubinage called the Danish marriage, of which we not uncommonly hear in those days.

The character of Harold is blackened with many, but mostly very vague, charges by the Norman writers. The English, on the other hand, paint him as the perfect model of a ruler. With regard to his accession to the crown, the common charge of usurpation springs from ignorance of the English law of the time. Harold was beyond all doubt regularly nominated by Eadward, regularly chosen by the witan, and regularly crowned by Ealdred. This last point is of importance in those days, when the rite of coronation was deemed of such moment. The Normans try to represent the ceremony as invalid, by saying that Harold was crowned by Stigand, archbishop of Canterbury, whose canonical position was doubtful. That Harold crowned himself, instead of receiving the ecclesiastical consecration, is a mere fable, arising from a misunderstanding of some of the rhetorical invectives of the Norman writers. It should be noticed that those contemporary writers who speak of Harold as an usurper do so wholly on the ground of the alleged right of William, and of Harold's oath to William. That Harold's accession was a wrong done to young Eadgar is an idea which we first hear of in the next century, when the doctrine of hereditary right had taken firmer root. In Domesday the reign of Harold is passed by; he is regularly spoken of as earl: the doctrine of the Norman lawyers was that William, though of course not full king till his coronation, had the sole right to the crown from the moment of Eadward's death.

The military skill of Harold is plain, both from the Welsh war, when he overcame the mountaineers by making his English soldiers adopt the Welsh tactics, and from his conduct both at Stamfordbridge and at Senlac. He clearly understood the difference between his two enemies, when it was wise to attack and when it was wise to await the attack. At Stamfordbridge his strategy was perfectly successful; it failed at Senlac only because of the disobedience of part of his army. The best witness to his civil government is the general peace and good order of England during that part of the reign of Eadward which was virtually his reign. When the peace is broken, it is always by the act of others, and Harold is always called on to make the settlement. He appears throughout as singularly mild and conciliating, never pressing hard upon any enemy. The later Norman writers indeed have an elaborate tale which represents Harold and Tostig as enemies from their childhood. But this is mere romance, with no ground in any contemporary writer.

The relations of Harold to the church, always an important feature in the character of a prince of that age, suggest several questions. He is charged in Domesday with several encroachments on ecclesiastical property, chiefly in Herefordshire, and the like charge is brought against him in a deed of Leofric, bishop of Exeter. But it must be remembered that this kind of charge is brought against every leading man of the time, and that we very seldom hear more than one side. The most distinct and detailed charge, that which represents Harold as a wholesale spoiler of the church of Wells, can be refuted, not by hearing the other side, but by going back to the charge as brought by the original complainant, Bishop Gisa. We here find that Harold took nothing from the church, but simply hindered the bishopric from receiving a bequest to which there is some reason for thinking that he may have had a right as earl. On the other hand, Harold appears as the friend and protector of several ecclesiastical bodies, and above all as the founder of Waltham. Here we may remark that, when monks were all the fashion, he preferred the secular clergy. He was the firm friend of the best prelate of his time, Bishop Wulfstan, and he appeared on good terms with most of the leading churchmen.

The contemporary authorities are the English Chronicles, the Latin biographer of Eadward in Dr Luard's collection (he gives a splendid panegyric on Harold), and Florence of Worcester, on the English side. On the Norman side are the Bayeux Tapestry, William of Poitiers, William of Jumièges, Guy of Amiens (*Carmen de Bello Hastingensi*). In the next century the book *De Inventione Sanctæ Crucis Walthamensis* gives Harold's picture as drawn in his own foundation. The book called *Vita Haroldi* is a mere romance, but contains one or two scraps of authentic tradition; Orderic, Eadmer, William of Malmesbury, and the writers of the 12th century generally, often prove particular facts, and especially show how the estimate of the events of the 11th century gradually changed. The French life of Eadward in the 13th is very bitter against Harold. Of the Scandinavian writers, Saxo Grammaticus is violent against him, while the biographer of Olaf Tryggvesson counts him for a saint. All the statements are brought together and examined in Freeman's *History of the Norman Conquest*, vols. ii. and iii. The opposite pictures of the earlier writers, Thierry and Palgrave, are also worth comparing. (E. A. F.)

HAROUN AL RASCHID, more properly Harún er Rashid, "Aaron the Orthodox," was the fifth of the 'Abbaside caliphs of Bagdad. His full name was Harún 'bn Mohammed ibn Abdallah ibn Mohammed ibn Ali 'bn 'Abdallah ibn Abbás. He was born at Ray the last day of Dhi 'l Heggah, 145 A.H. (20th March 763 A.D.) according to some accounts, and according to others 1st Moharrem 149 A.H. (15th Feb. 766 A.D.). Haroun al Raschid was twenty-two years old when he ascended the throne. His biographers unanimously speak of him as "the most accomplished, eloquent, and generous of the caliphs;" but, though his name is a household word, and few figures stand out more grandly prominent in the history of their times, little is really popularly known about his private life and personal history.

Raschid owed his own succession to the throne entirely to the prudence and sagacity of Yahya 'bn Khalid ibn Barmek, his secretary,[1] whom, on his accession, he appointed his lieutenant and grand vizier. Yahya, upon whom the whole responsibility of the government really devolved, performed his duties with the most consummate ability and judgment. He fortified the frontiers, and repaired all the deficiencies in the administration of the empire. He filled the treasury, made the provinces flourishing and prosperous by encouraging trade and securing the public safety, and in a word brought the caliphate up to the highest pitch of prosperity and glory. He personally superintended and organized the whole system of government. As a minister he was eloquent, wise, accomplished, and prudent, and he was moreover an able administrator, ruling with a firm hand and proving himself able to cope with any emergency that might arise. His generosity was munificent in the extreme and gained for him universal encomiums. With a most affable demeanour and great moderation he combined an imposing dignity that commanded universal respect.

In 182 A.H. (798 A.D.) Al Raschid proclaimed his son Abdallah as his heir apparent after El Amín, his eldest son, whom he had appointed his successor when only five years old, and gave him the post of viceroy of Khorassan. It was on this occasion that he gave ‘Abdallah the name of El Mamún and confided him to the care of Jaafer, son of Yahya. The historians speak of this act of Raschid's with natural surprise, for he had seen the results of similar policy on the part of his father and of his grandfather, as well as what his brother Hadi had done in his own case.

Yahya, the prime minister, and Jaafer, his son, enjoyed so fully the confidence of Haroun al Raschid that they rapidly rose to wealth and power. The great popularity and influence of the Barmek or Barmecide family, however, at length aroused the caliph's jealousy, and to make matters worse he heard that Jaafer had secretly married his sister. No sooner had he been made acquainted with the facts than he caused his sister to be put to death, ordered Mesrúr, his slave and executioner, to bring him Jaafer's head, and next murdered his two inoffending young nephews.

After the fall of the Barmek family the office of prime minister was exercised by Fadhl ibn Rabi‘ who had been chamberlain to Haroun himself, and to his predecessors Mensúr, Mehdí, and Hádi. He held the office of vizier until the death of Haroun al Raschid himself, which occurred at Tus, the birthplace of the celebrated Persian epic poet Firdousi. Al Raschid had set out for Khorassan to put down the insurrection of Rafi‘ ibn Leith ibn Nasr ibn Sayyar, who had revolted against his authority, made himself master of Samarcand, and killed the governor of that province. The rising had assumed such alarming proportions that Al Raschid determined to march in person against the rebels. He had not, however, got further than Tus when he was surprised by death in 193 A.H. (808–9 A.D.).

The reign of Al Raschid was one of the most brilliant in the annals of the caliphate, and the limits of the empire were then more widely extended than at any other period. The greater part of the Eastern world submitted to his laws, and paid tribute into his treasury; Egypt itself was only a province under his sway, and its ruler an officer appointed by himself. No caliph ever gathered round him so great a number of learned men,[2] poets, jurists, grammarians, cadis, and scribes, to say nothing of the wits and musicians who enjoyed his patronage. Haroun himself was an accomplished scholar and an excellent poet. He was well versed in history, tradition, and poetry, which he could always quote on appropriate occasions. He possessed exquisite taste and unerring discernment, and his dignified demeanour made him an object of profound respect to high and low.

Haroun al Raschid is best known to Western readers as the hero of many of the stories in the *Arabian Nights*; and in Arabic literature he is the central figure of numberless anecdotes and humorous stories. Of his incognito walks through Baghdad, however, the authentic histories say nothing; and the account of his relations with Charlemagne, of which European historians speak, does not rest on a trustworthy basis. His reign is chiefly remarkable for the fact that a family belonging to the pure Persian aristocracy held for so long the reins of power under a caliph whose boast was that *he* was the only one who came of unmixed Hashimi blood, that of the family from which the prophet of El Islam sprung.

The principal authorities for the history of this period are—the Arabic histories of Ibn el Athír, Ibn Khaldún, and the Tarikh el Khamís; while the best European works to consult on the subject are Gibbon's *Decline and Fall of the Roman Empire*, Osborn's *Islam under the Caliphs of Baghdad*, and Weil's *Geschichte der Chalifen*. (E. H. P.)

HARP, a musical instrument of the string kind, approximating to triangular form from the strings diminishing in length as they ascend in pitch. While the instrument is of great antiquity, it is yet from northern Europe that the modern harp and its name are derived. The Greeks and Romans preferred to it the lyre in its different varieties, and a Latin writer, Fortunatus (vii. 8), describes it in the seventh century of our era as an instrument of the barbarians—"Romanusque lyra, plaudat tibi barbarus harpa." This is believed to be the earliest mention of the name, which is clearly Teutonic,—the Old High German "harpha," the Anglo-Saxon "hearpe," the Old Norse "harpa." The modern French "harpe" retains the aspirate; in the Spanish and Italian "arpa" it is dropped.

For the origin of the instrument we have to look to Egypt, and the earliest document of it there give no indication that it had not existed long before. There are, indeed, representations in Egyptian paintings of stringed instruments of a bow form that support the idea of the invention of the harp from the tense string of the warrior's or hunter's bow. This primitive-looking instrument was played horizontally, being borne upon the performer's shoulder. Between it and the grand vertical harps in the frescos of the time of Rameses III., more than 3000 years old, paintings discovered by the traveller Bruce (fig. 1), there are varieties that permit us to bind the whole, from the simplest bow form to the almost triangular harp, into one family (see fig. 2).

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[1] According to the Mohammedan law of succession the eldest brother or male relation of the reigning monarch is the heir apparent to the throne, and several Moslem princes have endeavoured to set aside the claims of their brothers in favour of their own children. El Hadi, Haroun's brother, was no exception to the rule, and [illegible] Haroun [illegible] Yahya [illegible] afterwards acknowledged this as the greatest obligation which he owed to Yahya.

The Egyptian harp had no front pillar, and it, being strung with catgut, the tension and pitch must necessarily have been low. The harps above mentioned depicted in the tomb at Thebes, assumed from the players to be more than 6 feet high, have not many strings, the one, according to Wilkinson, having ten, the other thirteen. What the scale or gamut was of these strings it would be to no satisfaction to follow Burney and others in trying to recover. We must be content with the knowledge that the old Egyptians possessed harps in principle like our own, the largest having pedestals upon which they bestowed a wealth of decoration, as if to show how much they prized them.

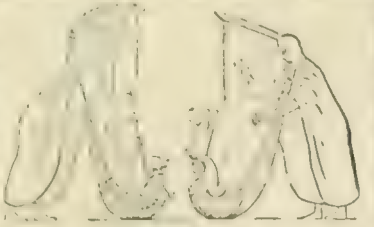


Fig. 1.

The ancient Assyrians had harps like those of Egypt in being without a front pillar, but differing from them in having the sound body uppermost, in which we find the early use of soundholes; while the lower portion was a bar to which the strings were tied and by means of which the tuning was apparently effected. What the Hebrew harp was, whether it followed the Egyptian or the Assyrian, we do not know. That King David played upon the harp as commonly depicted is rather a modern idea. Medieval artists frequently gave King David the psaltery, a horizontal stringed instrument from which has gradually developed the modern piano. The Hebrew "kinnor" may have been a kind of trigonon, a triangular stringed instrument between a small harp and a psaltery, probably sounded by a plectrum, or, as advocated by Dr Stainer in his essay on the music of the Bible, a kind of lyre.

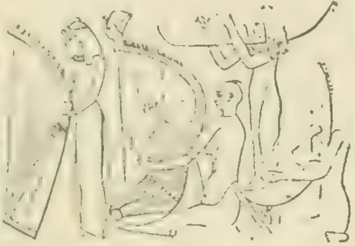
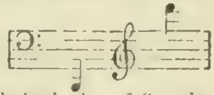


Fig. 2.

The earliest records that we possess of the Celtic race, whether Gaelic or Cymric, give the harp a prominent place and harpists peculiar veneration and distinction. The names for the harp are, however, quite different from the Teutonic. The Irish "clairseach," the Highland Scotch "clarsach," the Welsh, Cornish, Breton, "telyn," "telein," "telen," show no etymological kinship to the other European names. The first syllable in clairseach or clarsach is derived from the Gaelic "clar," a board or table (soundboard), while the first syllable of telyn is distinctly Old Welsh, and has a tensile meaning; thus resonance supplies the one idea, tension the other.

The literature of these Celtic harps may be most directly found in Bunting's *Ancient Music of Ireland*, Dublin, 1840; Gunn's *Historical Enquiry respecting the Performance on the Harp in the Highlands of Scotland*, Edinburgh, 1807; and E. Jones's *Musical and Poetical Memoirs of the Welsh Bards*, London, 1784. The treatises of Walker, Dalyell, and others may also be consulted; but in all these authorities due care must be taken of the bias of patriotism, and the laudable aim to reconstruct so much that we must be content to receive as only vaguely indicated in records and old monuments. There is, however, one early Irish monument about which there can be no mistake, the harp upon a cross belonging to the ancient church of Ullard near Kilkenny, the date of which cannot be later than 800; the sculpture is rude, but the instrument is clearly shown by the drawing in Bunting's work to have no front pillar. This remarkable structural likeness to the old harps of Egypt and Assyria may be accidental, but permits the plausible hypothesis of Eastern descent. The oldest specimen of the beautiful form the Irish harp is now recognized by, with gracefully curved front pillar and swayed neck (the latter known as the harmonic curve), is the famous harp in Trinity College, Dublin, the possession of which has been attributed to King Brian Boroimhe. From this mythic ownership Dr Petrie (see essay in Bunting) has delivered it; but he can only deduce the age from the ornamentation and heraldry, which fix its date in the 14th century or a little later. There is a cast of it in South Kensington Museum, accurately described in the catalogue by Mr Carl Engel. The next oldest is in the Highlands of Scotland, the *Clarsach Lumanach*, or Lamont's Clarsach, belonging, with another of later date, to the old Perthshire family of Robertson of Lude. Both are described in detail by Gunn. This Lamont harp was taken by a lady of that family from Argyleshire about 1460, on her marriage into the family of Lude. It had about thirty strings tuned singly, but the scale was sometimes doubled in pairs of unisons like lutes and other contemporary instruments. The Dalway harp in Ireland (fig. 3) inscribed "Ego sum Regina Cithararum," and dated 1621, appears to have had pairs of strings in the centre only. These were of brass wire, and played with the pointed finger nails. The Italian contemporary "Arpa Doppia" was entirely upon the duplex principle, but with gut strings played by the fleshy ends of the fingers. When Bunting met at Belfast in 1792 as many Irish harpers as could be at that late date assembled, he found the compass of their harps to comprise  thirty notes which were tuned diatonically in the key of G, under certain circumstances transposable to C and rarely to D, the scales being the major of these keys. The harp first appeared in the coat of arms of Ireland in the reign of Henry VIII.; and some years after in a map of 1567 preserved in a volume of State Papers, we find it truly drawn according to the outlines of the national Irish instrument. References to the Highlands of Scotland are of necessity included with Ireland, and in both we find another name for the harp, viz. "cruit." Bunting particularly mentions the "cinnard cruit" (harp with a high head) and the "crom cruit" (the curved harp). In the Ossianic MSS. of the Dean of Lismore (1512), the word "cruit" occurs several times, and in Neill M'Alpine's *Gaelic Dictionary* (1832), which gives the dialect of Islay, closely related to that of Ulster, the word "cruit" is rendered "harp." In Irish of the 8th and 9th centuries (Zeuss) "cithara" is always glossed by "crot." True the modern Welsh "crwth" is not a harp; but the expression of Fortunatus, "Chrotta Britanna canat," has been too readily accepted as meaning the half-fiddle half-lyre which also bears the name of "crwth" or "crowd." An old Welsh harp, not triple strung, exists, which bears a great resemblance to the Irish harp in neck, soundboard, and soundholes. The inference is fair that this was the form, although dimensions may have materially differed, of the Irish "crom cruit," while the triple strung harp with its elevated neck might be the form of the "cinnard cruit." But this does not imply derivation of the harp of Wales from that of Ireland or the reverse. There is really no good historical evidence, and there may have been a common or distinct origin on which ethnology only can throw light. The Welsh like the Irish harp was often an hereditary instrument to be preserved with great care and veneration, and used by the bards of the family, who were alike the poet-musicians and historians. A slave was not allowed to touch a harp, and it was exempted by the Welsh laws from seizure for debt. The old Welsh harp appears to have been at one time strung with horsehair, and by the Eisteddfod laws the pupil spent his novitiate of three years in the practice of a harp with that stringing. The comparatively modern Welsh triple harp (fig. 4) is always strung with gut. It has a rising neck as before stated, and three rows of strings,—the outer rows tuned diatonic, the centre one chromatic for the sharps and flats. Jones gives it 98 strings and a compass of 5 octaves and one note, from violoncello

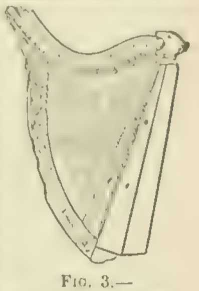


Fig. 3.—Irish (Dalway) Harp.

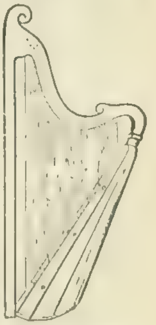


Fig. 4.—Welsh Triple Harp.

C. As in all Celtic harps, the left is the treble hand, and in the triple harps there are 27 strings on that side, the right or bass hand having 37, and the middle or chromatic row 34.

Turning to the modern harp, the first pattern of it is discovered in German and Anglo-Saxon illuminated MSS. as far back as the 9th century. A diatonic instrument, it must have been common throughout Europe, as Orcagna, Fra Angelico, and other famous Italian painters depict it over and over again in their masterpieces. No accidental semitones were possible with this instrument, unless the strings were shortened by the player's finger. This lasted until the 17th century, when a Tyrolese maker adapted hooks (perhaps suggested by the fretted or bonded clavichord) that, screwed into the neck, could be turned downwards to fix the desired semitone at pleasure. At last, somewhere about 1720, Hochbrucker, a Bavarian, invented pedals that, acting through the pedestal of the instrument, governed by mechanism the stopping, and thus left the player's hands free, an indisputable advantage; and it became possible at once to play in no less than eight major scales. By a sequence of improvements, in which two Frenchmen named Cousineau took an important part, the various defects inherent in Hochbrucker's plan became ameliorated. The pedals were doubled, and, the tuning of the instrument being changed from the key of E♭ to C♭, it became possible to play in fifteen keys, thus exceeding the power of the keyboard instruments, over which the harp has another important advantage in the simplicity of the fingering, which is the same for every key.

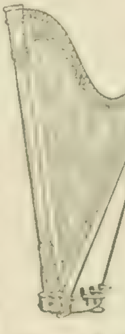


Fig. 5.—Modern Pedal Harp.

It is to Sebastian Erard we owe the perfecting of the pedal harp (fig. 5), a triumph he gained in Paris by unremitting studies begun when he adopted a "fork" mechanism in 1786 and ended in 1810 when he had attained complete success. The mechanical perfection of Erard's apparatus must be seen to be appreciated. The pedals give the extent of movement the disks perform from which the studs project that stop the strings, as it may be required to raise the string in pitch a half tone or a whole tone. Erard's merit was not confined to this improvement only; he modified the structure of the comb that conceals the mechanism, and constructed the sound-body of the instrument upon a modern principle more advantageous to the tone.

Notwithstanding these improvements and the great beauty of tone the harp possesses, the domestic use of it has for years past been declining. The great cost of a good harp, and the trouble to many amateurs of tuning, may have led to the supplanting of the harp by the more convenient and useful pianoforte. With this comes naturally a diminution in the number of solo-players on the instrument. Were it not for the increasing use of the harp in the orchestra, the colour of its tone having attracted the masters of instrumentation, so that the great scores of Meyerbeer and Gounod, of Berlioz, Liszt, and Wagner are not complete without it, we should perhaps know little more of the harp than of the dulcimer, in spite of the efforts of distinguished virtuosi whose devotion to their instrument maintains its technique on an equality with that of any other, even the most in public favour.

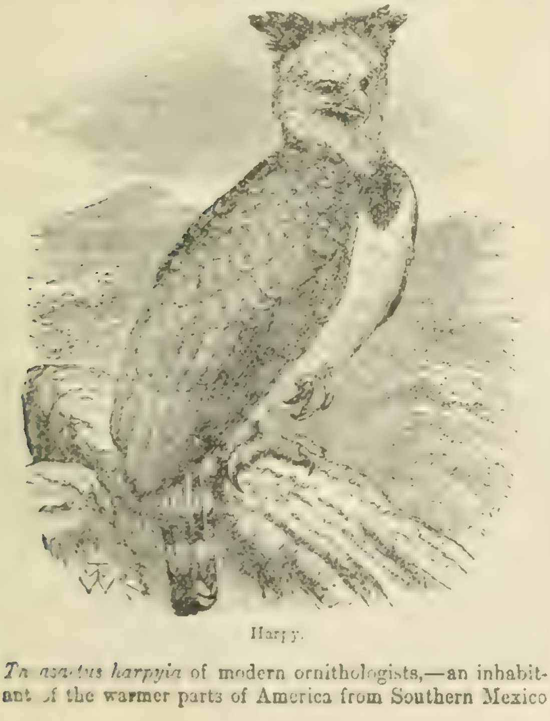
See, in addition to the works already referred to, Engel's *Musical Instruments in the South Kensington Museum*, 1874, and the articles "Harp," in Rees's *Cyclopædia*, written by Dr Burney, in Stainer and Barrett's *Dictionary of Musical Terms*, 1876, and in Grove's *Dictionary of Music and Musicians*, 1879. (A. J. H.)

HARPER'S FERRY, a post village of Jefferson county, West Virginia, United States, is grandly situated at the foot of Bolivar heights and at the confluence of the Shenandoah and Potomac rivers, where they intersect the Blue Ridge, 45 miles N.W. of Washington. It is the junction-point of the Baltimore and Ohio and the Winchester and Potomac railways; and the Ohio and Chesapeake canal passes along the Maryland side of the Potomac river. The village since the civil war has been in a decaying condition. It is the seat of Stover college, for students of colour. Previous to the war Harper's Ferry contained an extensive arsenal and armoury, and during the war it was the scene of several exploits which have given it a name in history. On the 16th October 1859 it was seized by John Brown, the celebrated abolitionist, and a small handful of followers, but as he was unsupported by a rising of the slaves he was overpowered on the morning of the 18th and taken prisoner. On the 18th April 1861 it was captured by the Confederates, who on evacuating it in the following June destroyed the arsenal and armoury and the bridge across the Potomac. The village was afterwards held by a Union garrison of 12,000 men, who, however, on the 15th September 1862, after a brave resistance of several days, surrendered to a strong Confederate force under Jackson and A. P. Hill. After the battle of Antietam, on the 17th of the same month, it was reoccupied by the army of the Potomac under General M'Clellan, who left a strong garrison in the place. In June 1863 it was again abandoned to the Confederates on their march to Pennsylvania. After their defeat at Gettysburg, the town again fell into the hands of the Federal troops, who held it until the demonstration against Washington in July 1864. After the battle of Monocacy on July 9th it was occupied by the United States forces, and held by them until the end of the war. The most flourishing part of the town was nearly destroyed by a flood in the Shenandoah, October 1878. The population is about 2000.

HARPIES, or Harpyiæ, a word from the root seen in ἁρπάζω, to snatch, are in Homer merely the embodiment of the rapacious power of violent winds. When a man has disappeared in a sudden and inexplicable fashion, it is said that the Harpies have carried him off; and the words ἅρπυιαι and θύελλαι are used indifferently (*cf. Od.* xiv. 371 with 727, and xx. 66 with 77) to indicate the agent in his sudden disappearance. But *Od.* xx. 63-5 shows that the winds were conceived as carrying the man away to the banks of Oceanus, in other words, to the sky. So it is said (*Il. Ven.*, 208; Schol. *Il.* xx. 234) that a θέσπις ἄελλα carried off Ganymede to heaven. There can be no doubt that the wind was by the primitive Indo-Germanic people considered to be the agent that carried off the souls of the dead to dwell with their fathers in heaven, and that this idea appears in the *Odyssey* (also *Il.* vi. 345) in a more fanciful form. As messengers of Zeus the Harpies are called Διὸς κύνες (Ap. Rh., ii. 289). In some accounts a Harpy is said to have become by Poseidon the mother of the horse Arion, and another form of the same union appears in *Il.* xvi. 148, when the harpy Podarge, grazing in a meadow by the stream of Oceanus, bears to Zephyrus (the fruitful generative wind) the two horses of Achilles. This myth, which occurs in numberless forms, has been explained in article Gorgons; from which it is clear that ultimately Harpy is another epithet, like Gorgo and Erinys, of the swift, sudden, violent thunderstorm of a southern country. It is therefore with good ground that the three forms are compared by Æschylus (*Eum.*, 48). The function of snatching away mortals to the other world leads up to the duty which the Greeks came to assign to the Erinyes of pursuing and punishing certain kinds of offenders (see Furies). In *Od.* xx. 66 *sq.* it is related that the orphan daughters of Pandareus grew up under the care of the gods; but when Aphrodite went to Olympus to beg to perfect their life by a marriage, the Harpies carried them off and delivered them to the Erinyes. In these two daughters, one of whom is the nightingale (*Od.* xx. 518), and the other probably the swallow (see Schwartz in Kuhn's *Zeitschrift*, x. 121), we recognize the spring growing up in beauty till it is suddenly snatched away from the earth by the storms of autumn. Hesiod (*Theog.*, 267) says that the Harpies, Aello and Ocypete, winged goddesses with beautiful locks, are the daughters of Thaumas and Electra. Other accounts make them children of Poseidon or of Phineus, always the sun in some form; while a third, Celæno, is often added to their number. As we come down later in literature, a more bestial and repulsive character attaches to the Harpies. This is especially seen in the myth of the blind king Phineus, the sun god in the dark winter months, tormented by the Harpies, where the transforming fancy of the poets can be traced more and more. Hesiod related (Strabo, vii. 463) that the Harpies carried off Phineus to the land of the Glactophagi, a mythic people, who represent like the Hyperboreans or the Phæacians the race of the dead, the Patris or Manes. The myth was incorporated as an episode in the tale of the Argonauts, and is then imitated by Virgil with still more nauseous details (*Æn.* iii. 212). On the so-called Harpy monument from Lycia, now in the British Museum, they appear as winged figures, the body like that of a bird with the head and bust of a woman. They are carrying off small figures, probably departed souls.

HARPOCRATES, originally an Egyptian deity, was adopted by the Greeks, and became in later times an object of worship both to Greeks and Romans. In Egypt Harpa-khruti, Horus the child, was one of the forms of Horus, the sun-god, the child of Osiris (see EGYPT, vol. vii. p. 717). Hence Herodotus (ii. 144) considers him the same as the Greek Apollo. He was said by the Greeks to have been born with his finger on his lips, and is thus represented in statues. As the god of silence he became a favourite deity among the later mystic schools of philosophy. Festivals with certain mysterious rites were celebrated in his honour.

HARPY, a large diurnal bird of prey, so named after the mythological monster of the classical poets,—the

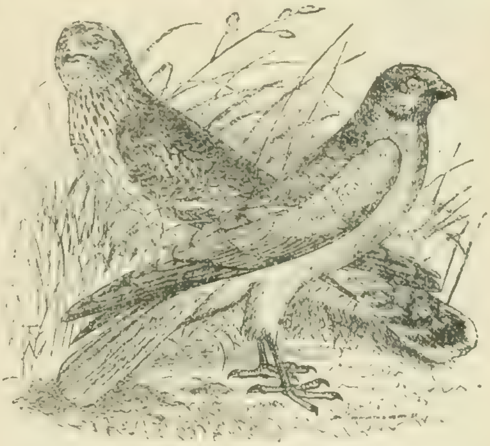


Harpy.

Thrasaëtus harpyia of modern ornithologists,—an inhabitant of the warmer parts of America from Southern Mexico to Brazil. Though known for more than two centuries, its habits have come very little under the notice of naturalists, and what is said of them by the older writers must be received with some suspicion. A cursory inspection of the bird, which is not unfrequently brought alive to Europe, its size, and its enormous bill and talons, at once suggest the vast powers of destruction imputed to it, and are enough to account for the stories told of its ravages on mammals,—sloths, fawns, peccaries, and spider-monkeys. It has even been asserted to attack the human race. How much of this is fabulous there seems no means at present of determining, but some of the statements are made by veracious travellers—D'Orbigny and Tschudi. It is not uncommon in the forests of the isthmus of Panama, and Mr Salvin says (*Proc. Zool. Society*, 1864, p. 368) that its flight is slow and heavy. Indeed its Owl-like visage, its short wings and soft plumage, do not indicate a bird of very active habits, but the weapons of offence with which, as above stated, it is armed, show that it must be able to cope with vigorous prey. Its appearance is sufficiently striking—the head and lower parts, except a pectoral band, white, the former adorned with an erectile crest, the upper parts dark grey banded with black, the wings dusky, and the tail barred; but the huge bill and powerful scutellated legs most of all impress the beholder. The precise affinities of the Harpy cannot be said to have been determined. By some authors it is referred to the Eagles, by others to the Buzzards, and by others again to the Hawks; but possibly the first of these alliances is the most likely to be true. (A. N.)

HARRIER. See DOG.

HARRIER, or HEN-HARRIER, name given to certain birds of prey which were formerly very abundant in parts of the British Islands, from their habit of harrying poultry. The first of these names has now become used in a generic sense for all the species ranked under the genus *Circus* of Lacépède, and the second confined to the particular species which is the *Falco cyaneus* of Linnæus and the *Circus cyaneus* of modern ornithologists.



Hen-Harrier (Male and Female).

On the wing Harriers have much resemblance to Buzzards, using the same flapping stroke of the pinions, and wheeling or sailing aloft as they fly. One European species indeed, *C. æruginosus*, though called in books the Marsh-Harrier, is far more commonly known in England and Ireland as the Moor-Buzzard. But Harriers are not, like Buzzards, arboreal in their habits, and always affect open country, generally, though not invariably, preferring marshy or fenny districts, for snakes and frogs form a great part of their ordinary food. On the ground their carriage is utterly unlike that of a Buzzard, and their long wings and legs render it easy to distinguish the two groups when taken in the hand. All the species also have a more or less well-developed ruff or frill of small thickset feathers surrounding the lower part of the head, nearly like that seen in Owls, and accordingly many systematists consider that the genus *Circus*, though undoubtedly belonging to the *Falconidæ*, connects that Family with the *Striges*. No osteological affinity, however, can be established between the Harriers and any section of the Owls, and the superficial resemblance will have to be explained in some other way. Harriers are found almost all over the world,[1] and fifteen species are recognized by Mr Sharpe (*Cat. Birds Brit. Museum*, i. pp. 50–73). In most if not all the Harriers the sexes differ greatly in colour, so much so that for a long while the males and females of one of the commonest and best known, the *C. cyaneus* above mentioned, were thought to be distinct species, and were or still are called in various European languages by different names. The error was maintained with the greater persistency since the young males, far more abundant than the adults, wear much the same plumage as their mother, and it was not until after Montagu's observations were published at the beginning of the present century that the "Ringtail," as she was called (the *Falco pygargus* of Linnæus), was generally admitted to be the female of the "Hen-Harrier." But this was not Montagu's only good service as regards this genus. He proved the hitherto unexpected existence of a second species,[2] subject to the same diversity of plumage. This was called by him the Ash-coloured Falcon, but it now generally bears his name, and is known as Montagu's Harrier, *C. cineraceus*. In habits it is very similar to the Hen-Harrier, but it has longer wings, and its range is not so northerly, for while the Hen-Harrier extends to Lapland, Montagu's is but very rare in Scotland, though in the south of England it is the most common species. Harriers indeed in the British Islands are rapidly becoming things of the past. Their nests are easily found, and the birds when nesting are easily destroyed. In the south-east of Europe, reaching also to the Cape of Good Hope and to India, there is a fourth species, the *C. swainsoni* of some writers, the *C. pallidus* of others. In North America *C. cyaneus* is represented by a kindred form, *C. hudsonius*, usually regarded as a good species, the adult male of which is always to be recognized by its rufous markings beneath, in which character it rather resembles *C. cineraceus*, but it has not the long wings of that species. South America has in *C. cinereus* another representative form, while China, India, and Australia possess more of this type. Thus there is a section in which the males have a strongly contrasted black and grey plumage, and finally there is a group of larger forms allied to the European *C. æruginosus*, wherein a grey dress is less often attained, of which the South African *C. ranivorus* and the New Zealand *C. gouldi* are examples. (A. N.)

HARRINGTON, JAMES (1611–1677), a distinguished writer on the philosophy of government, was sprung from an old family in Rutlandshire, and was born in January 1611. He received a careful education, and in his eighteenth year entered Trinity College, Oxford, as a gentleman commoner. One of his tutors was the famous Chillingworth. At the close of his university career he set out to travel on the Continent, and proceeded first to Holland, where he spent several years. He served some time in the Dutch army, and enjoyed the friendship both of the prince of Orange and of the queen of Bohemia. After visiting France and Italy, he returned to England and lived in retirement till 1646, when he was named one of the grooms of the bed-chamber to Charles I., who was at that time being conveyed south from Newcastle as prisoner of the parliament. Though republican in his ideas, Harrington secured the confidence and respect of the king, who showed strong personal regard for him. On the removal of Charles to the Isle of Wight, Harrington was prevented from accompanying him, and was for a short time put in confinement because he would not swear to refuse assistance to the king should he attempt to escape. His feelings of respect led him also to accompany Charles to the scaffold in the following year.

After Charles's death Harrington once more withdrew into private life and devoted his time to the composition of his work on the theory of the state, afterwards published under the title of *Oceana*. The nature of his views was well known, and, as they pleased neither republicans nor royalists, the work was naturally regarded with some suspicion. By order of Cromwell the *Oceana* was seized when passing through the press. Harrington, however, managed to secure the favour of the Protector's favourite daughter, Mrs Claypole; the work was restored to him, and appeared in 1656, dedicated to Cromwell. The views embodied in *Oceana*, particularly that bearing on vote by ballot and rotation of magistrates and legislators, Harrington and others who formed a club called the "Rota" endeavoured to push practically, but with no success. In December 1661, by order of Charles II., Harrington was arrested on a charge of conspiracy, and though there seem to have been no sufficient grounds for the accusation, he was thrown into prison. Despite his repeated request no public trial could be obtained, and when at length he endeavoured to protect himself by claiming the right of *habeas corpus*, he was secretly removed to a small island off Plymouth. There his health completely gave way, and his mind appeared to be affected. By careful treatment he was restored to bodily vigour, but it is supposed that his mind never recovered its tone. After his release he married,—at what date does not seem to be precisely known. He died September 11, 1677.

Harrington's books consist of the *Oceana*, and of papers, pamphlets, aphorisms, even treatises, in support and defence of the *Oceana*. The *Oceana* is not a philosophical romance; it is a hard, prolix, and in many respects heavy exposition of a new method for constituting civil society. The details are elaborated with infinite care, even the salaries of officials being computed, but the important or leading ideas in the book are two in number, with two practical precepts following from them. The first is that the determining element of power in a state is property generally, property in land in particular; the second is that the executive power ought not to be vested for any considerable length of time in the hands of the same men or class of men. As practical corollary to his first proposition Harrington recommends an agrarian law, limiting the portion of land held to that yielding a revenue of £2000, and consequently insisting on particular modes of distributing landed property. As a practical maxim following from the second he lays down the rule of rotation by ballot. A third part of the executive, senate, or whatever it might be, are voted out by ballot every year (not being capable of being elected again for three years). Harrington explains very carefully how the state and its governing parts are to be constituted by his scheme, and *Oceana* undoubtedly contains many valuable ideas. As a book, however, it is irretrievably dull.

His *Works* were edited by Toland in 1700. Toland's edition, with additions by Birch, appeared in 1747, and again in 1771.

HARRINGTON, SIR JOHN. See HARINGTON.

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[1] The distribution of the different species is rather curious, while the range of [illegible], *C. maillardi*, seems to be limited to the island of Réunion (Bourbon).

[2] A singular mistake, which has lately been productive of further error, was made by Albin, who drew his figure (*Hist. Birds*, ii., pl. 5) from a specimen of one species, and coloured it from a specimen of the other.

HARRIOT, or HARRIOTT, THOMAS (1560-1621), an English mathematician and astronomer, was born at Oxford in 1560. After studying at St Mary's Hall, Oxford, where he took his bachelor's degree in 1579, he became tutor to Sir Walter Raleigh, who in 1585 appointed him to the office of geographer to the second expedition to Virginia. Harriot published an account of this expedition in 1588, and the work was afterwards reprinted in Hakluyt's *Voyages*. On his return to England after an absence of two years, he resumed his mathematical studies with zeal and success; and having made the acquaintance of Henry Percy, earl of Northumberland, distinguished for his patronage of men of science, he received from him a yearly pension of £120. He died at London 2d July 1621, after having suffered much from a cancer in the lip, occasioned it is supposed by a habit he had contracted of holding in his mouth instruments of brass often charged with verdigris. A manuscript of Harriot's entitled "Ephemeris Chrysometria" is preserved in Sion College; and his *Artis Analyticæ Praxis ad Æquationes Algebraicas resolvendas* was published at London in 1631. An account of his contributions to the science of algebra will be found in the article ALGEBRA, vol. i. p. 514; and Wallis's *History of Algebra* (1685) may also be consulted. From some papers of Harriot's discovered in 1784 it would appear that he had either procured a telescope from Holland, or divined the construction of that instrument, and that he coincided in point of time with Galileo in discovering the spots on the sun's disk.

HARRIS, JAMES (1709-1780), a distinguished English writer on the subject of grammar, was born at Salisbury on the 20th of July 1709 He received his early education at Salisbury, whence he was removed to Oxford at the age of sixteen; and, having passed the usual number of years as a gentleman commoner at Wadham College, he was entered at Lincoln's Inn as a student of law, though not intended for the bar. When he had attained his twenty-fourth year his father died; and this event, having at once freed him from all control, and placed him in the possession of an independent fortune, enabled him to exchange the study of law for other pursuits more congenial to his taste. The decided bent of his mind had always been towards the Greek and Latin classics; and to the study of these he now applied himself with unremitting assiduity during a period of fourteen or fifteen years. The first fruit of this lengthened course of application was a volume which he published in 1744, containing three treatises—one on art, another on music, painting, and poetry, and a third on happiness. In 1751 appeared the work by which he is best known, *Hermes*, a philosophical inquiry concerning universal grammar. Although *Hermes* had considerable reputation in its day as a treatise on grammar, it must now be regarded as antiquated, and even as erroneous in conception. It is not so much a work on grammar as an attempt to force upon grammatical forms a strictly logical significance, to discover the groundwork of all grammars by analysing the thoughts to be expressed in words. This method, as we now recognize, is incapable of throwing light upon the oral structure and growth of language and grammatical forms. In 1775 Harris published his *Philosophical Arrangements*, part of a larger work which he had meditated, but did not complete, on the peripatetic logic. It is in fact a commentary on Aristotle's categories, and an attempt to discuss problems of more recent philosophy by the Aristotelian notions. The *Philological Inquiries* is a pleasantly written but slight work on the principles of literary criticism and style. It is the least pedantic of all his works. Harris died in December 1780. His works were collected and published in 2 vols., 1801, by his son, Lord Malmesbury, who prefixed a brief biography.

HARRIS, JOHN, D.D. (c. 1667-1719), an English writer, best known as the editor of the *Lexicon Technicum*, which ranks as the earliest of the long line of English encyclopædias, and as the compiler of the *Collection of Voyages and Travels* which passes under his name. He was educated at St John's College, Cambridge, where he took his B.A. degree in 1687, and proceeded M.A. in 1690. Having entered the church, he was soon presented to the rectory of Winchelsea in Sussex; and as early as 1698 he was in sufficient repute as a learned divine to be entrusted with the delivery of the seventh series of the Boyle lectures—*Atheistical Objections against the Being of God and His Attributes fairly considered and fully refuted*. Between 1702 and 1704 we find him lecturing on mathematics on the foundation of Charles Cox, and advertizing himself as a mathematical tutor at Amen Corner. The friendship of Sir William Cowper, afterwards lord chancellor, soon after raised him to a much higher position. Besides receiving the office of private chaplain to Sir William, he was presented in 1708 with a prebend in Rochester Cathedral, and appointed to the rectory of the united parishes of St Mildred, Bread Street, and St Margaret Moses. In this position he showed himself an ardent supporter of the Government, and got into a bitter quarrel with the Rev. Charles Humphreys, who afterwards was chaplain to Dr Sacheverel. Harris was one of the early members of the Royal Society, and for a time acted as vice-president. Besides his contributions to the society's *Transactions*, and the two important works by which he is still remembered, he published a number of treatises on mathematics and occasional sermons; and at his death on September 7, 1719, he was busy completing an elaborate *History of Kent*, of which the first volume had just left the press. He is said to have died in poverty brought on by his own bad management of his affairs. There is only one good account of his life, that by Nichols in the *Literary Anecdotes*, vol. ix., and this even, owing to scarcity of materials, is strangely defective.

HARRIS, JOHN (1802-1856), divine and theologian, was born at Ugborough in Devonshire, March 8, 1802. At the age of fifteen he joined the Independent Church, and began to preach to the rustics of the neighbourhood as a member of the Bristol Itinerant Society. After studying at the Independent college at Hoxton he was in 1827 ordained pastor of a small congregation at Epsom. There in 1836 he wrote his essay, *Mammon, or Covetousness the Sin of the Christian Church*, which won a prize of 100 guineas offered by Dr Conquest, and brought its author into notice, thirty thousand copies being sold within a few years. In 1838 he received the degree of doctor of divinity from Brown University, America, and was appointed president and professor of theology in Cheshunt college; and in 1850, when the Independent colleges at Highbury, Homerton, and Coward, near London, were united, Dr Harris was elected principal of the New College thus formed. He died December 21, 1856.

Besides *Mammon*, he wrote the *Great Teacher* (1835); two prize essays, *Britannia* (1837) and *The Great Commission* (1842); and *Contributions to Theological Science*. *The Pre-Adamite Earth* (1847), *Man Primeval* (1849), and *Patriarchy* (1855), form the beginning of a series, intended to illustrate the history of man from a theological point of view, but interrupted by his death.

HARRIS, SIR WILLIAM SNOW (1791-1867), a distinguished electrician, was descended from an old family of Plymouth solicitors, and was born there 1st April 1791. He received his early education at the Plymouth grammar-school, and completed a course of medical studies at the university of Edinburgh, after which he established himself as a general medical practitioner in Plymouth. On his marriage in 1824 he resolved to abandon his profession on account of its duties interfering too much with his favourite study of electricity. As early as 1820 he had invented a new method of arranging the lightning conductors of ships, the peculiarity of which was that the metal was permanently fixed in the masts and extended throughout the hull; but it was only with great difficulty, and not till nearly thirty years afterwards, that his invention was adopted by the Government for the royal navy. In 1826 he read a paper before the Royal Society "On the Relative Powers of various Metallic Substances as Conductors of Electricity," which led to his being elected a member of the society in 1831. Subsequently, in 1834, 1836, and 1839, he read before the society several valuable papers on the elementary laws of electricity, and he also communicated to the Royal Society of Edinburgh various interesting accounts of his experiments and discoveries in the same field of inquiry. In 1835 he received the Copley gold medal from the Royal Society for his papers on the "Laws of Electricity by High Tension," and in 1839 he was chosen to deliver the Bakerian lecture. Meanwhile, although a Government commission had recommended the general adoption of his conductors in the royal navy, and the Government had granted him an annuity of £300 "in consideration of services in the cultivation of science," the naval authorities continued to offer various objections to his invention; to aid in removing these he in 1843 published his work on *Thunder-storms*, and also about the same time contributed a number of papers to the *Nautical Magazine* illustrative of damage by lightning. His system was actually adopted in the Russian navy before he succeeded in removing the prejudices against it in England, and in 1845 the emperor of Russia in acknowledgment of his services presented him with a valuable ring and a superb vase. At length, every doubt as to the efficiency of his system having been removed, he received in 1847 the honour of knighthood, and subsequently a grant of £5000. After succeeding in introducing his invention into general use Harris resumed his labours in the field of original research, but as he failed to realize the advances that had been made by the new school of science his application resulted in no discoveries of much value. His manuals of *Electricity*, *Galvanism*, and *Magnetism*, contributed to Weale's rudimentary series, were however written with great clearness, and passed through several editions. He died 22d January 1867, while having in preparation a *Treatise on Frictional Electricity*, which was published posthumously in the same year, with a memoir of the author by Charles Tomlinson, F.R.S.

HARRISBURG, a city of the United States, capital of Dauphin county and of the State of Pennsylvania, is beautifully situated on the east bank of the Susquehanna river, on the Pennsylvania canal, and at the junction of several railways, 126 miles by rail N. of Washington and 105 W. by N. of Philadelphia. The river, which is here a mile in width, is crossed by two bridges, one of which is for the use of the railways. Two other bridges of great beauty and strength span the river in view of the State-house. The State buildings, dating from 1819, occupy an eminence in the centre of the busiest portion of the city, and consist of the State capitol, 180 feet long by 80 feet wide, with a circular portico in front supported by six Ionic columns and surmounted by a dome, and, on two sides of the capitol, smaller buildings uniform in design, containing the executive chamber, the State treasury, and various other offices. The capitol park contains a monument to those who died in the Mexican war. Among the other public buildings are the county court-house, the State arsenal, the county prison, and the opera-house. Harrisburg is a bishop's see of the Roman Catholic Church. It is well provided with academies and schools, and possesses about 30 churches, several of which are costly and ornamental edifices. It is also the seat of the State library of over 40,000 volumes. Among the benevolent institutions are the city hospital, the home for the friendless, and the State lunatic hospital. An abundant water supply is obtained from the river. Coal and iron are largely wrought in the neighbourhood, and the great facilities of communication both by canal and railway have enabled the city to become one of the centres of the iron trade. It possesses large iron-foundries, manufactories of steel, machines, boilers, engines, carriages, nails, files, galvanized iron, brooms, soap, and shoes, rolling-mills, saw and planing mills, flour-mills, cotton-mills, potteries, tanneries, and breweries. The inhabitants in 1860 numbered 13,405, and in 1870 23,104. The population of the city proper for 1880 is estimated at 31,700, and that of the suburbs at 4900, making a total of 36,600.

Harrisburg received its name from John Harris, an Englishman who settled on the site of the town in 1726, and whose son established a ferry over the Susquehanna in 1753. The town was founded in 1785 under the name of Harrisburg, which was afterwards changed to Louisbourg; in 1791 it was incorporated under its present name; in 1812 it became the capital of the State; and in 1860 it was made a city.

HARRISON, John (1693–1776), an eminent mechanician, was the son of a carpenter, and was born at Faulby, near Pontefract, in Yorkshire, in the year 1693. Thence his father and family removed in 1700 to Barrow, in Lincolnshire. Young Harrison at first learned his father's trade, and worked at it for several years, at the same time occasionally making a little money by land-measuring and surveying. The strong bent of his mind, however, was towards mechanical pursuits; and this showed itself specially in endeavours to improve the construction of clocks and watches so as to render them more accurate measurers of time. He soon learned that, to enable a clock to keep accurate time, the pendulum must be so constructed as to preserve the distance between the point of suspension and centre of oscillation invariable, notwithstanding the expansion and contraction of the rod caused by changes of temperature. To accomplish this Harrison devised, in 1726, his ingenious "gridiron pendulum," which consists in having the bob suspended by a series of parallel rods, alternately of steel and brass, so arranged that the downward expansion of the steel rods from change of temperature is exactly compensated for by the upward expansion of the brass rods. This principle of compensation, modified to suit particular cases, is now applied to all good watches and chronometers. Another ingenious improvement in clockmaking devised by Harrison was his recoil escapement, which obviated the necessity of keeping the pallets well oiled. He was led to invent this, as he himself tells us, by having on one occasion had to go a long distance to set right a turret clock which had stopped simply from want of oil on the pallets. This escapement, although answering admirably the intended purpose, is rather too delicate to be adopted in ordinary practice. Harrison was also the first to employ the commonly used and effective form of "going ratchet," which is a spring arrangement for keeping the timepiece going at its usual rate during the interval of being wound up.

In Harrison's time the Government of the country had become fully alive to the necessity of determining more accurately the longitude at sea. For this purpose they passed an Act in 1714 offering rewards of £10,000, £15,000, and £20,000 to any who should construct chronometers that would determine the longitude within 60, 40, and 30 miles respectively. Harrison applied himself vigorously to the task, and in 1735 went to the Board of Longitude with a watch which he also showed to Halley, Graham, and others. Through their influence he was allowed to proceed in a king's ship to Lisbon to test it, and the result was so satisfactory that the commissioners gave him £500 to carry out further improvements. Harrison worked at the subject with the utmost perseverance, and, after making several watches, went up to London in 1761 with one which he considered very perfect. His son William was sent on a voyage to Jamaica to test it, and, on his return to Portsmouth in 1762, the watch was found to have lost only 1 minute 54½ seconds. This was sufficiently accurate, as it determined the longitude within 18 miles, and Harrison claimed the full reward of £20,000. After some further trials £10,000 of it was paid to him in 1765, and the remainder in 1767, after he had written such a description of his instrument as would enable other artists to copy it. Harrison died in 1776, at the age of eighty-two. His want of early education was felt by him greatly throughout life. He was unfortunately never able to express his views clearly in writing, although in conversation he could give a very precise and exact account of his many intricate mechanical contrivances. He wrote a book entitled *Description concerning such Mechanism as will afford a Nice or True Mensuration of Time.*

HARRISON, WILLIAM HENRY (1773–1841), ninth president of the United States, third son of Governor Benjamin Harrison, was born at Berkeley, Charles City co., Virginia, February 9, 1773. In 1792 he joined the army with the commission of ensign, and in the following year he became lieutenant and acted as aide-de-camp to Wayne in his expedition against the Western Indians. He was promoted to a captaincy in 1795, but resigned in 1797 on being appointed secretary of the North-West Territory. In 1799 he was chosen to represent that territory in congress, and after its division in 1801 he became governor of the new territory of Indiana and superintendent of negotiations with the Indians, over whom, on the breaking out of hostilities in 1811, he gained the important victory of Tippecanoe. In 1813 as major-general and commander of the north-western army he defeated the British forces at the battle of the Thames. In 1814 he concluded a treaty with the North-Western Indians, and in the same year he resigned his commission. He was elected in 1816 member of congress for Cincinnati, in 1819 member of the State senate of Ohio, in 1824 United States senator, and in 1828 minister to Colombia, an office which he held for less than a year, when he retired for a time into private life. By the urgent request of the Whigs he was induced in 1836 to stand for the presidency of the United States, and though unsuccessful, he at the next election in 1840 defeated the same candidate Van Buren by an overwhelming majority, after a canvass memorable for the extraordinary enthusiasm it awakened, and historically important for its introduction of new political methods—many of the most characteristic features of Western elections having their origin in this "Harrison campaign." He was scarcely spared, however, to enter upon the discharge of his duties as president, dying April 4, 1841, about a month after his inauguration. Harrison published at Cincinnati in 1838 a small treatise on the Indians entitled *A Discourse on the Aborigines of the Ohio Valley.*

HARROGATE, a town and watering-place in the West Riding of Yorkshire, England, is beautifully situated on a fine plateau near the River Nidd, 18 miles W. of York. It is indebted for its rise and importance to its medicinal springs, and is now the principal inland watering-place in the north of England. It consists of two scattered townships, Low Harrogate and High Harrogate, which have gradually been connected by a continuous range of handsome houses and villas. A common of 200 acres, which is secured by act of parliament from ever being built upon, stretches in front of the main line of houses, and on this account Harrogate, notwithstanding its rapid increase, has retained all its rural charm. As the town is equidistant from the east and west coasts, its air is supposed to possess certain special qualities, and there is the further advantage of a choice between the more bracing atmosphere of High Harrogate and the sheltered and warm climate of the low town. The waters are chalybeate, sulphureous, and saline, and some of the springs possess all these qualities to a greater or less extent. The principal chalybeate springs are the Tewitt well, called by Dr Bright, who wrote the first account of it, the "English Spa," discovered by Captain William Slingsby of Bilton Hall about the year 1570; the Royal Chalybeate Spa, more commonly known as John's Well, discovered in 1631 by Dr Stanhope of York, and provided with a neat octagonal building erected in 1842; Muspratt's chalybeate or chloride of iron spring discovered in 1819, but first properly analysed by Dr Sheridan Muspratt in 1865; and the Starbeck springs midway between High Harrogate and Knaresborough. The principal sulphur springs are the old sulphur well in the centre of Low Harrogate, discovered about the year 1656; the Montpellier springs, the principal well of which was discovered in 1822, situated in the grounds of the Crown Hotel and surmounted by a handsome building in the Chinese style containing pump-room, baths, and reading-room; and the Harlow Car springs, situated in a wooded glen about a mile west from Low Harrogate. Near Harlow Car is Harlow observatory, a square tower 100 feet in height, standing on elevated ground and commanding a very extensive view. A saline spring situated in Low Harrogate was discovered in 1783. Besides the hotels and churches, the principal public buildings are the High Harrogate college, a boarding-school for young gentlemen; the new Victoria baths, erected in 1871 at a cost of £20,000; the Bath hospital for poor patients, founded in 1824; and the Rogers almshouses, founded in 1869. About a mile to the south-east of Harrogate the Crymple valley is spanned by a railway viaduct 1850 feet in length. The population of the town in 1861 was 4737, and in 1871 6843.

HARROW-ON-THE-HILL, a village of Middlesex, England, 10 miles N.W. of London, derives the latter part of its name from its position on a hill which rises from the surrounding plain to the height of about 200 feet. On the summit, and forming a conspicuous landmark, is the church of St Mary, said to have been founded by Lanfranc, archbishop of Canterbury, in the reign of William I., but of the original building very little is now left. Harrow is chiefly celebrated for its school, founded in 1571 by John Lyon, a yeoman of the neighbouring village of Preston who had yearly during his life set aside 20 marks for the education of poor children of Harrow. Though the charter was granted by Queen Elizabeth in 1571, and the statutes drawn up by the founder in 1590, two years before his death, it was not till 1611 that the first building was opened for scholars. Lyon originally settled about two-thirds of his property on the school, leaving the remainder for the maintenance of the highway between London and Harrow, but in the course of time the values of the respective endowments have changed, and while the road commissioners receive about £3500, the school's share is only about £1600. In 1660 the headmaster, taking advantage of a concession in Lyon's statutes, began to receive "foreigners," *i.e.*, boys from other parishes, who were to pay for their education. From this time the prosperity of the school may be dated. In 1809 the parishioners of Harrow appealed to the Court of Chancery against the manner in which the school was conducted, but the decision, while it recognized their privileges, confirmed the right of admission to foreigners. At present foundationers receive their education at a slightly cheaper rate than foreigners; there are none who are taught gratis. The government of the school was originally vested in six persons of standing in the parish, who had the power of filling vacancies in their number by election among themselves; but under the Public Schools Act of 1868 the governing body now consists of the surviving members of the old board, besides six new members who are elected respectively by the Lord Chancellor, the universities of Oxford, Cambridge, and London, the Royal Society, and the assistant masters of the school. There is a considerable number of scholarships in connexion with the school to both the great English universities, some to special colleges, others to colleges in the choice of the holders. The general mode of instruction and discipline is modelled on that of Eton, where most of the former headmasters of Harrow were educated. Originally an exclusively classical school, mathematics became in 1837 a compulsory study at Harrow; modern languages, compulsory on the upper forms only since 1851, were extended to the whole school in 1855; while English history and literature began to be more especially studied about 1869. Science, music, and drawing are now also taught. Among the famous men who have been educated here may be mentioned Bruce, the Abyssinian traveller, Sir William Jones, the Orientalist, Dr Parr, who was born at Harrow, Admiral Rodney, Sheridan, Byron, Peel, Theodore Hook, Lord Palmerston, Lord Herbert of Lea, the earl of Shaftesbury, and Archbishop Trench. Comparatively little change was made in the school buildings till 1819, when the new portion was begun; but since that time improvements and additions have steadily increased. In 1839 a school-chapel was consecrated; but this has been gradually replaced by a handsomer edifice completed in 1857. The Vaughan library was built in 1861-63, and a hospital for the boys in 1865. A new speech room, a gymnasium, and laboratories have been erected out of the Lyon Tercentenary Fund, subscribed since 1871. The population of the parish in 1871 was 8537, and of the local board district 4997.

HARRY, Blind, or Henry the Minstrel, author of a poem in twelve books, entitled *The Actis and Deidis of the illuster and vailzeand campioun, Schir William Wallace, Knicht of Ellerslie.* All that is known of Henry's personal history is contained in the following quotation from Major —"Henry, who was blind from his birth, composed in the time of my youth the whole book of William Wallace, and embodied all the traditions about him in the ordinary measure, in which he was well skilled. By the recitation of these in the presence of the great, he procured, as indeed he deserved, food and clothing." Major was born about 1469, and the only MS. copy of Henry's works is that in the Advocates' Library, Edinburgh, dated 1488. It was first printed at Edinburgh in 1570. In his *Lives of Scottish Worthies*, P. F. Tytler claims for it a certain historical worth, as "the work of an ignorant man, who was yet in possession of valuable and authentic materials." On account of its glorification of the national hero it has enjoyed a long popularity among the Scottish peasantry, but it possesses no poetical merit except a certain rude fire and energy, and as a literary production its place must be reckoned a very humble one.

HARTEBEEST (*Alcelaphus caama*), a species of antelope, occurring in considerable numbers throughout southern and central Africa. It stands nearly 5 feet high at the shoulder, and is somewhat ungainly in form owing to the disproportionate development of its fore and hind quarters,—a difference which gives to the posterior limbs when in motion an appearance of weakness. The head is long and narrow, and is crowned on its summit by a pair of nearly cylindrical horns, ringed throughout their lower half and smooth above. The hair of this species is short, soft, and recumbent, and is of a brownish-yellow colour above and nearly white beneath, the colour, however, being to some extent dependent on age and sex and on the season of the year. The harte-beest is gregarious, living in herds of from five to ten individuals, and frequenting tracts of uninhabited wilderness, or the light brush forest in the neighbourhood of rivers. It is exceedingly wary, and consequently difficult of approach, and when suddenly come upon, the entire herd, according to Sir Andrew Smith, scampers off in the train of a leader,—the herd being rarely seen, when in flight, otherwise than in a string, one treading on the footsteps of another. Of a mild and gentle disposition, the harte-beest seeks safety, whenever it can, in flight; when at bay, however, it does not hesitate to turn upon its pursuers and to make use of its powerful horns as weapons of offence. During the heat of the day it is said to rest leaning against the trunks of trees, when the colour of its body so harmonizes with that of the bark as frequently to enable it to elude observation. Dr Schweinfurth, who had frequent opportunity of observing those animals in central Africa, describes a curious and as yet unexplained habit of which he was himself a witness. Having approached nearer to a herd of harte-beests than usual without attracting their attention, he observed them running in couples like the horses in a circus, "going round and round a clump of trees, whilst the others stood in groups of three or four intently watching them. After a time these in turn took their places, and, two at a time, ran their own circuit in a similar fashion." He conjectures that the performance had probably some connexion with pairing time. The flesh of this species is considered superior to that of any other South African antelope, the eland alone excepted.

Harte-beest.

HARTFORD, a city in the United States of North America, in 41° 45′ 59″ N. lat., 72° 40′ 45″ W. long., is the eastern portion of the town of the same name, the county seat of Hartford county, and the capital of the State of Connecticut. It is situated on the west bank of the Connecticut river, 60 miles from Long Island Sound, at the head of steamboat and sloop navigation, and 100 miles N.E. of New York and 95 W.S.W. of Boston by rail. An important centre of railway communication, it has also regular lines of steamboats and packets, besides some 200 sailing craft engaged in the coasting trade. The river is usually closed from the middle of December to the middle of March, and at the breaking up of the ice in spring sometimes rises 29 feet. The city is intersected by the sluggish and dirty Park river, which is spanned by 10 bridges. A covered toll-bridge, 1000 feet long, across the Connecticut river, connects the city with East Hartford. There are about 80 miles of streets, mostly lighted with gas, well drained, and more than half paved, and running north and south or east and west with considerable regularity. The city is for the most part compactly built of brick, granite, and freestone,—the public buildings and those of many private corporations being elegant and substantial. The old State-house, a Doric edifice, completed in 1796, has become the city hall, while the State, since 1879, occupies a capacious new building of white marble in the modern Gothic style, costing over $3,100,000, and standing conspicuously in the midst of the city on a slight elevation at the south side of Bushnell Park (a beautiful area of 43 acres). There are also in the city three other public squares. Of the seven cemeteries the most noteworthy is Cedar Hill, in the south west part of the town, comprising 268 acres. Wadsworth's tower on Talcott mountain, to the north west, affords one of the finest views in New England. Hartford is a healthy city, and its mean annual temperature is 50° Fahr. The area of the city is 10 square miles; and the population in 1870 was 37,180, of whom 10,817 were foreigners. A careful estimate of the population in 1879 gives nearly 50,000.

The city is divided into 8 wards, and is governed by a mayor and 16 aldermen elected biennially, and 32 councilmen elected annually. The water supply is from four reservoirs in West Hartford, with a capacity of 1,298,450,367 gallons. In 1873 a free public bathing-house was established. Since 1864 the city has had a paid fire department, and now has seven steam fire-engines and a fire-alarm telegraph with 26 miles of wire. The total real estate and personal property in the city assessed for taxation, October 1, 1878, was $44,001,245. The debt of the town in 1879 was $1,298,158, and of the city $2,152,308.

The principal business of the city is insurance. In 1879 there were 9 fire insurance companies, with assets of $19,104,6[illegible], 8 life insurance companies, with assets of $101,101,368, and 1 accident insurance company, with assets, $1,170,163. There were 16 banks and trust companies, with an aggregate capital of over $[illegible], and 4 savings banks, with deposits, October 1, 1878, amounting to $4,528,893. There are also, exclusive of railroads, 73 mechanical and manufacturing corporations, though several of the larger ones have their works in adjacent towns. These have a capital of $17,347,000, and some of them a world-wide reputation, as the Colt Fire-arms Company, with works occupying grounds of 123 acres reclaimed by an extensive dike along the Connecticut river. They also include carpet, linen, and silk works, and a manufactory of edge-tools. The publication of books too is a considerable interest. A very important branch of trade is the sale of leaf tobacco, which is the chief crop of the Connecticut river valley.

In 1879 there were 36 churches and 15 chapels of all denominations, including a fine Jewish synagogue. Here, too, is the seat of the Roman Catholic bishop, and the headquarters, in the United States, of the Chinese educational commission. Beside the 17 public schools and school houses, which have cost $1,032,000, and with their 163 teachers and 7680 pupils cost about $200,000 a year, there were in 1879 43 educational and charitable corporations, several of them of notable importance, especially Trinity College (Episcopal), founded in 1823 as Washington College, which now has beautiful and commodious buildings in the south part of the city; the Theological Institute of Connecticut (Congregational), founded in 1834; the Hartford high and grammar school, founded 1655, the oldest educational institution in the State, and occupying one of the finest school edifices in the country; the Watkinson library of reference, with 34,000 volumes; the rooms and library of the Connecticut historical society, with its valuable collections of relics, books, and MSS.; the young men's institute, a circulating library of 27,000 volumes (the last three, with a picture gallery, occupy a roomy and accessible building known as the Wadsworth Athenæum); the very complete State law library at the State-house; the American asylum for the deaf and dumb, retreat for the insane, Hartford hospital and orphan asylum (see CONNECTICUT, vol. vi. p. 250). Thomas Green in 1764 opened the first printing-office in the city, and established the *Connecticut Courant*, which has ever since been regularly published. There were in 1879 three daily newspapers, seven weekly, and four monthly. In 1797 A. Kinsley operated the first steam locomotive in Hartford streets, and a portion of the Hartford and New Haven railroad was in operation in 1839. The railroads, however, have not been permanently successful, that to New York being the only one of those meeting at Hartford which is in a prosperous condition.

Hartford was known to the aborigines as Suckiaug; it was first permanently settled in 1635 by emigrants from eastern Massachusetts, and called Newtown. In 1637 it was named Hartford after Hertford in England. The Dutch had built a fort there in 1633, but it passed wholly into English hands in 1654. The first town meeting was held in 1635, and the first place of worship built, and school put in operation, in 1638. In 1639 was written at Hartford the constitution for the colony, the first framed in America, and embodying the characteristic features of all which follow. The first code of laws was drawn up in 1650, reducing the capital offences from 160 under English law to 15. In 1687 Sir E. Andros came to Hartford while the assembly was in session, and demanded the charter, but it was concealed in the notorious Charter Oak by Captain Joseph Wadsworth, and remained hidden till 1689. The historic tree survived till 1856. The city was incorporated in 1784, and in 1785 it became the sole capital of Connecticut.

HARTIG, GEORG LUDWIG (1764-1836), a German writer on forestry, was born at Gladenbach near Marburg, 2d September 1764. After obtaining a practical knowledge of forestry from his uncle at Harzburg, he studied from 1781 to 1783 at the university of Giessen. In 1786 he became inspector of forests to the prince of Solms-Braunfels at Hungen in the Wetterau, where he founded a school for the teaching of forestry. After obtaining in 1797 the appointment of inspector of forests to the prince of Orange Nassau, he continued his school of forestry at Dillenburg, where its attendance considerably increased. On the dissolution of the principality by Napoleon I. in 1805 he lost his situation, but in 1806 he went as chief superintendent of forests to Stuttgart, whence in 1811 he was called to Berlin as principal superintendent of forests under the Prussian Government. There he again opened his institution for instruction in forestry, and succeeded in connecting it with the university of Berlin, where in 1830 he was named honorary professor. He died at Berlin 2d February 1836.

Hartig was the author of a number of valuable works on forestry, new editions of which have been published by his son Theodor. The principal of these works are *Lehrbuch fur Jager*; *Lehrbuch fur Forster*; *Kubiktabellen fur geschnittene, beschlagene, und runde Holzer*; and *Lexikon fur Jager und Jagdfreunde*.

HARTLEPOOL, and **WEST HARTLEPOOL**, respectively a municipal borough and a town of England, county of Durham, and included in the parliamentary borough of the Hartlepools, are situated the one on the north and the other on the south side of Hartlepool Bay, about a mile apart, but having connexion by railway, and practically forming portions of one town. By railway Hartlepool is 10 miles and West Hartlepool 12 miles N.N.E. of Stockton-on-Tees. The principal buildings of Hartlepool are the parish church, in the Early English style, dedicated to St Hilda; the borough hall, in the Italian style, erected in 1866, behind which there is a large market; the Durham militia artillery depôt, erected in 1861; the temperance hall, the mechanics' institute, and the theatre. New schools for boys, girls, and infants have been erected by the school board; and Prissick's schools, founded in 1826, have been constituted elementary schools under the Education Act of 1870. Among the other schools are Crook's endowed school, founded in 1755, and the school in connexion with Henry Smith's charity. The town was originally surrounded by walls, of which considerable remains may yet be seen. It is well supplied with water. The principal buildings of West Hartlepool are the atheneum, the town-hall, the exchange, in the Gothic style, erected in 1875 at a cost of £10,000, the mechanics' institute, and the theatre. A Government school of art was established in 1874. The manufactures of the two towns are very much alike: they possess iron-works, puddling furnaces, brass and iron foundries, engine and boiler works, sawmills, cement works, tile works, and breweries. With the addition of the new docks, completed in 1879, the dock area between the towns is 86 acres, besides which there are ponds with an area of about 80 acres. Considerable difficulty has been found in maintaining a sufficient depth of water at the harbour bar of Hartlepool, and although the use of a powerful dredge has been so far effectual, it is probable that the only adequate remedy will be the extension of the breakwater. A large lighthouse for guiding the entrance of vessels was erected in 1846-47 at a cost of nearly £6000. In the shipping returns Hartlepool and West Hartlepool are classed together as one port; in 1878 the number of vessels that entered the port, including those in ballast, was 4640, with a tonnage of 885,762; the number that cleared 4662, with a tonnage of 992,370. For the five years ending 1878 the average number of vessels that entered was 5371, with a tonnage of 975,039, while 5447 cleared, with a tonnage of 1,005,740. The principal exports are coal, coke, machines, and cotton, linen and woollen goods, and the principal imports, timber, cattle, corn, provisions, and wool. The fisheries are considerable. The town is much resorted to in summer for sea-bathing. Several caverns, which may be explored for nearly fifty yards, have been excavated by the sea out of the rocks on the shore of the peninsula. The parliamentary borough of the Hartlepools has an area of 7267 acres, and besides Hartlepool includes Stranton (in which parish West Hartlepool is situated), Seaton Carew, and Throston. Its population in 1861 was 27,475, and in 1871, 38,203. The population of the municipal borough of Hartlepool in 1861 was 12,245, and in 1871, 13,166; and the population of Stranton in 1861 was 13,601, and in 1871, 22,166.

The name Hartlepool means the pool or lake of Hart. The town grew up round a monastery which had St Hilda as its abbess, and the harbour was of some consequence as early as 1171. In the 13th century Hartlepool belonged to the Bruces of Annandale in Scotland, the progenitors of the royal family of that name. The town was erected into a borough about 1200. After Bruce ascended the Scottish throne his English possessions were forfeited, and Hartlepool was granted to the Cliffords. It suffered severely from the Scots in 1312, and again in 1315 after the battle of Bannockburn. During the great northern rebellion in the reign of Elizabeth it was seized by the insurgents. In 1644 it was taken by the Scottish army, and it remained in the possession of Scotland till 1647. West Hartlepool was founded in 1844 by Mr R. W. Jackson, the first M.P. for the borough of the Hartlepools. Its first dock was commenced in 1847, after which it increased with great rapidity.

HARTLEY, DAVID (1705-1757), who may justly be called the founder of the English Association school of psychologists, was born on the 30th August 1705. His father, who was vicar of Armley in Yorkshire, wished him to enter the church; and with this view he was sent at the age of fifteen to Jesus College, Cambridge, where he studied under Saunderson the mathematician, and distinguished himself so much that he was elected a fellow of his college. But his university career so far modified his opinions that, feeling himself no longer able conscientiously to sign the Thirty-nine Articles, he abandoned his first intention and devoted himself to the study of medicine. He, however, remained in the communion of the English Church, living on intimate terms with the most distinguished churchmen of his day, among whom may be named Joseph Butler, Warburton, Law, Hoadley, and the poet Young. Indeed he seemed to have [illegible] ecclesiastical as well as civil authorities. The doctrine to which he most strongly objected was that of eternal punishment. His keen interest in theology is proved by the fact that he devoted a large part of his *Observations* to that subject, the objective side of which he treated upon orthodox lines. The life of Hartley was the useful life of a benevolent and studious physician. He practised at Newark, Bury St Edmunds, London, and lastly at Bath, where he died on the 28th August 1757, within two days of his fifty-second birthday. It was at the age of twenty-five that he commenced the series of essays that was to make up his *Observations on Man: his Frame, his Duty, and his Expectations*. The praise of originality cannot be denied him. It is noteworthy, however, that very nearly at the same time with the publication of Hartley's *Observations* (1749), two works appeared in French expounding theories essentially similar to his—Condillac's *Traité sur l'Origine des Connaissances humaines* (1746) and the *Traité Analytique de l'Ame* by Charles Bonnet of Geneva, whose coincidence with Hartley in the most distinctive features of his philosophy is extremely remarkable. But Hartley's own account of the matter is so straightforward as to command immediate assent. His physical theory, he tells us, was drawn from certain speculations as to nervous action which Newton had published in his *Principia*. His psychological theory was suggested by an *Essay on the Fundamental Principle of Virtue or Morality* (written by a clergyman named Gay, and prefixed by Law to his translation of Archbishop King's Latin work on the *Origin of Evil*), the chief object of which was to show that sympathy and conscience are developments by means of association from the selfish feelings. It is greatly to Hartley's credit that he so frankly owned his obligations to a work so far inferior to his own in completeness and tone of thought.

The outlines of Hartley's theory are as follows. With Locke he asserted that, prior to sensation, the human mind is a blank. By a growth from simple sensations those states of consciousness which appear most remote from sensation come into being. And the one law of growth of which Hartley took account was the law of contiguity, synchronous and successive. By this law he sought to explain, not only the phenomena of memory, which others had similarly explained before him, but also the phenomena of emotion, of reasoning, and of voluntary and involuntary action.

By his physical theory Hartley gave the first strong impulse to the modern study of the intimate connexion of physiological and psychical facts which has proved so fruitful, though his physical theory in itself is inadequate, and has not been largely adopted. He held that sensation is the result of a vibration of the minute particles of the medullary substance of the nerves, to account for which he postulated, with Newton, a subtle elastic ether, rare in the interstices of solid bodies and in their close neighbourhood, and denser as it recedes from them. Pleasure is the result of moderate vibrations, pain of vibrations so violent as to break the continuity of the nerves. These vibrations leave behind them in the brain a tendency to fainter vibrations or "vibratiuncles" of a similar kind, which correspond to "ideas of sensation." Thus memory is accounted for. The course of our ideas, or the flow of thought generally, when not immediately dependent upon external sensation, is accounted for on the ground that there are always vibrations in the brain on account of its heat and the pulsation of its arteries. What these vibrations shall be is determined by the nature of each man's past experience, and by the influence of the circumstances of the moment, which cause now one now another tendency to prevail over the rest. Sensations which are often associated together become each of them associated with the ideas corresponding to the others; and the ideas corresponding to the associated sensations become associated together, sometimes so intimately that they form what appears to be a new simple idea, not without careful analysis resolvable into its component parts.

Starting, like the modern Associationists, from a detailed account of the phenomena of the senses, Hartley tries to show how, by the above laws, [illegible] may be explained. [illegible] employed throughout. [illegible] mental state but sensation. He [illegible] asserts the existence of pure disinterested sentiment, while showing it to be a growth from the self-regarding feelings. Voluntary action is explained as the result of a close connexion between a motion and a sensation or "idea," and, in the reverse case, between an "idea" and a motory vibration. Therefore in the Freewill con-this as Hartley took his place as a Determinist. It is singular that, as he tells us, it was only with reluctance, and when his speculations were nearly complete, that he came to a conclusion on this subject in accordance with his theory.

Hartley's theory of reasoning is forced into agreement with the rest of his system. He declares that "assent and dissent, whatever their precise and particular nature may be, must come under the notion of ideas, being only those very complex internal feelings which adhere by association to such clusters of words as are called propositions. . . . And thus a mathematical proposition is nothing more than a group of ideas united by association," this group of ideas including "not only the sum of the ideas belonging to the terms of the proposition, but also those which belong to equality, coincidence, and truth."

The remaining half of the *Observations* is devoted to discussion of theological questions and to practical ethics, and does not call for detailed notice. While emphatically asserting his faith in supernatural religion, in the psychological part of his work he treats, not only conscience, but also the religious emotions entirely as developments from sensation, in the same sense as the pleasures of imagination.

Clearness, freedom from redundancy, and a severe simplicity and beauty are the best characteristics of his style. "No book," writes Sir James Mackintosh, "perhaps exists which, with so few of the common allurements, comes at last so much to please by the picture it presents of the writer's character. . . . Whoever bestows a careful perusal on the work must be unfortunate if he does not see, feel, and own that the writer was a great philosopher and a good man." (T. M. W.)

HARTLIB, SAMUEL (*c.* 1600–1662) was born towards the beginning of the 17th century at Elbing in Prussia, his father being a refugee from Poland. His mother was English. About 1628 Hartlib came to England, where he carried on a mercantile agency, and at the same time found leisure to enter with interest into the public questions of the day. An enthusiastic admirer of Comenius, he published in 1637 his *Conatum Comenianorum Præludia*, and in 1639 *Comenii Pansophiæ Prodromus et Didactica Dissertatio*. In 1641 appeared his *Relation of that which hath been lately attempted to procure Ecclesiastical Peace among Protestants*, and *A Description of Macaria*, containing his ideas of what a model state should be. During the civil war Hartlib occupied himself with the peaceful study of agriculture, printing at his own expense several treatises by others on the subject. In 1650 he issued the *Discourse of Flanders Husbandry* by Sir Richard Weston; and in 1651 his *Legacy, or an Enlargement of the Discourse of Husbandry used in Brabant and Flanders*, by Robert Child (see AGRICULTURE, vol. i. p. 297). For his various labours Hartlib received from Cromwell a pension of £100, afterwards increased to £300, as he had spent all his fortune on his experiments. He planned a school for the sons of gentlemen, to be conducted on new principles, and this probably was the occasion of his friend Milton's *Tractate on Education*, addressed to him in 1644, and of Sir William Petty's *Two Letters* on the same subject, in 1647 and 1648. His own literary labours were mostly confined to prefaces and short essays. Blythe, a contemporary, says that Ad. Speed, while engaged on his *Improvements in Husbandry*, was lodged and entertained by Samuel Hartlib. At the Restoration Hartlib lost his pension, which had already fallen into arrears; he petitioned parliament for a new grant of it, but what success he met with is unknown, as his latter years and death are wrapped in obscurity. 1662 has been assigned as the probable year of his death, as the latest of his extant letters bears that date.

His other publications are the following:—*Considerations tending to England's Reformation in Church and State*, 1647; *Vindication of Mr John Dury*, 1650, *Treatise touching Cases of Conscience Resolved*, 1652; *A true and ready way to learn the Latin Tongue*, 1654; *The Reformed Commonwealth of Bees and the Reformed Virginian Silkworm*, 1655; and *The Compleat Husbandman*, 1659. See *Biographical Memoir of Samuel Hartlib*, by H. Dircks, 1865; *Gentleman's Magazine*, January 1862; Warton's *Milton*; Harte's *Agricultural Essays*; Donaldson's *Agricultural Biography*; and Masson's *Milton*.

HARTMANN, MORITZ (1821–1872), a German poet and novelist, was born of Jewish parents at Duschnik in Bohemia, October 15, 1821. He studied at Prague and Vienna, and after a tour in Italy, Switzerland, and South Germany became a teacher in Vienna. He left Austria, however, in 1844, in order to publish without danger a volume of patriotic poems entitled *Kelch und Schwert*, which appeared at Leipsic in 1845, and in which he gave expression to somewhat radical sentiments as regards both church and state, in language full of the fire of youthful passion and tinged with considerable poetic fancy. After residing for some years in Belgium and France, he came to Leipsic, where in 1847 he published *Neuere Gedichte*. On his venturing towards the close of this year to return to Austria he suffered a short imprisonment, from which he was freed by the revolution of the following March. In the same year he was chosen to represent the district of Leitmeritz in the Frankfort parliament, where he took his seat on the extreme left. In October he accompanied Blum and Frobel to Vienna, but he made his escape before the execution of Blum, and took part in the deliberations of the "Rump Parliament" at Stuttgart. In 1849 he published the *Reimchronik des Pfaffen Maurizius*, a satirical political poem in the style of the old chronicles. After the dissolution of the "Rump Parliament," he went to Switzerland, then to England and Ireland, and in 1850 to Paris, where, besides other literary engagements, he held that of correspondent to the *Kolnische Zeitung*. On the outbreak of the Russian war he became correspondent of the same paper in the Crimea, where he remained eighteen months. After several years' residence at Paris he settled in 1860 at Ghent, where he delivered courses of lectures on German literature and history in some of the principal academies. In 1863 he removed to Stuttgart to edit the *Freya*, and in 1868 he undertook the editorship at Vienna of the *Neue Freie Presse*. He died at Oberdobling near Vienna, May 13, 1872. Hartmann published several volumes of poems in addition to those already mentioned, and besides his spirited accounts of his travels and adventures he is the author of various novels of more than average merit. A series of tales (*Novellen*, 3 vols.) appeared in 1863, and a second series (*Nach Natur*, 3 vols.) in 1866. His collected works were published at Stuttgart in 10 vols., 1873–74, and a selection of his poems at the same place in 1874.

HARTMANN VON AUE, a Middle High German poet, was born about 1170. He was of knightly rank, and held a fief at Aue, which was probably on the upper Neckar. He seems to have been educated in a monastery, and was able to read and write. Among his accomplishments was a knowledge of French, and as he took part in the third crusade he must be considered to have passed under the influences which were in his time most favourable to poetic impulse. Although his lyrics are not without merit he excels chiefly in narrative poetry; and the best known of his narrative poems, which was also one of the earliest, is *Der arme Heinrich* ("Poor Henry"). Some of the incidents of this tale are exceedingly repulsive, but others are marked by delicate grace and pathos. Two other tales, *Erec* and *Iwein*, the former written before 1197 and the latter before 1204, treat of the Arthurian legend, and are based upon French poems by Chrétien de Troies. The story of each is clearly conceived, and the diction is fresh, harmonious, and animated. Hartmann has neither the exquisite finish and charm of Gottfried of Strasburg nor the soaring imagination of Wolfram von Eschenbach; but he stands next to these supreme medieval writers in the power of giving artistic shape to strong feeling. He is mentioned as alive in 1207 by Gottfried of Strasburg, but in 1220 his death is deplored by Heinrich von dem Turlein in the *Krone*.

Each of his works has found a special editor; and a complete edition of his writings has been issued by F. Bech in the *Deutsche Classiker des Mittelalters*. See L. Schmid, *Stand, Heimat, und Geschlecht des Minnesängers Hartmann* ([illegible]).

HARTSHORN, SPIRITS OF, a name signifying originally the ammoniacal liquor obtained by the distillation of horn shavings, afterwards applied to the partially purified similar products of the action of heat on nitrogenous animal matter generally, and now popularly used to designate solution of ammonia. See AMMONIA, vol. i. p. 741, and CHEMISTRY, vol. v. p. [illegible].

HARUN ER RASHID. See HAROUN AL RASCHID.

HARUSPICES (literally entrail-observers, *cf.* Sansk. *hirâ*, Gr. χορδή), a class of soothsayers in Rome. Their art consisted especially in deducing from the appearance presented by the entrails of the slain victim the will of the gods. They also interpreted all portents or unusual phenomena of nature, especially thunder and lightning, and prescribed the expiatory ceremonies after such events. To please the god, the victim must be without spot or blemish, and the practice of observing whether the entrails presented any abnormal appearance, and thence deducing the will of heaven, was also very important in Greek religion. This art, however, appears not to have been, as some other modes of ascertaining the will of the gods undoubtedly were, of genuine Aryan growth. It is foreign to the Homeric poems, and must have been introduced into Greece after their composition. In like manner, as the Romans themselves believed, the art was not indigenous in Rome, but derived from Etruria. The Etruscans were said to have learned it from a being named Tages, grandson of Jupiter, who had suddenly sprung from the ground near Tarquinii. The art was practised in Rome chiefly by Etruscans, seldom by native-born Romans who had studied in the priestly schools of Etruria. Though it was of great importance under the early republic, it never became a part of the state religion. In this respect the haruspices ranked lower than the augurs; the latter were a more ancient and purely Roman institution, and were a most important element in the political organization of the city. In later times the art fell into disrepute, and the saying of Cato the censor is well known, that he wondered one haruspex could look another in the face without laughing (Cic., *De Div.*, ii. 24). Under the empire, however, we hear of a regular collegium of sixty haruspices; and Claudius is said to have tried to restore the art and put it under the control of the pontifices.

HARVARD COLLEGE, the earliest institution of learning in the United States and on the continent of North America. The record gives its origin thus. The English colonists on Massachusetts Bay, settling at what is now Boston in 1630, began a plantation the next year three miles up Charles River, which they called "New Towne." The colony court of September 1636 "agreed to give £400," which exactly doubled the public tax for the year, "towards a schoale or colledge, whereof £200 to be paid the next yeare, and £200 when the work is finished, and the next court to appoint wheare and what building." In November 1637 "the Colledge is ordered to be at New Towne," the name of which had been changed to Cambridge, and a committee was appointed "to take order" for it. In March 1638-'9 "it is ordered that the colledge agreed upon formerly to bee built at Cambridge shalbe called Harvard Colledge." The reason was that the Rev. John Harvard, B.A. 1632, and M.A. 1635, of Emmanuel College, Cambridge, England, dying in Charlestown, Massachusetts, September 14, 1638, by will left half his estate, about £800, and his library, to the wilderness seminary. The college charter of 1650 declared the object to be "the education of the English and Indian youth of this country in knowledge and godlynes." The first brick edifice on the college grounds, having rooms for twenty of the aborigines, was called "the Indian college." In it was printed the apostle Eliot's translation of the Bible into the language of the natives, with primers, grammars, tracts, &c. Several of the natives were members of the college; only one graduated from it. By generous aid received from abroad for this special object, the college was greatly helped in its infancy.

Thus from the beginning private munificence rather than the public treasury fostered and sustained the college, and with steadily increasing preponderance all through its history have its supplies and endowments come from the generosity of individuals. Grants from the colony, province, and State, of small sums for salaries and incidental purposes, made annually or at intervals, wholly ceased more than sixty years ago. With scarce an exception all the present invested funds of the college and of its professional schools, amounting to $3,615,538.87, with the halls, library, and apparatus, are the benefactions of its friends.

The charter constitutes as a corporation a president, treasurer, and five fellows, who initiate all measures concerning the college, hold its funds, and have the nomination for filling vacancies in their own body, as also of all the officers for instruction and for the internal government of the institution in all its departments, subject, however, to the advice and approval and final action of a board of overseers. The State, claiming as founder and patron, till quite recently regarded the college as a State institution, over which it should exercise a direct control through the legislature and the executive, by its authority in the membership and the election of the whole or a part of the board of overseers. Various modifications made from time to time in the composition or method of choice of the members of this board not relieving the controversies and embarrassments incident to legislative action, which proved prejudicial to the best interests of the college, its organic connection with the State by this tie was severed by statute in 1866. The board of overseers as now constituted is composed of thirty of the alumni, besides the president and the treasurer, elected by the ballots of the alumni on commencement day at the college, in sections of five, serving a term of six years. With its complement of professional schools of law, medicine, theology, science, and many special departments of the latter, more than any other institution in America, and with but a few gaps yet to be filled in its completeness of method and equipment to bring it to comparison with foreign institutions of learning, Harvard College may claim to be in the most comprehensive sense of the term a university, a title which is, indeed, assumed, and generally applied to it. Recent changes in the course of study in the college have allowed a wide range for elective studies to undergraduates, the proportions being, one-fourth obligatory, three-fourths elective. In the professional schools most of the studies are obligatory. The number of bound volumes in the library and schools is 232,200. The number of halls owned and occupied for college uses is twenty-nine of brick or stone, including ten for students' chambers. The whole number of professors, instructors, &c., in all departments, is 135; of librarians, proctors, and other officers in the service of the college, 28. The number of the alumni of the college proper about 9600, the number in all departments about 14,000.

HARVEST BUG, a name erroneously applied to the hexapod larval condition of a mite, not one of the *Insecta* but belonging to the division *Acaridea* of the class *Arachnida*. It is very small, of a brick-red color, and swarms both among wild vegetation and cultivated plants, especi ally near the sea, attaching itself, however, on the first opportunity to the bodies of human beings, hares, dogs, cats, and other mammals, and even insects. On reaching the skin, it rapidly burrows deeply into it, causing a painful itching, followed by a swelling of irritation and size varying with the individuals attacked, and enduring for several days. It is usually at the end of July or in August that these mites make their appearance; and the frequency with which they attach themselves to the lower extremities of people walking in fields at harvest time has given rise to their trivial name. The effect of their subcutaneous presence varies in different people, as above mentioned; in some it assumes so intensely painful an aspect as to originate a disease called autumnal erythema. Such severity of symptoms is generally found in warmer climates than that of Great Britain; the mite however is plentiful, and causes much annoyance in Scotland. Extraction with a fine needle, under a magnifying power, is the best way to get rid of the pests; but the application of a solution of carbolic acid, benzine, sulphur ointment, or any other powerful and easily diffused insecticide agent will usually soon destroy them.

The scientific name of this creature is *Acarus* (*Leptus* or *Tetranychus*) *autumnalis*, and in France it has received various common names, that of "rouget" being the best known. It has been placed in different genera by modern authors, who have hitherto considered it as a fully developed form, of somewhat doubtful affinities. The old naturalist De Geer appears to have suspected its correct status as an immature *Acarus*; but it has been reserved for the French naturalist, M. P. Mégnin, to prove from actual observation the fact that it is only the larva of a well-known mite, *Trombidium holosericeum*, a silky bright scarlet species often found in spring and early summer in gardens and fields. This distinguished observer has in like manner put beyond doubt the identity of various other members of the *Acaridæ*, hitherto dissociated. In April he found both sexes of the perfect mite, but at the end of May only newly gravid females occurred. These in June and July deposited their eggs, from which was hatched the creature hitherto known as the hexapod *Leptus autumnalis*. As soon as the larva has buried itself in the skin of the individual attacked, its abdomen dilates perceptibly, finally becoming about [illegible] times as large as on leaving the egg, though the cephalothorax [illegible] unchanged. It turns to an octopod nymph, or pupa, [illegible], during which the nutritive fluids [illegible] are assimilated, the adult stage of a purely phytophagous *Trombidium*, capable of reproduction, is reached.

There seems every reason to believe that the skin irritation [illegible] Mexico by a supposed insect, called *Thalsahuate* or *Tlalsahuate* [illegible], is really produced by this or a closely allied mite. Similar [illegible] are apparently caused by mites in Brazil, Martinique, Honduras, &c.; and the symptoms are naturally [illegible].

An [illegible], of all the stages of *Trombidium holo-* [illegible] *T.* [illegible] of which the octopod *T.* [illegible] every long-legged spiders, is the nymph or [illegible] *Naturelles*, [illegible] No. 5, by M. Mégnin.

HARVEY, GABRIEL (1545–1630), an English writer of the Elizabethan period, was the eldest son of a rope-maker at Saffron Walden, and received his education at Christ's College and Pembroke Hall, Cambridge, where we find him about 1576–78 lecturing on rhetoric. Immediately afterwards he appears to have been sent abroad by his patron the earl of Leicester, to whom he refers in his *Gratulationum Valdinensium libri quatuor* (Lond., 1578), a collection of poems in honour of the queen's visit to Audley End, near his native town. In 1585 he became doctor of laws. Though Harvey expresses a desire to be "epitaphed the Inventour of the English Hexameter," his name, familiar enough to his more learned contemporaries, would probably have been well nigh forgotten had it not been for his friendship with Spenser and his hostilities with Greene and Nash. To the student of Spenser he is familiar as one of the poet's principal correspondents, and as the Hobbinol who wrote the poem prefixed to the "Faerie Queen." His quarrel with Greene and Nash was begun by Greene alluding in his *Quip for an Upstart Courtier* (1592) to the fact that Harvey was the son of a rope-maker; and after Greene's death it raged with ever increasing violence until the archbishop of Canterbury issued an order for the seizure of all works written by either of the combatants.

Harvey's extant publications, which contain many minor matters of interest to the student of literature, are—*Ciceronianus*, London, H. Binnemann, 1577; *Rhetor, vel duorum dierum Oratio de Natura, Arte, et Exercitatione Rhetorica*, 1577; *Smithus vel Musarum Lachrymae*, Lond., 1578, in honour of the scholarly Sir Thomas Smith; *Foure Letters and certaine Sonnets, especially touching Robert Greene and other parties by him abused*, 1592; *Pierce's Supererogation, or a new Prayse of the Old Asse*, 1593, reprinted, but inaccurately, by Mr Collier, 4to, 1868; *A new Letter of Notable Contents*, 1593; *The Trimming of Thomas Nash, Gentleman, by the high tituled Don Richardo de Medico Campo*, 1597, reprinted in *The Old Book Collector's Miscellany*, Lond., 1871. See Warton's *History of English Poetry*, Hazlitt's edition, and J. P. Collier's *Bibliographical and Critical Account of the Rarest Books in the English Language*, Lond., 1865, under "Harvey," "Nash," and "Greene."

HARVEY, SIR GEORGE (1806-1876), a Scottish painter and president of the Royal Scottish Academy, was the son of a watchmaker, and was born at St Ninians, near Stirling, in February 1806. Soon after his birth his parents removed to Stirling, where George was apprenticed to a bookseller. His love for art having, however, become very decided, he in his eighteenth year entered the Trustees' Academy at Edinburgh. Here he so distinguished himself that in 1826 he was invited by the Scottish artists, who had resolved to found a Scottish academy, to join it as an associate. Indeed it was chiefly to the zeal and judgment of Harvey and of two others that it owed its early success. Harvey's first picture, A Village School, was exhibited in 1826 at the Edinburgh Institution; and from the time of the opening of the Academy in the following year he continued annually to enrich its exhibitions by a succession of pictures which, although they never obtained much fame beyond the limits of Scotland, appealed with such effect to Scottish sentiment as to win for him in his native land an unrivalled popularity. His best known pictures are those depicting historical episodes in religious history from a puritan or evangelical point of view, such as Covenanters Preaching, Covenanters' Communion, John Bunyan and his Blind Daughter, Sabbath Evening, and the Quitting of the Manse. He was, however, equally successful in subjects not directly religious; and The Bowlers, A Highland Funeral, The Curlers, A Schule Skailin', and Children Blowing Bubbles in the Churchyard of Greyfriars, Edinburgh, manifest the same close observation of character, artistic conception, and conscientious elaboration of details. In The Night Mail and Dawn Revealing the New World to Columbus the aspects of nature are made use of in different ways, but with equal happiness, to lend impressiveness and solemnity to human concerns. It was chiefly in his later years that he devoted his attention to landscape, the branch of art in which on the whole he was most successful, and there perhaps in suggesting the deep calm and the sweet and varied charm which broods among the hills when nature is at rest. He also devoted some attention to portraiture, among his works in this branch of art being a portrait of Professor Wilson, now at the Philosophical Institution, Edinburgh. In 1829 he was elected a fellow of the Royal Scottish Academy, and in 1864 he succeeded Sir J. W. Gordon as president. He received the honour of knighthood in 1867. His death took place at Edinburgh, January 22, 1876.

Sir George Harvey was the author of a paper on the "Colour of the Atmosphere," read before the Edinburgh Royal Society, and afterwards published with illustrations in *Good Words*; and in 1870 he published a small volume entitled *Notes of the Early History of the Royal Scottish Academy*. *Selections from the Works of Sir George Harvey, P.R.S.A., described by the Rev. A. L. Simpson, F.S.A. Scot., and photographed by Thomas Annan*, appeared at Edinburgh in 1869.

HARVEY, WILLIAM (1578–1657), the discoverer of the circulation of the blood, was the eldest son of Thomas Harvey, a prosperous Kentish yeoman, and was born at Folkestone on April 1, 1578. After passing through the grammar school of Canterbury, on the 31st of May 1593, having just entered his sixteenth year, he became a pensioner of Caius College, Cambridge; at nineteen he took his B.A. degree, and soon after, having chosen the profession of medicine, he went to study at Padua under Fabricius and Casserius (see ANATOMY, vol. i. pp. 809, 810). At the age of twenty-four Harvey became doctor of medicine, April 1602. Returning to England in the first year of James I., he settled in London; and two years later he married the daughter of Dr Lancelot Brown, who had been physician to Queen Elizabeth. In the same year Harvey became a candidate of the Royal College of Physicians, and was duly admitted a fellow (June 1607). In 1609 he obtained the reversion of the post of physician to St Bartholomew's Hospital. His application was supported by the king himself and by Dr Atkins, the president of the college. On the death of Dr Wilkinson in the course of the same year he succeeded to the post. He was thrice censor of the college, and in 1615 was appointed Lumleian lecturer. In the following year—the year of Shakespeare's death—he began his course of lectures, and first brought forward his views upon the movements of the heart and blood.[1] Meantime his practice increased, and he had the lord chancellor, Francis Bacon, and the earl of Arundel among his patients. In 1618 he was appointed physician extraordinary to James I., and on the next vacancy physician in ordinary to his successor. In 1628, the year of the publication of the *Exercitatio Anatomica de Motu Cordis et Sanguinis*, he was elected treasurer of the College of Physicians, but at the end of the following year he resigned the office, in order, by command of Charles I., to accompany the young duke of Lennox (James Stuart, afterwards duke of Richmond) on his travels. He appears to have visited Italy, and returned in 1632. Four years later he accompanied the earl of Arundel on his embassy to the emperor. He was eager in collecting objects of natural history, sometimes causing the earl anxiety for his safety by his excursions in a country infested by robbers after the Thirty Years' War. In a letter written on this journey, he says—"By the way we could scarce see a dog, crow, kite, raven, or any bird, or anything to anatomize; only some few miserable people, the reliques of the war and the plague, whom famine had made anatomies before I came." Having returned to his practice in London at the close of the year 1636, he accompanied Charles I. in one of his journeys to Scotland (1639 or 1641). While at Edinburgh he visited the Bass Rock; he minutely describes its abundant population of sea fowl in his treatise *De Generatione*, and incidentally speaks of the then credited account of the solan goose growing on trees as a fable. He was in attendance on the king at the battle of Edgehill (October 1642), where he withdrew under a hedge with the prince of Wales and the duke of York (then boys of twelve and ten years old), "and took out of his pocket a book and read. But he had not read very long before a bullet of a great gun grazed on the ground near him, which made him remove his station," as he afterwards told Aubrey. After the indecisive battle, Harvey followed Charles I. to Oxford, "where," writes the same gossiping narrator, "I first saw him, but was then too young to be acquainted with so great a doctor. I remember he came several times to our college (Trinity) to George Bathurst, B.D., who had a hen to hatch eggs in his chamber, which they opened daily to see the progress and way of generation." In Oxford he remained three years, and there was some chance of his being superseded in his office at St Bartholomew's Hospital, "because he hath withdrawn himself from his charge, and is retired to the party in arms against the Parliament." It was no doubt at this time that his lodgings at Whitehall were searched, and not only the furniture seized but also invaluable manuscripts and anatomical preparations.[2]

While with the king at Oxford he was made warden of Merton College, but a year later, in 1646, that city surrendered to Fairfax, and Harvey returned to London. He was now sixty-eight years old, and, having resigned his appointments and relinquished the cares of practice, lived in learned retirement with one or other of his brothers. It was in his brother Daniel's house at Combe that Dr (afterwards Sir George) Ent, a faithful friend and disciple (1604–1689), visited him in 1650. "I found him," he says, "with a cheerful and sprightly countenance investigating, like Democritus, the nature of things. Asking if all were well with him—'How can that be,' he replied, 'when the state is so agitated with storms and I myself am yet in the open sea? And indeed, were not my mind solaced by my studies and the recollection of the observations I have formerly made, there is nothing which should make me desirous of a longer continuance. But thus employed, this obscure life and vacation from public cares which would disgust other minds is the medicine of mine.'" The work on which he had been chiefly engaged at Oxford, and indeed since the publication of his treatise on the circulation in 1628, was an investigation into the recondite but deeply interesting subject of generation. Charles I. had been an enlightened patron of Harvey's studies, had put the royal deer parks at Windsor and Hampton Court at his disposal, and had watched his demonstration of the growth of the chick with no less interest than the movements of the living heart. Harvey had now collected a large number of observations, though he would probably have delayed their publication. But Ent succeeded in obtaining the manuscripts, with authority to print them or not as he should find them. "I went from him," he says, "like another Jason in possession of the golden fleece, and when I came home and perused the pieces singly, I was amazed that so vast a treasure should have been so long hidden." The result was the publication of the *Exercitationes de Generatione* (1651).

This was the last of Harvey's labours. He had now reached his seventy-third year. His theory of the circulation had been opposed and defended, and was now generally accepted by the most eminent anatomists both at home and abroad. He was known and honoured throughout Europe, and his own college erected a statue in his honour (1652), "viro monumentis suis immortali." In 1654 he was elected to the highest post in his profession, that of president of the college, but the following day he met the assembled fellows, and, declining the honour for himself on account of the infirmities of age, recommended the re-election of the late president Dr Prujean. He accepted, however, the office of consiliarius, which he again held in the two following years. He had already enriched the college with other gifts besides the honour of his name. He had raised for them "a noble building of Roman architecture (rustic work with Corinthian pilasters), comprising a great parlour or conversation room below and a library above"; he had furnished the library with books, and filled the museum with "simples and rarities," as well as with specimens of instruments used in the surgical and obstetric branches of medicine. At last he determined to give to his beloved college his paternal estate at Burmarsh in Kent. His wife had died some years before, his brothers were wealthy men, and he was childless, so that he was defrauding no heir when, in July 1656, he made the transfer of this property, then valued at £56 per annum, with provision for a salary to the college librarian and for the endowment of an annual oration, which is still given on the anniversary of the day. The orator, so Harvey orders in his deed of gift, is to exhort the fellows of the college "to search out and study the secrets of nature by way of experiment, and also for the honour of the profession to continue mutual love and affection among themselves."

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[1] A [illegible] MS. [illegible] in Harvey's [illegible] was [illegible] in the British Museum [illegible] "Experiments [illegible] so far as it has been [illegible], contains the [illegible] of his great discovery.

[2] [illegible]

Harvey, like his contemporary and great successor Sydenham, was long afflicted with gout, but he preserved his activity of mind to an advanced age. In his eightieth year, on the 3d of June 1657,[1] he was attacked by paralysis, and though deprived of speech was able to send for his nephews and distribute his watch, ring, and other personal trinkets among them. He died the same evening, "the palsy giving him an easy passport," and was buried with great honour in his brother Eliab's vault at Hempstead in Essex, "annorum et famæ satur."

Aubrey, to whom we owe most of the minor particulars about Harvey which have been preserved, says—"In person he was not tall, but of the lowest stature; round faced, olivaster complexion, little eyes, round, very black, full of spirits; his hair black as a raven, but quite white twenty years before he died." The best portrait of him extant is by Cornelius Jansen in the library of the College of Physicians, one of those rescued from the great fire, which destroyed their original hall in 1666. It has been often engraved, and is prefixed to the fine edition of his works published in 1766.

Harvey's Work on the Circulation.—In estimating the character and value of the discovery announced in the *Exercitatio de Motu Cordis et Sanguinis*, it is necessary to bear in mind the previous state of knowledge on the subject. Aristotle taught that in man and the higher animals the blood was elaborated from the food in the liver, thence carried to the heart, and sent by it through the veins over the body. His successors of the Alexandrian school of medicine, Erasistratus and Herophilus, further elaborated his system, and taught that, while the veins carried blood from the heart to the members, the arteries carried a subtle kind of air or spirit. For the practical physician only two changes had been made in this theory of the circulation between the Christian era and the 16th century. Galen had discovered that the arteries were not, as their name implies, merely air-pipes, but that they contained blood as well as vital air or spirit. And it had been gradually ascertained that the nerves (*νεῦρα*) which arose from the brain and conveyed "animal spirits" to the body were different from the tendons or sinews (*νεῦρα*) which attach muscles to bones. *First*, then, the physicians of the time of Linacre knew that the blood is not stagnant in the body. So did Shakespeare and Homer, and every augur who inspected the entrails of a victim, and every village barber who breathed a vein. Plato even uses the expression τὸ αἷμα κατὰ πάντα τὰ *μέλη σφοδρῶς περιφερόμενον*. But no one had a conception of a continuous stream returning to its source (a circulation in the true sense of the word) either in the system or in the lungs. If they used the word *circulatio*, as did Cæsalpinus,[2] it was as vaguely as the French policeman cries "Circulez." The movements of the blood were in fact thought to be slow and irregular in direction as well as in speed, like the "circulation" of air in a house, or the circulation of a crowd in the streets of a city. *Secondly*, they supposed that one kind of blood flowed from the liver to the right ventricle of the heart, and thence to the lungs and the general system by the veins, and that another kind flowed from the left ventricle to the lungs and general system by the arteries. *Thirdly*, they supposed that the septum of the heart was pervious and allowed blood to pass directly from the right to the left side. *Fourthly*, they had no conception of the functions of the heart as the motor power of the movement of the blood. They doubted whether its substance was muscular; they supposed its pulsation to be due to expansion of the spirits it contained; they believed the only dynamic effect which it had on the blood to be sucking it in during its active diastole, and they supposed the chief use of its constant movements to be the due mixture of blood and spirits.

Of the great anatomists of the 16th century, Sylvius (*In Hipp. et Gal. Phys. Partem Anatom. Isagoge*) described the valves of the veins; Vesalius (*De Humani Corporis Fabrica*, 1542) ascertained that the septum between the right and left ventricles is complete, though he could not bring himself to deny the invisible pores which Galen's system demanded. Servetus, in his *Christianismi Restitutio* (1553), goes somewhat further than his fellow-student Vesalius, and says—"Paries ille medius non est aptus ad communicationem et elaborationem illam; licet aliquid resudare possit;" and, from this anatomical fact and the large size of the pulmonary arteries he concludes that there is a communication in the lungs by which blood passes from the pulmonary artery to the pulmonary vein—"Eodem artificio quo in hepate fit transfusio a vena portæ ad venam cavam propter sanguinem, fit etiam in pulmone transfusio a vena arteriosa ad arteriam venosam propter spiritum." The natural spirit of the left side and the vital spirit of the right side of the heart were therefore, he concluded, practically the same, and hence two instead of three distinct *spiritus* should be admitted. It seems doubtful whether even Servetus rightly conceived of the entire mass of the blood passing through the pulmonary artery and the lungs. The transference of the *spiritus naturalis* to the lungs, and its return to the left ventricle as *spiritus vitalis*, was the function which he regarded as important. Indeed a true conception of the lesser circulation as a transference of the whole blood of the right side to the left was impossible until the corresponding transference in the greater or systemic circulation was discovered. Servetus, however, was the true predecessor of Harvey in physiology, and his claims to that honour are perfectly authentic and universally admitted.[3]

The way then to Harvey's great work had been paved by the discovery of the valves in the veins, and by that of the lesser circulation,—the former due to Sylvius and Fabricius, the latter to Servetus,—but the significance of the valves was unsuspected, and the fact of even the pulmonary circulation was not generally admitted in its full meaning.

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[1] This is the date usually given according to the college annals. [illegible] *History of England* [illegible] June 30; Harvey, [illegible] June 15; [illegible] Dr Lawrence, following the inscription on the tomb, gives June 3, 1658.

[2] Indeed the same word, *περίοδος αἵματος*, occurs in the Hippocratic writings, and was held by Van der Linden to prove that to the father of medicine himself, and not to Columbus or Cæsalpinus, belonged the laurel of Harvey.

[3] Realdus Columbus (*De Re Anatomica*, 1559) formally denies the permeability of the heart, yet correctly teaches that blood and spirits pass from the right to the left ventricle, not through the septum,

In his treatise Harvey proves (1) that it is the contraction, not the dilatation of the heart which coincides with the pulse, and that the ventricles as true muscular sacs squeeze the blood which they contain into the aorta and pulmonary artery; (2) that the pulse is not produced by the arteries enlarging and so filling, but by the arteries being filled with blood and so enlarging; (3) that there are no pores in the septum of the heart, so that the whole blood in the right ventricle is sent to the lungs and round by the pulmonary veins to the left ventricle, and also that the whole blood in the left ventricle is again sent into the arteries, round by the smaller veins into the venæ cavæ, and by them to the right ventricle again—thus making a complete "circulation"; (4) that the blood in the arteries and that in the veins is the same blood; (5) that the action of the right and left sides of the heart, auricles, ventricles, and valves, is the same, the mechanism in both being for reception and propulsion of liquid and not of air, since the blood on the right side, though mixed with air, is still blood; (6) that the blood sent through the arteries to the tissues is not all used, but that most of it runs through into the veins; (7) that there is no to and fro undulation in the veins, but a constant stream from the distant parts towards the heart; (8) that the dynamical starting point of the blood is the heart and not the liver.

The *method* by which Harvey arrived at his complete and almost faultless solution of the most fundamental and difficult problem in physiology has been often discussed, and is well worthy of attention. He begins his treatise by pointing out the many inconsistencies and defects in the [illegible] theory, [illegible] the writings of Galen himself, of Fabricius, Columbus, and others, with great respect, but with unflinching criticism. For, in his own noble language, wise men must learn anatomy, not from the decrees of philosophers, but from the fabric of nature herself, "nec ita [illegible] He had, [illegible] not only furnished himself with all the knowledge that books and the instruction of the best anatomists of Italy could give, but, by a long series of dissections, had gained a far more complete knowledge of the comparative anatomy of the heart and vessels than any contemporary—we may almost say than any successor, until the times of Hunter and Meckel. Thus equipped, he tells us that he began his investigations into the movements of the heart and blood by looking at them—*i.e.*, by seeing their action in living animals. After a modest preface, he heads his first chapter "Ex vivorum dissectione, qualis sit cordis motus." He minutely describes what he saw and handled in dogs, pigs, serpents, frogs, and fishes, and even in slugs, oysters, lobsters, and insects, in the transparent *minima squilla*, "quæ Anglice dicitur *a shrimp*," and lastly in the chick while still in the shell. In these investigations he used a *perspicillum* or simple lens. He particularly describes his observations and experiments on the ventricles, the auricles, the arteries, and the veins. He shows how the arrangement of the vessels in the fœtus supports his theory. He adduces facts observed in disease as well as in health to prove the rapidity of the circulation. He explains how the mechanism of the valves in the veins is adapted, not, as Fabricius believed, to moderate the flow of blood from the heart, but to favour its flow to the heart. He estimates the capacity of each ventricle, and reckons the rate at which the whole mass of blood passes through it. He elaborately and clearly demonstrates the effect of obstruction of the blood stream in arteries or in veins, by the forceps in the case of a snake, by a ligature on the arm of a man, and illustrates his argument by figures. He then sums up his conclusion thus:—"Circulari quodam motu, in circuitu, agitari in animalibus sanguinem, et esse in perpetuo motu; et hanc esse actionem sive functionem cordis quam pulsu peragit; et omnino motus et pulsus cordis causam unam esse." Lastly, in the 15th, 16th, and 17th chapters, he adds certain confirmatory evidence, as the effect of position on the circulation, the absorption of animal poisons and of medicines applied externally, the muscular structure of the heart and the necessary working of its valves. The whole treatise, which comprises only 67 pages of large print in the quarto edition of 1766, is a model of accurate observation, patient accumulation of facts, ingenious experimentation, bold yet cautious hypothesis, and logical deduction.

In one point only was the demonstration of the circulation incomplete. Harvey could not discover the [illegible] channels by which the blood passes from the arteries to the veins. This gap in the [illegible] was supplied several years later by the great anatomist Malpighi, who in 1661 saw in the lungs of a frog, by the newly invented [illegible], how the blood passes from the one set of vessels to the other. Harvey saw all that could be seen by the [illegible] of living animals. Malpighi, [illegible] after Harvey's death, [illegible] completed the [illegible] chain of evidence. It [illegible] from Harvey [illegible] it leaves Servetus no merit at all. But in fact the existence of the channels first seen by Malpighi was as clearly pointed to by Harvey's reasoning as the existence of Neptune by the calculations of Le Verrier and of Adams.

Harvey [illegible] was well aware of the novelty and importance of his theory. He says [illegible] Dr Argent, president of the College of Physicians, which [illegible] the dedication of his treatise to Charles I., that he should not have ventured to publish a book which alone asserts that the blood passes [illegible] and flows back again by a new path, contrary to the received doctrine [illegible] if he had not set forth his theory for more than nine years in his [illegible] lectures, [illegible] brought it to perfection, and convinced his colleagues by actual demonstrations of the truth of what he advanced. He anticipated opposition, and even obloquy [illegible], from the novelty of his views. These anticipations, however, the event proved to

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[illegible] Rome, which states that [illegible] have been groundless. If we are to credit Aubrey indeed, he found that after the publication of the *De Motu* [illegible] he fell mightily in his practice, [illegible] believed by the vulgar that he was crackbrained, and all the physicians were against him. [illegible] but the [illegible] [illegible] hypotheses and [illegible] ever for- [illegible] they must soon have returned to Harvey for a hand- [illegible]. In his own profession the book was received as it [illegible]. Some [illegible] it was [illegible] to be accepted without due [illegible], but his colleagues had heard his lectures and seen his demonstrations for years, they were [illegible] convinced of the truth [illegible], and the publication [illegible] him as his [illegible] [illegible] power. [illegible] took [illegible] and [illegible] convert. Few accepted the new [illegible] of claiming the honour of it for himself, [illegible] pretended that it could be found in [illegible]. The first attack on it was a feeble [illegible] by [illegible] Primrose, a pupil of Riolanus (*Exerc. et Animadv. in [illegible] Harvei de Motu Cord. et Sang.*, 1630). Five years later Parisanus, an Italian physician, published his *Lepus Cylus de Motu Cord. et Sang.* (Venice, 1635), a still more bulky and futile [illegible]. Primrose's attacks were "imbellia plerumque" and [illegible] that of Parisanus "in quamplurimis turpes," according to the contemporary judgment of Vessling. Their dulness has protected them from further censure. Caspar Hoffmann, professor at Nuremberg, while admitting the truth of the lesser circulation in the full Harveian sense, denied the rest of the new doctrine. To him the English anatomist replied in a short letter, still extant, with great consideration yet with modest dignity, beseeching him to convince himself by actual inspection of the truth of the facts in question. He concludes—"I accept your censure in the candid and friendly spirit in which you say you wrote it; do you also the same to me, now that I have answered you in the same spirit." This letter is dated May 1636, and in that year Harvey passed through Nuremberg with the earl of Arundel, and visited Hoffmann. But he failed to convince him; "nec tamen valuit Harveius vel coram," writes Schlegel, who, however, afterwards succeeded in persuading the obstinate old Galenist to soften his opposition to the new doctrine, and thinks that his complete conversion might have been effected if he had but lived a little longer—"nec dubito quin concessisset tandem in nostra castra." While in Italy the following year Harvey visited his old university of Padua, and demonstrated his views to Professor Vessling. A few months later this eminent anatomist wrote him a courteous and sensible letter, with certain objections to the new theory. The answer to this has not been preserved, but it convinced his candid opponent, who admitted the truth of the circulation in a second letter (both were published in [illegible]), and afterwards told a friend, "Harveium nostrum si audis, agnosces cælestem sanguinis et spiritus ingressum ex arteriis per venas in dextrum cordis sinum." Meanwhile a greater convert, Descartes, in his *Discours sur la Methode* (1637) had announced his adhesion to the new doctrine, and refers to "the English physician to whom belongs the honour of having first shown that the course of the blood in the body is nothing less than a kind of perpetual movement in a circle." Walæus of Leyden, Regius of Utrecht, and Schlegel of Hamburg successively adopted the new physiology. Of these professors, Regius was mauled by the pertinacious Primrose and mauled him in return (*Spongia qua eluuntur sordes quæ Jac. Primrosius*, &c., and *Antidotum adv. Spongiam venenatam Henr. Regii*). Descartes afterwards repeated Harvey's vivisections, and, more convinced than ever, demolished an unlucky Professor Plempius of Louvain, who had written on the other side. Dr George Ent also published an *Apologia pro Circulatione Sanguinis* in answer to Parisanus.

At last Riolan ventured to publish his *Enchiridium Anatomicum* (1648), in which he attacks Harvey's theory, and proposes one of his own. Riolan had accompanied the queen dowager of France (Maria de' Medici) on a visit to her daughter at Whitehall, and had there met Harvey and discussed his theory. He was, in the opinion of the judicious Haller, "vir asper et in nuperos suosque coævos inimitis ac nemini parcens, nimis avidus suarum laudum præco, et se ipso fatente anatomicorum princeps." Harvey replied to the *Enchiridium* with perfectly courteous language and perfectly conclusive arguments, in two letters *De Circulatione Sanguinis*, which were published at Cambridge in 1649, and are still well worth reading. He speaks here of the "circuitus sanguinis a me inventus." Riolan was unconvinced, but lived to see another professor of anatomy appointed in his own university who taught Harvey's doctrines. Even in Italy, Trullius, professor of anatomy at Rome, expounded the new doctrine in 1651. But the most illustrious converts were Pecquet of Dieppe, the discoverer of the thoracic duct, and of the true course of the lacteal vessels, and Thomas Bartholinus of Copenhagen, in his *Anatome ex omnium Veterum Recentiorumque Observationibus, imprimis Institutionibus beati mei parentis Caspari Bartholini, ad Circulationem Harveianam et vasa lymphatica renovata* (Leyden, 1651). At last Plempius also retracted all his objections; for, as he candidly stated, "having opened the bodies of a few living dogs, I find that all Harvey's statements are perfectly true." Hobbes of Malmesbury could thus say in the preface to his *Elementa Philosophiæ* that his friend Harvey, "solus quod sciam, doctrinam novam superata invidia vivens stabilivit."

It has been made a reproach to Harvey that he failed to appreciate the importance of the discoveries of the lacteal and lymphatic vessels by Aselli, Pecquet, and Bartholinus. In three letters on the subject, one to Dr Morison of Paris (1652) and two to Dr Horst of Darmstadt ([illegible]), a correspondent of Bartholinus, he discusses these observations, and shows himself unconvinced of their accuracy. He writes, however, with great moderation and reasonableness, and excuses himself from investigating the subject further on the score of the infirmities of age; he was then above seventy-four. The following quotation shows the spirit of these letters. "Laudo equidem summopere D. Pecqueti aliorumque in indagandâ veritate industriam singularem, nec dubito quin multa adhuc in Democriti puteo abscondita sint, a venturo sæculi indefatigabili diligentia expromenda." Bartholin, though personally disappointed in not having Harvey's concurrence, speaks of him with the utmost respect, and generously says that the glory of discovering the movements of the heart and of the blood was enough for one man.

Harvey's Work on Generation.—We have seen how Dr Ent persuaded his friend to publish this book in 1651. It is between five and six times as long as the *Exerc. de Motu Cord. et Sang.*, and is followed by excursus *De Partu*, *De Uteri Membranis*, *De Conceptione*; but, though the fruit of as patient and extensive observations, its value is far inferior. The subject was far more abstruse, and in fact inaccessible to proper investigation without the aid of the microscope. And the field was almost untrodden since the days of Aristotle. Fabricius, Harvey's master, in his work *De Formatione Ovi et Pulli* (1621), had alone preceded him in modern times. Moreover, the seventy-two chapters which form the book lack the coordination so conspicuous in the earlier treatise, and some of them seem almost like detached chapters of a system which was never completed or finally revised.

Aristotle had believed that the male parent furnished the body of the future embryo, while the female only nourished and formed the seed; this is in fact the theory on which, in the *Eumenides* of Æschylus, Apollo obtains the acquittal of Orestes. Galen taught almost as erroneously that each parent contributes seeds, the union of which produced the young animal. Harvey, after speaking with due honour of Aristotle and Fabricius, begins rightly "ab ovo"; for, as he remarks, "eggs cost little and are always and everywhere to be had," and moreover "almost all animals, even those which bring forth their young alive, and man himself, are produced from eggs" ("omnia omnino animalia, etiam vivipara, atque hominem adeo ipsum, ex ovo progigni"). This dictum, usually quoted as "omne vivum ex ovo," would alone stamp this work as worthy of the discoverer of the circulation of the blood, but it was a prevision of genius, and was not proved to be a fact until Von Baer discovered the mammalian ovum in 1827. Harvey proceeds with a careful anatomical description of the ovary and oviduct of the hen, describes the new-laid egg, and then gives an account of the appearance seen on the successive days of incubation, from the 1st to the 6th, the 10th, and the 14th, and lastly describes the process of hatching. He then comments upon and corrects the opinions of Aristotle and Fabricius, declares against spontaneous generation (though in one passage he seems to admit the current doctrine of production of worms by putrefaction as an exception), proves that there is no *semen fœmineum*, that the chalazæ of the hen's egg are not the *semen galli*, and that both parents contribute to the formation of the egg. He describes accurately the first appearance of the ovarian ova as mere specks, their assumption of yelk, and afterwards of albumen. In chapter xlv. he describes two methods of production of the embryo from the ovum: one is *metamorphosis*, or the direct transformation of pre-existing material, as a worm from an egg, or a butterfly from an *aurelia* (chrysalis); the other is *epigenesis*, or development with addition of parts, the true generation observed in all higher animals. Chapters xlvi.–l. are devoted to the abstruse question of the efficient cause of generation, which, after much discussion of the opinions of Aristotle and of Sennertius, Harvey refers to the action of both parents as the efficient instruments of the first great cause.[1] He then goes on to describe the order in which the several parts appear in the chick. He states that the *punctum saliens* or fœtal heart is the first organ to be seen, and explains that the nutrition of the chick is not only effected by yolk conveyed directly into the midgut, as Aristotle taught, but also by absorption from yolk and white by the umbilical or omphalomeseraic veins; on the fourth day of incubation appear two masses which he oddly names *vermiculus*, one of which develops into three vesicles, to form the cerebrum, cerebellum, and eyes, the other into the breastbone and thorax; on the sixth or seventh day come the viscera, and lastly, the feathers and other external parts. Harvey points out how nearly this order of development in the chick agrees with what he had observed in mammalian and particularly in human embryos. He notes the bifid apex of the fœtal heart in man and the equal thickness of the ventricles, the soft cartilages which represent the future bones, the large amount of liquor amnii and absence of placenta which characterize the fœtus in the third month; in the fourth the position of the testes in the abdomen, and the uterus with its Fallopian tubes resembling the uterus bicornis of the sheep; the large thymus; the cæcum, small as in the adult, not forming a second stomach as in the pig, the horse, and the hare; the lobulated kidneys, like those of the seal ("*vitulus*," sc. *marinus*) and porpoise, and the large suprarenal veins, not much smaller than those of the kidneys (emulgent). He failed, however, to trace the connexion of the urachus with the bladder. In the following chapters (lxiii.–lxxii.) he describes the process of generation in the fallow deer or the roe. After again insisting that all animals arise from ova, that a "conception" is an internal egg and an egg an extruded conception, he goes on to describe the uterus of the doe, the process of impregnation, and the subsequent development of the fœtus and its membranes, the *punctum saliens*, the cotyledons of the placenta, and the "uterine milk," to which Professor Turner has lately recalled attention. The treatise concludes with detached notes on the placenta, parturition, and allied subjects.

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[1] So in Exerc. liv.: "Superior itaque et divinior opifex, quam est homo, videtur hominem fabricare et conservare, et nobilior artifex, quam gallus, pullum ex ovo producere. Nempe agnoscimus Deum, creatorem summum atque omnipotentem, in cunctorum animalium fabrica ubique præsentem esse, et in operibus suis quasi digito monstrari. cujus in procreatione pulli instrumenta sint gallus et gallina. . . . Nec cuiquam sane hæc attributa conveniunt nisi omnipotenti rerum Principio, quocunque demum nomine idipsum appellare libuerit: sive Mentem divinam cum Aristotele, sive cum Platone Animam Mundi, aut cum aliis Naturam naturantem, vel cum ethnicis Saturnum aut Iovem; vel potius (ut nos decet) Creatorem ac Patrem omnium quæ in cœlis et terris, a quo animalia eorumque origines dependent, cujusque nutu sive effato fiunt et generantur omnia.

Harvey's other Writings and Medical Practice.—The remaining writings of Harvey which are extant are unimportant. A complete list of them will be found below, together with the titles of those which we know to be lost. Of these the most important were probably that on respiration, and the records of post-mortem examinations. From the following passage (*De Partu*, p. 550) it seems that he had a notion of respiration being connected rather with the production of animal heat than, as then generally supposed, with the cooling of the blood. "Hæc qui diligenter perpenderit, naturamque aeris diligenter introspexerit, facile opinor fatebitur eundem nec refrigerationis gratia nec in pabulum animalibus concedi. Hæc autem obiter duntaxat de respiratione diximus, proprio loco de eadem forsitan copiosius disceptaturi."

Of Harvey as a practising physician we know very little. Aubrey tell us that "he paid his visits on horseback with a footcloth, his man following on foot, as the fashion then was." He adds—"Though all of his profession would allow him to be an excellent anatomist, I never heard any that admired his therapeutic way. I knew several practitioners that would not have given threepence for one of his bills" (the apothecaries used to collect physicians' prescriptions and sell or publish them to their own profit), "and that a man could hardly tell by his bill what he did aim at." However this may have been,—and rational therapeutics was impossible when the foundation-stone of physiology had only just been laid,—we know that Harvey was an active practitioner, performing such important surgical operations as the removal of a breast, and he turned his obstetric experience to account in his book on generation. Some good practical precepts as to the conduct of labour are quoted by Willoughby, a contemporary. He also took notes of the anatomy of disease; these unfortunately perished with his other manuscripts. Otherwise we might regard him as a forerunner of Morgagni, for Harvey saw that pathology is but a branch of physiology, and like it must depend first on accurate anatomy. He speaks strongly to this purpose in his first epistle to Riolanus: "Sicut enim sanorum et boni habitus corporum dissectio plurimum ad philosophiam et rectam physiologiam facit, ita corporum morbosorum et cachecticorum inspectio potissimum ad pathologiam philosophicam." The only specimen we have of his observations in morbid anatomy is his account of the post-mortem examination made by order of the king on the body of the famous Thomas Parr, who died in 1635, at the reputed age of 152. Harvey insists on the value of physiological truths for their own sake, independently of their immediate utility; but he himself gives us an interesting example of the practical application of his theory of the circulation in the cure of a large tumour by tying the arteries which supplied it with blood (*De Generat.*, Exerc. xix.).

The following is believed to be a complete list of all the known writings of Harvey, published and unpublished:—

Exercitatio Anatomica de Motu Cordis et Sanguinis, 4to, Frankfort-on-the-Maine, 1628; *Exercitationes duæ Anatomicæ de Circulatione Sanguinis, ad Johannem Riolanum, filium, Parisiensem*, Cambridge, 1649; *Exercitationes de Generatione Animalium, quibus accedunt quædam de Partu, de Membranis ac Humoribus Uteri, et de Conceptione*, 4to, Lond., 1651; *Anatomia Thomæ Parr*, first published in the treatise of Dr John Betts, *De Ortu et Natura Sanguinis*, 8vo, Lond., 1669. Letters:—(1) to Caspar Hoffmann of Nuremberg, May 1636; (2) to Schlegel of Hamburg, April 1651; (3) three to Giovanni Nardi of Florence, July 1651, Dec. 1653, and Nov. 1655; (4) two to Dr Morrison of Paris, May 1652; (5) two to Dr Horst of Darmstadt, Feb. 1654-5 and July 1655; (6) to Dr Vlackveld of Haarlem, May 1657. His letters to Hoffmann and Schlegel are on the circulation; those to Morrison, Horst, and Vlackveld refer to the discovery of the lacteals; the two to Nardi are short letters of friendship. All these letters were published by Sir George Ent in his collected works (Leyden, 1687). Of two MS. letters, one on official business to the secretary Dorchester was printed by Dr Aveling, with a facsimile of the crabbed handwriting (*Memorials of Harvey*, 1875), and the other, about a patient, appears in Dr Willis's *Life of Harvey*, 1878. *Prelectiones anatomiæ universalis per me Gul. Harveium medicum Londinensem, anat. et chir. professorem, an. dom.* 1616, *æt.* 37,—MS. notes of his Lumleian lectures in Latin,—are in the British Museum library; they are almost illegible, but were partly deciphered and a photograph of one of the pages taken by Dr Sieveking; for an account of them see his Harveian Lecture for 1877. A second MS. has been discovered in the British Museum, entitled *Gulielmus Harveus de Musculis, Motu Locali*, &c., and an account of it was published by Dr George Paget (*Notice of an unpublished MS. of Harvey*, Lond., 1850). The following treatises, or notes towards them, were lost either in the pillaging of Harvey's house, or perhaps in the fire of London, which destroyed the old College of Physicians:—*A Treatise on Respiration*, promised, and probably at least in part completed (pp. 82, 550, ed. 1766); *Observationes de usu Lienis*; *Observationes de motu locali*, perhaps identical with the above-mentioned manuscript; *Tractatus physiologicus*; *Anatomica medicalis*, apparently notes of morbid anatomy; *De Generatione Insectorum*. The fine 4to edition of Harvey's *Works*, published by the Royal College of Physicians in 1766, was superintended by Dr Mark Akenside; it contains the two treatises, the account of the post-mortem examination of old Parr, and the six letters enumerated above. A translation of this volume by Dr Willis, with Harvey's will, was published by the Sydenham Society, 8vo, Lond., 1849.

The following are the principal biographies of Harvey:—in Aubrey's *Letters of Eminent Persons*, &c. (vol. ii., Lond., 1813), first published in 1685, the only contemporary account; in Bayle's *Dictionnaire Historique et Critique*, 1695 and 1720 (Eng. ed., 1738); in the *Biographia Britannica*, and in Aitken's *Biographical Memoirs*; the Latin Life by Dr Lawrence, prefixed to the college edition of Harvey's *Works* in 1766; memoir in *Lives of British Physicians*, Lond., 1830; a Life by Dr Robert Willis, founded on that by Lawrence, and prefixed to his English edition of Harvey in 1847; the much enlarged Life by the same author, published in 1878; the biography by Dr Munk in the *Roll of the College of Physicians*, 2d ed., vol. i., 1879.

The literature which has arisen on the great discovery of Harvey, on his methods and his merits, would fill a library. The most important contemporary writings have been mentioned above. The following list gives some of the most remarkable in modern times:—the article in Bayle's dictionary quoted above; *Two Introductory Lectures*, by Wm. Hunter, M.D., 1784; Sprengel, *Geschichte der Arzneikunde*, Halle, 1800, vol. iv.; Flourens, *Histoire de la Circulation*, 1854; Lewes, *Physiology of Common Life*, 1859, vol. ii. pp. [illegible]; Ceradini, *La Scoperta della Circolazione del Sangue*, Milan, 1876; Tollin, *Die Entdeckung des Blutkreislaufs durch Michael Servet*, Jena, 1876; Kirchner, *Die Entdeckung des Blutkreislaufes*, Berlin, 1878; Willis in his *Life of Harvey*; Wharton Jones, "Lectures on the Circulation of the Blood," *Lancet* for Oct. 25 and Nov. 1, 1879; and the *Harveian Orations*, especially those by Dr Sieveking, Dr Gull, and Prof. Rolleston. (P. H. P.-S.)

HARWICH, a municipal and parliamentary borough and seaport town of Essex, England, is situated on the extremity of a small peninsula projecting into the estuary of the Stour and Orwell, 70 miles N.E. of London by the Great Eastern Railway. It occupies an elevated situation, and a good view is obtained from Beacon Hill at the southern end of the esplanade. The town is somewhat irregularly built, but the streets though narrow are well paved. It is defended by a redoubt mounted with heavy guns and by three martello towers. The only public building of importance is the church of St Nicholas, an edifice of white brick in the Perpendicular style, with stone buttresses and steeple, erected in 1821 at a cost of £20,000. The harbour is one of the best on the east coast of England, and in stormy weather is largely taken advantage of for shelter. Its entrance is, however, encumbered with rocks, and is dangerous without a pilot. The rapid accumulation of shingle threatened some years ago to block up the principal entrance, but this has been prevented by the construction of two breakwaters, having a length respectively of 1350 and 1000 feet. The shipping trade of the port was much injured by the removal, after the introduction of steamships, of the Hamburg and other packets from the station; but since the construction of the Great Eastern Railway steam packets have plied regularly between Harwich and Antwerp and Rotterdam. In 1878 1198 British ships entered the port with a tonnage of 298,227, and 35 foreign ships with a tonnage of 10,921. The number of British ships that cleared was 1233, with a tonnage of 296,095, and of foreign ships 28, with a tonnage of 8544. The principal imports are grain, timber, and tobacco, and the principal exports cement and fish. Shipbuilding has declined since the discontinuance of the Government dockyards. The prosperity of the town depends now largely on its shrimp and lobster fisheries, but there are also Roman cement works, breweries, and manufactories for artificial manure and for sails and tackle. It is much frequented for sea-bathing, and its suburb of Dovercourt possesses a chalybeate spring, the spa-house of which contains a library and museum. Harwich in all probability occupies the site of a Roman station. In 885 a great naval battle took place opposite the town between the Danes and the fleet of King Alfred, and in 1666 another took place between the Dutch and the English. Harwich was created a parliamentary borough by King Edward II. in 1318 with the privilege of returning two members, but since the Reform Act of 1867 it has returned only one. The population of the municipal and parliamentary borough in 1871 was 6079.

HARZ MOUNTAINS, THE (also spelt HARTZ, the German *Harzgebirge*, and the ancient *Silva Hercynia*), the most northerly mountain-system of Germany, situated between the rivers Weser and Elbe, occupy an area of about 786 square miles, of which 457 belong to Prussia, 286 to Brunswick, and 43 to Anhalt. Their greatest length extends in a S.E. and N.W. direction for about 56 miles, and their maximum breadth is about 20 miles. The group is made up of an irregular series of terraced plateaus, rising here and there into rounded summits, and intersected in various directions by narrow, deep valleys. The N.W. and higher part of the mass is called the Ober or Upper Harz; the S.E. and more extensive part, the Unter or Lower Harz, while the N.W. and S.W. slopes of the Upper Harz form the Vorharz. The Brocken group, which divides the Upper and Lower Harz, is generally regarded as a part of the former. The prevalent upper geological formation of the whole district is greywacke and clay-slate, through which the granite here and there protrudes, as in the case of the Brocken. The highest summits of the Upper Harz are the Brocken (3742 feet), the Heinrichshöhe (3402 feet), the Greater and Less Konigsberg (3376 feet and 3369 feet), and the Wormberg (3182 feet); the Lower Harz, the Auersberg (1870 feet), and the Victorshöhe (1762 feet). The towns in the district, though not large, are tolerably numerous. The principal are—in the Upper Harz, Goslar, Klausthal, Zellerfeld, Andreasberg, Altenau, Lautenthal, Wildemann, Grund, Harzburg, Ilsenburg, and Wernigerode; and in the Lower Harz, Harzgerode, Elbingerode, Rubeland, Quedlinburg, Ballenstedt, Gernrode, Suderode, Blankenburg, Thale, and Stolberg.

The chief industry is mining, which has been carried on since the middle of the 10th century. The Harz is second only to the Erzgebirge among the mountains of Germany in mineral wealth. The most important mineral is a peculiarly rich argentiferous lead, but gold in small quantities, copper, iron, sulphur, alum, and arsenic are also found. Marble, granite, and gypsum are worked; and large quantities of vitriol are manufactured. The vast forests that cover the mountain slopes supply the materials for a very considerable trade in timber. Much wood is exported for building and other purposes, while in the Harz itself no other fuel is used, whether for smelting the ores, which is done at the mines, or for domestic use. Employment is thus given to a large number of charcoal burners. The saw-dust of the numerous wood-factories is collected for use in the manufacture of paper. Turf-cutting, coarse lace-making, and the breeding of canaries and native song birds also occupy many of the people. Agriculture is carried on chiefly on the plateaus of the Lower Harz; but there is excellent pasturage both in the north and in the south. In the Lower Harz, as in Switzerland, the cows, which carry bells harmoniously tuned, are driven up into the heights in early summer, returning to the sheltered regions in late autumn.

The Harz being the first obstacle to oppose the moist, cold winds from the North Sea, the northern summits are destitute of trees, but the lower slopes of the Upper Harz are heavily wooded with pines and firs. Between the forests of these stretch numerous peat-mosses, which contain in their spongy reservoirs the sources of many small streams. On the Brocken are found one or two arctic and several alpine plants. In the Lower Harz the forests contain a great variety of timber. The oak, elm, and birch are common, while the beech especially attains an unusual size and beauty. The walnut-tree grows in the eastern districts.

The last bear was killed in the Harz in 1705, and the last lynx in 1817, and since that time the wolf too has become extinct; but deer, foxes, wild cats, and badgers are still to be found in the forests.

The streams are very numerous, but are all small. While they are rendered extensively useful, by various skilful artifices, in working the mines underground, at other parts of their course they present the most picturesque scenery in all the picturesque Harz. Perhaps the finest valley is the rocky Bodethal, with the Ross-Trappe, the Hexentanzplatz, the Baumannshöhle, and the Bielshöhle.

The inhabitants, about 70,000 in number, are descended from various stocks. The Upper and Lower Saxon, the Thuringian, and the Frankish races have all contributed to form the present people, and their respective influences are still to be traced in the varieties of dialect. The boundary line between High and Low German passes through the Harz.

The Harz is now one of the most frequented tourist resorts of Germany. It is traversed by excellent roads in all directions, and is completely girt by railways from the principal towns of the empire. The chief point of interest is undoubtedly the Brocken or Blocksberg, famous as the scene of the "Walpurgisnacht" in Goethe's *Faust*, as well as for the atmospherical phenomena of which the "spectre of the Brocken" (see HALO) is the best known. The Harz was the last stronghold of paganism in Germany, and to that fact are due the weird legends, in which no district is [illegible], and the wild and fanciful names that are given by the people to the peculiar objects and appearances of nature.

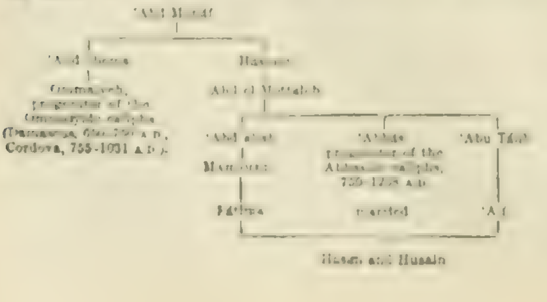
Literature.—A very full list of works on the Harz, especially on the Brocken, will be found appended to the pamphlet *Zur Geschichte des Brockenwesens*, 4th ed., Aschersleben and Leipsic, 1875. See also Hoffmann, *Harz*[illegible], [illegible]; Hausmann, [illegible] *Harzes*, Klausthal, 1827; Zimmermann, *Harzgebirge*, Darmstadt, 1834; Hoffmann, [illegible] *Harzes*, Göttingen, 1836; Hausmann, [illegible] *Harzgebirge*, Göttingen, 1842; [illegible], 1851; [illegible], *Der Harz*, [illegible]; Lachmann, [illegible] *des Harzgebirges*, Braunschweig, 1851; Spieker, *Der Harz* [illegible], Berlin, 1852 and 1856; [illegible], *Harzbuch*, Gotha, 1856; [illegible], 1864; [illegible], 1870, *Harz und Kyffhäuser* [illegible], &c., 1870, and *Der Harz*, 1873; [illegible] *Harz und* [illegible], Berlin, 1877; [illegible], London, 1877; Mrs Barton, [illegible] *Harz Forest*, Edinburgh, 1867; [illegible], *Geschichte des Harzes*, Klausthal, 1871; [illegible] *Harz*, [illegible], 1877; Blackburn, *The Harz Mountains, a Tour*, London, 1877; [illegible], "Unter dem Harz," 1877; Rev. J. S. [illegible] and J. W. [illegible], in [illegible], vol. xxx; Heine, *Harzreise*. Among the Handbooks may be noted those of [illegible], Werner, Gottschalk, Meyer, Müller, Pröhle, and Grieben.

HARZBURG, or NEUSTADT-HARZBURG, the chief town of an office in the Brunswick circle of Wolfenbüttel, Prussia, is situated 727 feet above sea-level on the right bank of the Radau, a tributary of the Ocker, and at the terminus of the Brunswick-Harzburg Railway, 5 miles E.S.E. from Goslar and 18 miles S. from Wolfenbüttel. The opening of the railway has made the Harzburg route a principal one for persons visiting the Harz, and the town is also much frequented as a summer residence. It possesses a salt-water bath and also a hydropathic establishment. A mile and a half south from the town lies the Burgberg, 1500 feet above sea-level, on whose summit, according to tradition, there was at one time an altar to the heathen idol Krodo, still to be seen in the Ulrich chapel at Goslar. There are now on the summit of the hill a hotel, the remains of an old castle, and a monument erected in 1875 to the honour of Prince Bismarck, with an inscription taken from one of his speeches against the Ultramontane claims of Rome—"Nach Canossa gehen wir nicht." The population of Harzburg in 1875, including the villages of Bündheim, Schulenrode, and Schlewecke, was 4271.

The castle was built by the emperor Henry IV. between 1065 and [illegible], but was laid in ruins by the Saxons about [illegible]. By Frederick I. it was granted to Henry the Lion, who [illegible]. It was the [illegible] residence of Otto IV., who died at it, and by his will granted it to the counts of Wernigerode. After being frequently besieged and taken, it came, after the battle of [illegible] in 15[illegible], passed to the house of Brunswick. It ceased to be of any importance as a fortress after the Thirty Years' War, and gradually fell into ruins.

See [illegible] *Geschichte der Harzburg*, Halberstadt, 18[illegible]; [illegible], *Harzburg und seine Umgebung*, [illegible], 1862; [illegible], *Die Harzburg, nach* [illegible] *und Geschichte*, [illegible], 18[illegible].

HASAN AND HUSEIN, the sons of 'Alí ibn Abu Tálib, cousin and son-in-law of Mahomet, and heroes of the passion play performed annually throughout India and Persia by Shiah Mahometans in the month of Moharram. Their relationship to the prophet is important to the understanding of their history, and may be seen from the following table:—


'Abd Menâf
'Abd Shems
Hashim
Ommaiyeh, progenitor of the Ommaiyide caliphs (Damascus, 661-750 A.D.; Cordova, 755-1031 A.D.).
'Abd el Muttalib
'Abdallah
'Abbás progenitor of the Abbaside caliphs, 750-1258 A.D.
'Abu Tálib
Mahomet
Fátima
married
'Alí
Hasan and Husein

The office of guardian of the kaabeh or temple of Mecca, and chief of the tribe of Koreish, which was vested in 'Abd Menâf, would have descended to 'Abd Shems, his eldest son, had it not been given to Hashim, the second, in reward for some military successes, and this circumstance caused a bitter enmity between the two families. When Mahomet died, 'Alí claimed the right to the office of caliph (*Khalífah*, "vicegerent" or "successor"), but found formidable rivals in Abu Bekr, the father of 'Ayesha the prophet's favourite wife, 'Omar, another of his fathers-in-law, and 'Othmán, the only member of the rival house of Ommaiyeh who had joined the Moslem ranks. 'Ayesha, whom 'Alí had mortally offended by listening to a charge of inconstancy which had been made against her, made common cause with the Ommaiyides, and strenuously opposed 'Alí's succession. A compromise was effected by the election of Abu Bekr; on his death 'Omar was made caliph, and when he in turn died, 'Othman was elected, as 'Alí refused to subscribe to the conditions imposed upon him that he should govern in accordance with the "traditions" as well as the Korán. These "traditions" are the whole body of ceremonial laws and customs by which the imperfect code of the Korán was supplemented; they are derived from ancient Arab and even Jewish usage, although to give them a proper sanction and force they have been attributed to Mahomet himself, who is supposed to have enunciated them at different times as separate *ahádíth* (singular, *hadíth*), and the tracing of them through the various authorities to the prophet himself is still a most important branch of Moslem theology.

The "traditions" are spoken of collectively as the *Sunnah*, whence the name Sunnis, given to that sect of Mahometans who follow them, and it was to this that 'Alí refused to subscribe. 'Othman on his accession displayed an unblushing partisanship for his own, the Ommaiyide, family, and appointed Mo'awiyeh, a bitter enemy of the Hashimi family, governor of Syria. 'Othman was assassinated in 655 A.D., and 'Alí was then unconditionally elected caliph. He immediately recalled Mo'awiyeh, who refused to obey, and, supported by the influence of the implacable 'Ayesha, claimed the caliphate for himself. A severe struggle between the two parties ensued, and 'Alí was at first successful, but was at length compelled by intrigue to submit his claims to arbitration, instead of following up his military advantages. A number of his followers, about 12,000, taking umbrage at this, deserted him, thus originating the sect of Khárejiyeh or "Separatists," who reject the lawful government established by public consent. A conspiracy of three of these deserters resulted in the murder of 'Alí, who was slain at the door of a mosque in Kúfa, and buried at a spot about 5 miles from that town. A magnificent mausoleum was afterwards erected over his tomb, which became later on the site of the town Meshed 'Alí, "'Alí's shrine," one of the great places of resort for Shiah pilgrims. On 'Alí's death his eldest son Hasan was elected caliph, but resigned the office in favour of Mo'awiyeh on condition that he should resume it at the latter's death. Mo'awiyeh, however, who wished his own son Yezíd to succeed him, caused Hasan to be foully murdered by his own wife eight years later. Yezíd succeeded his father, on the latter's death, without opposition or election, and the Ommaiyide dynasty became thus firmly established on the throne. The partisans of 'Alí's family were, however, far from content, and Husein, 'Alí's surviving son, was secretly invited to Kúfa to place himself at the head of the party, and revolt against Yezíd. Prompt measures were taken by the caliph, who had obtained timely warning of the movement. 'Obeidallah, a vigorous officer, was appointed governor of Kúfa, seized upon Husein's envoy, Muslim, and one Hani in whose house he had been concealed, and when the populace assembled and clamoured for their release he caused them to be beheaded and their heads to be cast down among the crowd. Husein was intercepted on the borders of Babylonia by Harro, with a company of horse, who told him he had orders to bring him alone to Kufa, but allowed him to proceed by what route he chose without losing sight of him. A horseman met them on the road with secret orders from 'Obeidallah to lead Husein into an open and undefended place, and halt until 'Amer, the commander of the Syrian army, arrived with his forces. This happened the next day, and Husein and his small escort were surrounded by 4000 horse, and slaughtered, after a stubborn resistance, on the plain of Kerbelá by the banks of the Euphrates, under peculiarly tragic circumstances, his little son 'Abdallah, and his nephew, a beautiful child, both being murdered in his arms. This took place on the 10th of Moharram 61 A.H. (680 A.D.), and is commemorated during that month by the Shiahs in India and Persia, a long miracle play being performed, the scenes of which are carried on from day to day, and culminate in carrying out the *tabút* or coffins of the martyrs to an open place, generally the cemetery, or in sea side places to the sea-shore.

The cause of 'Alí and his family was warmly expoused by the Persians, who had been forced to embrace Islam, but who regarded the Sunneh or Semitic law with especial repugnance. The party were known as Shiahs, "Sectarians;" and as the quarrel between them and the Sunnis thus perpetuates the old enmity between Jew and Gentile, between the Semitic and Aryan races, it has produced an irreparable breach in Islam.

The passion play of *Hasan and Husein* has been published in English by Sir Lewis Pelly (London, 1879, 2 vols. 8vo) from the dictation of native teachers and performers of the drama. (E. H. P.)

HASBEYA, or HASBEIYA, a town of the Druses, about 36 miles west of Damascus, is situated at the foot of Mount Hermon in Syria, overlooking a deep amphitheatre, from which a brook flows to the Hasbáni. Both sides of the valley are planted in terraces with olives, vines, and other fruit trees. The grapes are either dried, or made into a kind of syrup. About four fifths of the inhabitants are Christians, and in 1846 an American Protestant mission was established in the town. This little community suffered much persecution at first from the Greek Church, and afterwards from the Druses, by whom in 1860 nearly 1000 Christians were massacred, while others escaped to Tyre or Sidon. The castle in Hasbeya was held by the crusaders under Count Oran; but in 1171 the Druse emirs of the great Shehaab family (see DRUSES) recaptured it. In 1205 this family was confirmed in the lordship of the town and district, which they held till the Turkish authorities took possession of the castle in the present century. Near Hasbeya are bitumen pits let by Government; and to the north, at the source of the Hasbáni, the ground is volcanic. Some travellers have identified Hasbeya with the Biblical Baal-Gad, or Baal Hermon,—a supposition rendered the more likely by the ruins of several temples near the town. Population about 5000.

HASDRUBAL. Of the bearers of this very common Carthaginian name the most famous are the following:—

1. One of the leaders of the popular party at the close of the First Punic War. He was conspicuous for his dexterous management in politics and his conciliatory manners. He married the daughter of Hamilcar Barca; and his skilful and cordial co-operation was of enormous consequence to Hamilcar during his Spanish wars. He went to Spain with his father in law, but soon returned to Carthage, where his talents were specially needed to conduct the party at home. He was, however, in Spain when Hamilcar fell (229); and was soon formally appointed by the home Government to the command which he had at once assumed. Devoting himself most successfully to the task of consolidating the Carthaginian power in Spain, he founded New Carthage as the Spanish capital, and married the daughter of a Spanish chief. His kindly and generous manner attached the natives to him, and brought many over to the Carthaginian alliance. In 221 he fell by the hand of an assassin. The account given of him by Polybius is much more favourable and far more trustworthy than that of the Roman author Fabius whom he refers to.

2. The second son of the great Hamilcar. He was left by Hannibal as commander in Spain (219 B.C.), where he had to contend with the two Scipios, Cneius and Publius. Three years were spent in desultory warfare, in which the Romans were generally successful. After the battle of Cannæ, Hasdrubal was ordered to march into Italy, while Himilco was sent from Carthage with a fresh army to supply his place. But a decisive battle on the Ebro, in which he was totally defeated, checked his northward march. It is hardly possible to exaggerate the importance of this battle. Had a fresh Carthaginian army joined Hannibal in Italy for the campaign of 215 or 214, the danger to Rome would have been infinitely increased. Several years now passed, marked by the Roman historians with fresh Roman victories; and it is certain that the struggle continued doubtful till 212, when both the Scipios were defeated and slain. In spite of this great success, Hasdrubal was not at the moment able to begin the march on Italy. The Romans were skilfully rallied by Lucius Marcius, and in 211 a fresh army under the prætor Nero landed in Spain. At the same time there seems to have been no co-operation among the Carthaginian generals; and when the younger Scipio landed in Spain (210) he found their armies widely separated. Taking advantage of this, Scipio by a sudden attack (209) captured New Carthage, which contained vast military stores, all the Spanish hostages, and 10,000 captives. To achieve this brilliant success he had to leave the road northwards undefended; and although he rapidly returned and (according to the Roman accounts) defeated Hasdrubal at Bæcula in Andalusia, the Carthaginian general was able to make his way with a strong army to the Pyrenees, which he crossed in safety near the western extremity. The whole course of the Spanish wars, and especially the chronology of these later events, are very obscure. At all events Hasdrubal, after a very rapid and skilful march across the whole breadth of Gaul, appeared early in 207 in the north of Italy. When once he had succeeded in getting out of Spain, this brilliant march proved Hasdrubal worthy of his father and his brother; and long as it had taken to carry out his plan, we must remember that after the Romans perceived the necessity of keeping him back from Italy the difficulties in his way were enormous. On hearing of the passage of the Pyrenees, the Romans raised extraordinary levies, but before they had taken any steps to meet him, Hasdrubal was already in Cisalpine Gaul. Hannibal was still in Apulia, perhaps not expecting his brother so soon; Hasdrubal sent to meet him two Numidian horsemen with four Gauls, who almost at the end of their perilous journey fell into the hands of the consul Nero. In the meantime Hasdrubal had advanced into Umbria, where the plebeian consul Livius was encamped near Sena. Nero, with 7000 men, left his own camp, and by a rapid march, which must be ranked among the most important events of the war, joined his colleague. The united army was much too strong for Hasdrubal. He tried to avoid a battle, but his guides failed him, and he was forced to fight on the south bank of the Metaurus. A long and bloody conflict resulted in the complete defeat of the Carthaginians, and Hasdrubal, after all was lost, fell sword in hand in the midst of the enemy. His head, which was thrown by Nero's soldiers into Hannibal's camp, first revealed to the latter his brother's defeat and the ruin of the Carthaginian cause.

HASLINGDEN, a market-town of Lancashire, England, is situated 7 miles S.E. of Blackburn, in a hilly district on the borders of the forest of Rossendale, and is supposed by some to derive its name from the hazel trees which at one time abounded in its neighbourhood. The town formerly stood on the slope of a hill, but the modern part, which is substantially built of stone, has been erected at its base. The parish church dedicated to St James was, with the exception of the tower, which dates from the time of Henry VIII., rebuilt in 1780, and the whole structure was restored in 1879. Handsome schools are attached, to which there is an endowment for ten poor boys, founded in 1749. The principal other buildings are the mechanics' institute, the town hall, where the sessions and county court are held, and the public hall for assemblies. The woollen manufacture, formerly the staple of the town, has now been superseded by that of cotton, and there are also silk manufactures, iron-works, and size-works. In the vicinity there are collieries and quarries for stone, flags, and slate. The population of the town in 1861 was 6929, and 7698 in 1871, and that of the township was 10,109 and 12,000.

HASPE, a town of Prussia, province of Westphalia, government district of Arnsberg, and circle of Hagen, is situated in the valley of the Ennepe where the Hasper stream joins that river, and on the railway from Düsseldorf to Dortmund, 25 miles north-east of Düsseldorf. It has iron foundries, rolling mills, puddling furnaces, and manufactures of iron, steel, and brass wares, and of machines. Haspe was raised to the rank of a town in 1874. The population in 1875 was 7930.

HASSAN, a district of Mysore, India, lying between 12° 30′ and 13° 22′ N. lat. and between 75° 32′ and 76° 58′ E. long. It is bounded on the S.W. by the Madras district of South Kanara, and on the S. partly by the state of Coorg. The main portion of the district consists of the river basin of the Hemavati and its tributaries. It naturally divides into two portions, the Malnád or hill country, which includes some of the highest ranges of the Western Gháts, and the Maidán or plain country, sloping towards the south. The Hemavati, which flows into the Cauvery in the extreme south, is the great river of the district; its most important tributary is the Yagachi. The upper slopes of the Western Gháts are abundantly clothed with magnificent forests, and wild animals of all sorts abound. Among the mineral products are kaolin, felspar, and quartz. The soil of the valleys is a rich red alluvial loam.

The area extends to 3291 square miles. The census of 1871 returned the inhabitants at 669,961—329,097 males and 340,864 females—the Hindus numbering 650,877, Mahometans 14,460, Jains 1954, Christians 2670. Hassan town and Narsipur each contain more than 5000 inhabitants. The staple crops consist of *ragi*, rice, tobacco, sugar-cane, the cocoa-nut and areca-nut palms, plantain trees, and chillies. Coffee cultivation has been on the increase of late years. The first plantation was opened in 1843, and now there are 155 coffee estates owned by Europeans and 9500 native holdings. The statistics of irrigation show a total of 6905 tanks in the district and 215 miles of canals. The exports are large, consisting chiefly of food-grains and coffee. The imports are European piece goods, hardware of all sorts, and spices. The largest weekly fair is held at Alur. A great annual religious gathering and fair, attended by about 10,000 persons, takes place every year at Melukot. The gross revenue amounted in 1873–74 to £126,[illegible], and the police force in 1874 numbered 670 men of all ranks, maintained at a cost of £23,602. There were 213 schools in 1874 aided by Government, attended by 4370 pupils, and 147 unaided with 1657 pupils. The average mean temperature of the district is 76°, and the average rainfall at Hassan town during seven years was 36 inches. In the Ghats as much as 180 inches sometimes fall in the year. Malarious fever prevails in the Malnád during the early rains.

The real history of Hassan does not begin until the epoch of the Ballala dynasty, which lasted from the 10th till the 14th century. Their capital was at Dwarasamudra, the ruins of which are still to be seen scattered round the village of Halebid in this district. The earlier kings professed the Jain faith, but the finest temples were erected to Siva by the later monarchs of the line. While they were at the zenith of their power the whole of southern India acknowledged their sway. After the Mahometan invasion in the 14th century, the district of Hassan ceased to exist as the seat of a metropolis, and became a remote province known as Balam. Since 1832 the district, with the rest of Mysore, has been under direct British administration.

HASSAN. See ASSASSINS, vol. ii. p. 723.

HASSE, JOHANN ADOLPH (1699–1783), a musical composer, is a striking instance of the instability of fame. One of the most prolific and most celebrated composers of the 18th century, he is now all but forgotten, and his extant works rest quietly on the shelves of public libraries. He was born at Bergedorf near Hamburg, on March 25, 1699, and received his first musical education from his father. Being possessed of a fine tenor voice, he chose the theatrical career, and joined the operatic troupe conducted by Reinhard Keiser at Hamburg, the same Keiser in whose orchestra Handel had played the second violin some years before. Hasse's success led to an engagement at the court theatre of Brunswick, and it was there that, in 1723, he made his début as a composer with the opera *Antigonus*. The success of this first work induced the duke to send Hasse to Italy for the completion of his studies, and in 1724 he went to Naples and placed himself under the tuition of the celebrated Porpora, with whom, however, he seems to have disagreed both as a man and as an artist. On the other hand he gained the friendship of Alessandro Scarlatti, to whom he owed his first commission for a serenade for two voices, sung at a family celebration of a wealthy merchant by two of the greatest singers of Italy, Farinelli and Signora Tesi. This event established Hasse's fame; he soon became very popular by the name of "il caro Sassone," and his opera *Sesostrato*, written for and produced at the Royal Opera at Naples in 1726, made his name known all over Italy. At Venice, where he went in 1727, he and his works were received with equal favour It was there that he became acquainted with the celebrated singer Faustina Bordoni, better known as Faustina Hasse, for she became the composer's wife in 1730. The artist-couple soon afterwards went to Dresden, in compliance with a brilliant offer made to them by the splendour-loving elector of Saxony, Augustus II. There Hasse remained for two years, after which he again journeyed to Italy, and also in 1733 to London, in which latter city he was tempted by the aristocratic clique inimical to Handel to become the rival and antagonist of that great master. But this he modestly and wisely declined, remaining in London only long enough to superintend the rehearsals for his opera *Artaserse*. All this while Faustina had remained at Dresden, the declared favourite of the public and unfortunately also of the elector, her husband, who remained attached to her, being allowed to see her only at long intervals. In 1739, after the death of Augustus II., Hasse settled permanently at Dresden till 1763, when he and his wife retired from court service with considerable pensions. But Hasse was still too young to rest on his laurels. He went with his family to Vienna, and added several operas to the great number of his works already in existence. His last work for the stage was the opera *Ruggiero*, written for the wedding of Archduke Ferdinand at Milan. On the same occasion a dramatic cantata by Mozart, then (1771) fourteen years old, was performed, and Hasse is said to have prophesied Mozart's future greatness much in the same manner as Mozart himself predicted that of Beethoven. By desire of his wife Hasse settled at her birthplace Venice, and there he died December 23, 1783. His compositions were innumerable, including as many as 120 operas, besides oratorios, cantatas, masses, and almost every variety of instrumental music. It would be needless to criticize or give the titles of these compositions, for most of them are, as was said before, totally and not unjustly forgotten. Moreover, comparatively few of them have escaped destruction. During the siege of Dresden by the Prussians in 1760, most of his manuscripts, collected for a complete edition to be brought out at the expense of the elector, were burnt. Some of his works, amongst them an opera *Alcide al Bivio*, have been published, and the libraries of Vienna and Dresden possess the autographs of others. Hasse's instrumentation is certainly not above the low level attained by the average musicians of his time, and his ensembles do not present any features of interest. In dramatic fire also he was wanting, but he had a fund of gentle and genuine melody, and by this fact his enormous popularity during his life must be accounted for. The two airs which Farinelli had to repeat every day for ten years to the melancholy king of Spain, Philip V., were both from Hasse's works. Of Faustina Hasse, almost as celebrated as her husband, most that is necessary has been said above. It will be sufficient to add that she was born at Venice in 1700, sang at Vienna, London (under Handel, 1726), and Dresden, and was, according to the unanimous verdict of the critics (including Dr Burney), one of the greatest singers of a time rich in vocal artists. The year of her death is not exactly known. Most probably it shortly preceded that of her husband.

HASSELQUIST, Frederick (1722-1752), a Swedish traveller and naturalist, was born near Linkoeping in East Gothland, 3 January 1722. He lost his father at an early age, and his uncle, his sole remaining protector, in his thirteenth year, but succeeded by means of private teaching in supporting himself while continuing his education. In 1741 he entered the university of Upsala, where his taste for the study of nature was fostered and developed by Linnæus, and where in 1747 he obtained licence in medicine, and published a thesis entitled *De Viribus Plantarum*. On account of the frequently expressed regrets of Linnæus at the lack of information regarding the natural history of Palestine, Hasselquist resolved to undertake a journey to that country, and a sufficient subscription having been obtained to defray expenses, he, after making himself acquainted with the languages of the Levant, embarked for Smyrna, where he arrived November 26, 1749. He visited parts of Asia Minor, Egypt, Cyprus, and Palestine, and made large natural history collections, but his constitution, naturally weak, gave way under the fatigues and anxieties of travel, and he died at Smyrna, February 9, 1752, on his way homewards. His collections reached home in safety, and five years after his death the results of his wanderings were published by Linnæus under the title *Resa till Heliga Landet forattad från år* 1749 *till* 1752. The work is divided into two parts, the first consisting of the traveller's journal and letters, and the second of his remarks on the botany, zoology, and mineralogy of the countries through which he passed, with observations on the prevalent diseases and their cure, and the state of industry, commerce, and the arts. It was translated into French and German in 1762, and into English in 1766.

HASSELT, a town of Belgium, capital of the province of Limburg, is situated on the Demer and on the railway from Aix-la-Chapelle to Maestricht, 20 miles north-west of Liege. It possesses two churches, a hospital, a spacious town hall, an athenæum, and a public library. Tobacco and madder are cultivated in the neighbourhood. The principal manufactures are linen, lace, brandy, and beer. At Hasselt the Dutch under the prince of Orange gained a victory over the Belgians under General Daine, 6th May 1831. The population in 1876 was 11,361.

HASSENPFLUG, Hans Daniel Ludwig Friedrich (1793-1862), a minister of state in Hesse-Cassel, celebrated as a reactionary, was born at Hanau, in the electorate of Hesse, in 1793. He studied law at Gottingen, and was appointed by the elector Frederick William I. (then acting as regent) to a subordinate post in that university. He rose rapidly, and proved himself a man of great resolution and energy. From the first he adopted that line of policy which made him so disliked throughout his career. He exercised, that is to say, a suspicious censorship over the press; he reduced to a shadow the power of the legislative chambers; he introduced new and harsh measures of army discipline, and contended relentlessly with all disciples of free thought. In the matter of education he showed praiseworthy zeal, and promoted as far as he could the national schools of Hesse. But the services he rendered in this way were not sufficient to induce the mass of the people to pardon the reactionary tendency of his general policy, and he was obliged in 1837 to flee from the general hatred he had encountered. He found shelter in Prussia, where the Government entrusted him with the discharge of various judicial offices, and he remained in Prussia till the full tide of reaction had set in after the year 1848. He then (1850) returned to Hesse Cassel, the ministry of the revolution of 1848 having been dismissed. Despite the fact that Hassenpflug had never freed himself from a charge of peculation brought against him in the performance of his judicial duties in Prussia, he was appointed by the elector of Hesse to the head of the new ministry. He acted at once on the old lines, levying taxes without the consent of the chambers, dissolving them when they protested, and finally proclaiming martial law. The soldiers rose, the officers being on the side of the people; the Government was in so precarious a condition that it seemed wise to the elector to flee with his court to Wilhelmsbad. Partly by the influence of Hassenpflug the German bundesrath (or council of all the states) espoused the cause of the elector against his subjects, and by the end of the year (1850) the astute minister had the satisfaction of seeing the reactionary Government (with himself as minister of finance) reinstated in power. His position was, however, difficult, owing to his great unpopularity among all classes. When in 1852 the brother of the elector assaulted him in a fit of lunacy, Hassenpflug at once sent in his resignation, but it was not accepted till 1855. He then retired to Marburg (in Hesse), where he died October 15, 1862. His friend Dr Vilmar, who pronounced his funeral oration, dwelt chiefly on the piety of the deceased, who he said never travelled without a copy of the New Testament.

HASTINAPUR, an ancient city of India, in the Meerut district, North-Western Provinces, lying on the bank of the Burígangá, or former bed of the Ganges, 22 miles N.E. of Meerut. It formed the capital of the great Pándava kingdom, celebrated in the *Mahábhárata*, and probably one of the earliest Aryan settlements outside the Punjab. Few traces of the ancient city now remain, but tradition points to a group of shapeless mounds as the residence of the children of the moon, the Lunar princes of the house of Bhárata whose deeds are commemorated in the great national epic. After the conclusion of the famous war which forms the central episode of that poem, Hastinapur remained for some time the metropolis of the descendants of Parikshit, but the town was finally swept away by a flood of the Ganges, and the capital was transferred to Kausámbi.

HASTINGS, a municipal and parliamentary borough and market town of Sussex, England, the principal of the Cinque Ports, is picturesquely situated on the southern coast of England, 74 miles from London by the London, Brighton, and South Coast Railway, and 62 by the London and South-Eastern Railway. It lies in two gorges, surrounded by an amphitheatre of hills and cliffs on every side except the south. At the beginning of the century, when it first came into reputation as a watering-place, Hastings consisted of two main streets; but since then many new streets and squares have been added, and St Leonards, at that time about a mile distant, is now connected with it by a line of terraces and parades, and forms its more fashionable district. On the brink of the western cliff there still stand a square and a circular tower of the old castle, probably erected soon after the time of William the Conqueror, and the ruins, opened up by excavation in 1824, of the castle chapel, a transitional Norman structure 110 feet long, with a nave, chancel, and aisles. Besides the chapel, there was also at one time a college, both being under the control of a dean and secular canons. The deanery was at one time held by Thomas a Becket, and one of the canonries by William of Wykeham. The principal public buildings are the old parish churches of All Saints and St Clements, both in the Perpendicular style, the former containing in its register for 1619 the baptism of Titus Oates, whose father was rector of the parish, and the latter two brasses to Thomas Weekes (d. 1563) and John Bailey (d. 1592); the town-hall, erected in 1823; the music hall, erected in 1859; the assembly room, the Roman Catholic college, the Augustinian monastery, and the Albert memorial and drinking fountain, erected in 1864. Among the industries of the town are fishing, boat building, and coach-making; but its prosperity depends chiefly upon its reputation as a watering-place. Its popularity in this respect is owing to its historical interest, its picturesque situation, the many beautiful walks in the neighbourhood, its fine level sands, and its healthy climate, which, while bracing and vigorous in the higher parts of the town, is in its lower parts specially suited, from its mildness, for sufferers from pulmonary complaints. The town is well supplied with hotels, reading rooms, and pleasure gardens, and possesses a line of parades extending along the coast for nearly 3 miles. The Marina, a covered parade 600 feet in length, was built in 1825. There is a fine pier, opened in 1872, 900 feet in length, and possessing a pavilion capable of seating nearly 2000 persons. A public park, 70 acres in extent, is at present being laid out. The sewage of the town is conveyed a considerable distance out to sea before it is discharged. The area of the municipal borough is 1636 acres, and of the parliamentary borough 4617 acres. The population of the municipal borough in 1871 was 29,291, and of the parliamentary borough 33,337.

Hastings is of great antiquity, and was a place of some importance in the time of the Anglo-Saxons. Some derive its name from [illegible] mit vessels above 100 tons burthen, and this only at full tide. The town received a charter of incorporation from Elizabeth in 1558, which was confirmed and enlarged by Charles II. In the 42d of Edward III. it obtained the privilege of returning two members to parliament.

HASTINGS, Warren (1732–1818), the first governor-general of British India, was born on the 6th of December 1732 in the little hamlet of Churchill in Oxfordshire. He came of a family which had been settled for many generations in the adjoining village of Daylesford; but his great-grandfather had sold the ancestral manor-house, and his grandfather had been unable to maintain himself in possession of the family living. His mother died a few days after giving him birth; his father, Pynaston Hastings, drifted away to perish obscurely in the West Indies. Thus unfortunate in his birth, young Hastings received the elements of education at a charity school in his native village. At the age of eight he was taken in charge by an elder brother of his father, Howard Hastings, who held a post in the customs. After spending two years at a private school at Newington Butts, he was moved to Westminster, where among his contemporaries occur the names of Lord Thurlow and Lord Shelburne, Sir Elijah Impey, and the poets Cowper and Churchill. In 1749, when his headmaster Dr Nichols was already anticipating for him a successful career at the university, his uncle died, leaving him to the care of Mr Chiswick, who was in the direction of the East India Company; and he determined to send his ward to seek his fortune as a "writer" in Bengal.

When Hastings landed at Calcutta in October 1750, the affairs of the East India Company were at a low ebb. Throughout the entire south of the peninsula French influence, was predominant. The settlement of Fort St George or Madras, captured by force of arms, had only recently been restored in accordance with a clause of the peace of Aix-la-Chapelle. The lurid genius of Dupleix everywhere overshadowed the native imagination, and the star of Clive had scarcely yet risen above the horizon. The rivalry between the English and the French, which had already convulsed the south, did not penetrate to Bengal. That province was under the able government of Ali Vardi Khan, who peremptorily forbade the foreign settlers at Calcutta and Chandarnagar to introduce feuds from Europe. The duties of a young "writer" were then such as are implied in the name. At an early date Hastings was placed in charge of an *aurung* or factory in the interior, where his duties would be to superintend the weaving of silk and cotton goods under a system of money advances. In 1755 he was transferred to Kasimbazar, the river port of the native capital of Murshidabad. In 1756 the old nawab died, and was succeeded by his grandson Suraj ud Daulah, a spoilt boy of 19, whose name is indelibly associated with the tragedy of the Black Hole. When that passionate young prince, in revenge for a fancied wrong, resolved to drive the English out of Bengal, his first step was to occupy the fortified factory at Kasimbazar, and make prisoners of Hastings and his companions. Hastings was soon released at the intercession of the Dutch resident, and made use of his freedom at Murshidabad to open negotiations with the English fugitives at Falta, the site of a Dutch factory near the mouth of the Hoogly. In later days he used to refer with pride to his exertions on this occasion, when he was first initiated into the wiles of Oriental diplomacy. After a while, he found it necessary to fly from the Mahometan court, and join the main body of the English at Falta. When the relieving force arrived from Madras under Colonel Clive and Admiral Watson, Hastings enrolled himself as a volunteer, and took part in the action which led to the recovery of Calcutta. Clive showed his appreciation of Hastings's merits by appointing him in 1758 to the important post of resident at the court of Murshidábád. It was there that he first came into collision with the Bengali Bráhman, Nandkumar, whose subsequent fate throws so deep a shadow upon his own fair fame. During his three years of office as resident he was able to render not a few valuable services to the Company; but it is more important to observe that his name nowhere occurs in the official lists of those who derived pecuniary profit from the necessities and weakness of the native chiefs. In 1761 he was promoted to be member of council, under the presidency of Mr Vansittart, who had been introduced by Clive from Madras. The period of Vansittart's government has been truly described as "the most revolting page of our Indian history." The entire duties of administration were suffered to remain in the hands of the nawab, while a few irresponsible English traders had drawn to themselves all real power. The members of council, the commanders of the troops, and the commercial residents plundered on a grand scale. The youngest servant of the Company claimed the right of trading on his own account, free from taxation and from local jurisdiction, not only for himself but also for every native subordinate whom he might permit to use his name. It was this exemption, threatening the very foundations of the Mussulman government, that finally led to a rupture with the nawab. Macaulay, in his celebrated essay, has said that "of the conduct of Hastings at this time little is known." As a matter of fact, the book which Macaulay was professing to review describes at length the honourable part consistently taken by Hastings in opposition to the great majority of the council. Sometimes in conjunction only with Vansittart, sometimes absolutely alone, he protested unceasingly against the policy and practices of his colleagues. On one occasion he was stigmatized in a minute by Mr Batson with "having espoused the nawab's cause, and as a hired solicitor defended all his actions, however dishonourable and detrimental to the Company." An altercation ensued. Batson gave him the lie, and struck him in the council chamber. When war was actually begun, Hastings officially recorded his previous resolution to have resigned, in order to repudiate responsibility for measures which he had always opposed. Waiting only for the decisive victory of Buxar over the allied forces of Bengal and Oudh, he resigned his seat and sailed for England in November 1764.

After fourteen years' residence in Bengal Hastings did not return home a rich man, estimated by the opportunities of his position. According to the custom of the time he had augmented his slender salary by private trade. At a later date, he was charged by Burke with having taken up profitable contracts for supplying bullocks for the use of the Company's troops. It is admitted that he conducted by means of agents a large business in timber in the Gangetic sundarbans. When at Falta he had married Mrs Campbell, the widow of an officer. She bore him two children, of whom one died in infancy at Murshidábád, and was shortly followed to the grave by her mother. Their common gravestone is in existence at the present day, bearing date July 11, 1759. The other child, a son, was sent to England, and also died shortly before his father's return. While at home Hastings is said to have attached himself to literary society; and it may be inferred from his own letters that he now made the personal acquaintance of Samuel Johnson and Lord Mansfield. In 1766 he was called upon to give evidence before a committee of the House of Commons upon the affairs of Bengal. The good sense and clearness of the views which he expressed caused attention to be paid to his desire to be again employed in India. His pecuniary affairs were embarrassed, partly from the liberality with which he had endowed his few surviving relatives. The great influence of Lord Clive was also exercised on his behalf. At last, in the winter of 1768, he received the appointment of second in council at Madras. Among his companions on his voyage round the Cape were the Baron Imhoff, a speculative portrait painter, and his wife, a lady of some personal attractions and great social charm, who was destined henceforth to be Hastings's life-long companion. Of his two years' work at Madras it is needless to speak in detail. He won the good will of his employers by devoting himself to the improvement of their manufacturing business, and he kept his hands clean from the prevalent taint of pecuniary transactions with the nawáb of the Carnatic. One fact of some interest is not generally known. He drew up a scheme for the construction of a pier at Madras, to avoid the dangers of landing through the surf, and instructed his brother-in-law in England to obtain estimates from the engineers Brindley and Smeaton.

In the beginning of 1772 his ambition was stimulated by the nomination to the second place in council at Bengal with a promise of the reversion of the governorship when Mr Cartier should retire. Since his departure from Bengal in 1764 the situation of affairs in that settlement had scarcely improved. The second governorship of Clive was marked by the transfer of the *díwání* or financial administration from the Mogul emperor to the Company, and by the enforcement of stringent regulations against the besetting sin of peculation. But Clive was followed by two inefficient successors; and in 1770 occurred the most terrible Indian famine on record, which is credibly estimated to have swept away one-third of the population. In April 1772 Warren Hastings took his seat as president of the council at Fort William. His first care was to carry out the instructions received from home, and effect a radical reform in the system of government. Clive's plan of governing through the agency of the native court had proved a failure. The directors were determined "to stand forth as *díwán*, and take upon themselves by their own servants the entire management of the revenues." All the officers of administration were transferred from Múrshidabád to Calcutta, which Hastings boasted at this early date that he would make the first city in Asia. This reform involved the ruin of many native reputations, and for a second time brought Hastings into collision with the wily Bráhman, Nandkumar. At the same time a new settlement of the land revenue on leases for five years was begun, and the police and military systems of the country were placed upon a new footing. Hastings was a man of immense industry, with an insatiable appetite for details. The whole of this large series of reforms was conducted under his own personal supervision, and upon no part of his multifarious labours did he dwell in his letters home with greater pride. As an independent measure of economy, the stipend paid to the titular nawáb of Bengal, who was then a minor, was reduced by one-half—to sixteen *lákhs* a year (say £160,000). Macaulay imputes this reduction to Hastings as a characteristic act of financial immorality; but in truth it had been expressly enjoined by the court of directors, in a despatch dated six months before he took up office. His pecuniary bargains with Sujáh Daula, the nawáb wazir of Oudh, stand on a different basis. Hastings himself always regarded them as incidents in the general scheme of his foreign policy. The Mahrattas at that time had got possession of the person of the Mogul emperor, Sháh Alam, from whom Clive obtained the grant of Bengal in 1765, and to whom he assigned in return the districts of Allahábád and Kora and a tribute of £300,000. With the emperor in their camp, the Mahrattas were threatening the province of Oudh, and causing a large British force to be cantoned along the frontier for its defence. Warren Hastings, as a deliberate measure of policy, withheld the tribute due to the emperor, and resold Allahábád and Kora to the wazír of Oudh. The Mahrattas retreated, and all danger for the time was dissipated by the death of their principal leader. The wazír now bethought him that he had a good opportunity for satisfying an old quarrel against the adjoining tribe of Rohillas, who had played fast and loose with him while the Mahratta army was at hand. The Rohillas were a race of Afghan origin, who had established themselves for some generations in a fertile tract west of Oudh, between the Himalayas and the Ganges, which still bears the name of Rohilkhand. They were not so much the occupiers of the soil, as a dominant caste of warriors and freebooters. But in those troubled days their title was as good as any to be found in India. After not a little hesitation, Hastings consented to allow the Company's troops to be used to further the ambitious designs of his Oudh ally, in consideration of a sum of money which relieved the ever-pressing wants of the Bengal treasury. The Rohillas were defeated in fair fight. Some of them fled the country; and so far as possible Hastings obtained terms for those who remained. The fighting, no doubt, on the part of the wazír was conducted with all the savagery of Oriental warfare; but there is no evidence that it was a war of extermination.

Meanwhile, the affairs of the East India Company had again come under the consideration of Parliament. The Regulating Act, passed by Lord North's ministry in 1773, effected considerable changes in the constitution of the Bengal Government. The council was reduced to four members with a governor-general, who were to exercise certain indefinite powers of control over the presidencies of Madras and Bombay. Hastings was named in the Act as governor-general for a term of five years. The council consisted of General Clavering and the Hon. Colonel Monson, two third-rate politicians of considerable parliamentary influence; Philip Francis, then only known as an able permanent official; and Barwell, of the Bengal Civil Service. At the same time a supreme court of judicature was appointed, composed of a chief and three puisne judges, to exercise an indeterminate jurisdiction at Calcutta. The chief-justice was Sir Elijah Impey, already mentioned as a schoolfellow of Hastings at Westminster. The whole tendency of the Regulating Act was to establish for the first time the influence of the crown, or rather of parliament, in Indian affairs. The new members of council disembarked at Calcutta on the 19th of October 1774; and on the following day commenced the long feud which scarcely terminated twenty-one years later with the acquittal of Warren Hastings by the House of Lords. Macaulay states that the members of council were put in ill-humour because their salute of guns was not proportionate to their dignity. In a contemporary letter Francis thus expresses the same petty feeling: "Surely Mr H. might have put on a ruffled shirt." Taking advantage of an ambiguous clause in their commission, the majority of the council (for Barwell uniformly sided with Hastings) forthwith proceeded to pass in review the recent measures of the governor-general. All that he had done they condemned; all that they could they reversed. Hastings was reduced to the position of a cipher at their meetings. After a time they lent a ready ear to detailed allegations of corruption brought against him by his old enemy Nandkumar. To charges from such a source, and brought in such a manner, Hastings disdained to reply, and referred his accuser to the supreme court. The majority of the council, in their executive capacity, resolved that the governor-general had been guilty of peculation, and ordered him to refund. A few days later Nandkumar was thrown into prison on a stale charge of forgery, tried before the supreme court sitting in banc, found guilty by a jury of Englishmen, and sentenced to be hanged. That Hastings set the prosecution in motion, no reasonable person can doubt; and it is equally clear that Chief-Justice Impey is free from all personal blame. The majority of the council abandoned their supporter, who was executed in due course. He had forwarded a petition for reprieve to the council, which Clavering took care should not be presented in time, and which was subsequently burnt by the common hangman on the motion of Francis. At the time no one dared to impute to Hastings the crime of a judicial murder. But though he had thus silenced the charges brought against him, a combination of circumstances placed him in a position of fresh difficulty. While the strife was at its hottest, he had sent an agent to England, with a general authority to place his resignation in the hands of the Company under certain conditions. The agent thought fit to exercise that authority. The resignation was promptly accepted, and one of the directors was appointed to the vacancy. But in the meantime Colonel Monson had died, and Hastings was thus restored, by virtue of his casting vote, to the supreme management of affairs. He refused to ratify his resignation; and when Clavering attempted to seize on the governor-generalship, he judiciously obtained an opinion of the supreme court in his own favour. From that time forth, though he could not always command an absolute majority in council, Hastings was never again subjected to gross insult, and his general policy was able to prevail.

A crisis was now approaching in foreign affairs which demanded all the experience and all the genius of Hastings for its solution. Bengal was prosperous, and free from external enemies on every quarter. But the Government of Bombay had hurried on a rupture with the Mahratta confederacy at a time when France was on the point of declaring war against England, and when the mother-country found herself unable to subdue her rebellious colonists in America. Hastings did not hesitate to take upon his own shoulders the whole responsibility of military affairs. All the French settlements in India were promptly occupied. On the part of Bombay, the Mahratta war was conducted with procrastination and disgrace. But Hastings amply avenged the capitulation of Wárgáon by the complete success of his own plan of operations. Colonel Goddard with a Bengal army marched across the breadth of the peninsula, from the valley of the Ganges to the western sea, and achieved almost without a blow the conquest of Guzerát. Captain Popham, with a small detachment, stormed the rock fortress of Gwalior, then deemed impregnable and the key of Central India; and by this feat held in check Sindiá, the most formidable of the Mahratta chiefs. The bhonsla, or Mahratta rájá of Nágpur, whose dominions bordered on Bengal, was won over by the diplomacy of an emissary of Hastings. But while these events were taking place, a new source of embarrassment had arisen at Calcutta. The supreme court, whether rightly or wrongly, assumed a jurisdiction of first instance over the entire province of Bengal. The English common law, with all the absurdities and rigours of that day, was arbitrarily extended to an alien system of society. *Zamíndárs*, or government renters, were arrested on mesne process; the sanctity of the *zanána*, or women's chamber, as dear to Hindus as to Mahometans, was violated by the sheriff's officer; the deepest feelings of the people and the entire fabric of revenue administration were alike disregarded. On this point the entire council acted in harmony. Hastings and Francis went joint bail for imprisoned natives of distinction. At last, after the dispute between the judges and the executive threatened to become a trial of armed force, Hastings set it at rest by a characteristic stroke of policy. A new judicial office was created in the name of the Company, to which Sir Elijah Impey was appointed, though he never consented to draw the additional salary offered to him. The understanding between Hastings and Francis, originating in this state of affairs, was for a short period extended to general policy. An agreement was come to by which Francis received patronage for his circle of friends, while Hastings was to be unimpeded in the control of foreign affairs. But a difference of interpretation arose. Hastings recorded in an official minute that he had found Francis's private and public conduct to be "void of truth and honour." They met as duellists. Francis fell wounded, and soon afterwards returned to England.

The Mahratta war was not yet terminated, but a far more formidable danger now threatened the English in India. The imprudent conduct of the Madras authorities had irritated beyond endurance the two greatest Mussulman powers in the peninsula, the nizam of the Deccan and Hyder Ali, the usurper of Mysore, who began to negotiate an alliance with the Mahrattas. A second time the genius of Hastings saved the British empire in the east. On the arrival of the news that Hyder had descended from the highlands of Mysore, cut to pieces the only British army in the field, and swept the Carnatic up to the gates of Madras, he at once adopted a policy of extraordinary boldness. He signed a blank treaty of peace with the Mahrattas, who were still in arms, reversed the action of the Madras Government towards the nizam, and concentrated all the resources of Bengal against Hyder Ali. Sir Eyre Coote, a general of renown in former Carnatic wars, was sent by sea to Madras with all the troops and treasure that could be got together; and a strong body of reinforcements subsequently marched southwards under General Leslie along the coast line of Orissa. The landing of Coote preserved Madras from destruction, though the war lasted through many campaigns and only terminated with the death of Hyder. Leslie's detachment was decimated by an epidemic of cholera (perhaps the first mention of this disease by name in Indian history); but the survivors penetrated to Madras, and not only held in check the Bhonsla and the nizam, but also corroborated the lesson taught by Goddard—that the Company's sepoys could march anywhere, when boldly led. Hastings's personal task was to provide the ways and means for this exhausting war. A considerable economy was effected by a reform in the establishment for collecting the land tax. The Government monopolies of opium and salt were then for the first time placed upon a remunerative basis. But these reforms were of necessity slow in their beneficial operation. The pressing demands of the military chest had to be satisfied by loans, and in at least one case from the private purse of the governor-general. Ready cash could alone fill up the void; and it was to the hoards of native princes that Hastings's fertile mind at once turned. Cheyte Sing, rájá of Benares, the greatest of the vassal chiefs who had grown rich under the protection of the British rule, lay under the suspicion of disloyalty. The wazír of Oudh had fallen into arrears in the payment due for the maintenance of the Company's garrison posted in his dominions, and his administration was in great disorder. In his case the ancestral hoards were under the control of his mother, the begum of Oudh, into whose hands they had been allowed to pass at the time when Hastings was powerless in council. Hastings resolved to make a progress up country in order to arrange the affairs of both provinces, and bring back all the treasure that could be squeezed out of its holders by his personal intervention. When he reached Benares and presented his demands, the rájá rose in insurrection, and the governor-general barely escaped with his life. But the faithful Popham rapidly rallied a force for his defence. The native soldiery were defeated again and again; Cheyte Sing took to flight, and an augmented permanent tribute was imposed upon his successor. The Oudh business was managed with less risk. The wazir consented to everything demanded of him. The begum was charged with having abetted Cheyte Sing in his rebellion; and after the severest pressure applied to herself and her attendant eunuchs, a fine of more than a million sterling was exacted from her. Hastings appears to have been not altogether satisfied with the incidents of this expedition, and to have anticipated the censure which it received in England. As a measure of precaution, he procured documentary evidence of the rebellious intentions of the raja and the begum, to the validity of which Impey obligingly lent his extra-judicial sanction.

The remainder of Hastings's term of office in India was passed in comparative tranquillity, both from internal opposition and foreign war. The centre of interest now shifts to the India House and to the British Parliament. The long struggle between the Company and the ministers of the crown for the supreme control of Indian affairs and the attendant patronage had reached its climax. The decisive success of Hastings's administration alone postponed the inevitable solution. His original term of five years would have expired in 1778; but it was annually prolonged by special Act of Parliament until his voluntary resignation. Though Hastings was thus irremovable, his policy did not escape censure. Ministers were naturally anxious to obtain the reversion to his vacant post, and Indian affairs formed at this time the hinge on which party politics turned. On one occasion Dundas carried a motion in the House of Commons censuring Hastings, and demanding his recall. The directors of the Company were disposed to act upon this resolution; but in the court of proprietors, with whom the decision ultimately lay, Hastings always possessed a sufficient majority. Fox's India Bill led to the downfall of the Coalition Ministry in 1783. The Act which Pitt successfully carried in the following year introduced a new constitution, in which Hastings felt that he had no place. In February 1785 he finally sailed from Calcutta, after a dignified ceremony of resignation, and amid enthusiastic farewells from all classes.

On his arrival in England, after a second absence of sixteen years, he was not displeased with the reception he met with at court and in the country. A peerage was openly talked of as his due, while his own ambition pointed to some responsible office at home. Pitt had never taken a side against him, while Lord Chancellor Thurlow was his pronounced friend. But he was now destined to learn that his enemy Francis, whom he had discomfited in the council chamber at Calcutta, was more than his match in the parliamentary arena. Edmund Burke had taken the subject races of India under the protection of his eloquence. Francis, who had been the early friend of Burke, supplied him with the personal animus against Hastings, and with the knowledge of details, which he might otherwise have lacked. The Whig party on this occasion unanimously followed Burke's lead. Dundas, Pitt's favourite subordinate, had already committed himself by his earlier resolution of censure; and Pitt was induced by motives which are still obscure to incline the ministerial majority to the same side. To meet the oratory of Burke and Sheridan and Fox, Hastings wrote an elaborate minute with which he wearied the ears of the House for two successive nights, and he subsidized a swarm of pamphleteers. The impeachment was decided upon in 1786, but the actual trial did not commence until 1788. For seven long years Hastings was upon his defence on the charge of "high crimes and misdemeanours." During this anxious period he appears to have borne himself with characteristic dignity, such as is consistent with no other hypothesis than the consciousness of innocence. At last, in 1795, the House of Lords gave a verdict of not guilty on all the charges laid against him; and he left the bar at which he had so frequently appeared, with his reputation clear, but ruined in fortune. However large the wealth he brought back from India, all was swallowed up in defraying the expenses of his trial. Continuing the line of conduct which in most other men would be called hypocrisy, he forwarded a petition to Pitt praying that he might be reimbursed his costs from the public funds. This petition, of course, was rejected. At last, when he was reduced to actual destitution, it was arranged that the East India Company should grant him an annuity of £4000 for a term of years, with £90,000 paid down in advance. This annuity expired before his death; and he was compelled to make more than one fresh appeal to the bounty of the Company, which was never withheld. Shortly before his acquittal he had been able to satisfy the dream of childhood, by buying back the ancestral manor of Daylesford, where the remainder of his life was passed in honourable retirement. In 1813 he was called on to give evidence upon Indian affairs before the two Houses of Parliament, which received him with exceptional marks of respect. The university of Oxford conferred on him the honorary degree of D.C.L.; and in the following year he was sworn of the Privy Council, and took a prominent part in the reception given to the duke of Wellington and the allied sovereigns. He died on the 22d of August 1818, in his 86th year, and lies buried behind the chancel of the parish church, which he had recently restored at his own charges.

In physical appearance, Hastings "looked like a great man, and not like a bad man." The body was wholly subjugated to the mind. A frame naturally slight had been further attenuated by rigorous habits of temperance, and thus rendered proof against the diseases of the tropics. Against his private character not even calumny has breathed a reproach. As brother, as husband, and as friend, his affections were as stedfast as they were warm. By the public he was always regarded as reserved, but within his own inner circle he gave and received perfect confidence. In his dealings with money, he was characterized rather by liberality of expenditure than by carefulness of acquisition. A classical education and the instincts of family pride saved him from both the greed and the vulgar display which marked the typical "nabob," the self-made man of those days. He could support the position of a governor-general and of a country gentleman with equal credit. Concerning his second marriage, it suffices to say that the Baroness Imhoff was about forty years of age, with a family of grown-up children, when the complaisant law of her native land allowed her to become Mrs Hastings. She survived her husband, who seems to have cherished towards her to the last the sentiments of a lover. Her children he adopted as his own; and it was chiefly for her sake that he desired the peerage which was twice held out to him.

Hastings's public career will probably never cease to be a subject of controversy. It was his misfortune to be the scapegoat upon whose head Parliament laid the accumulated sins, real and imaginary, of the East India Company. If the acquisition of our Indian empire can be supported on ethical grounds, Hastings needs no defence. No one who reads his private correspondence will admit that even his least defensible acts were dictated by dishonourable motives. It is more pleasing to point out certain of his public measures upon which no difference of opinion can arise. He was the first to attempt to open a trade route with Thibet, and to organize a survey of Bengal and of the eastern seas. It was he who persuaded the *pandits* of Bengal to disclose the treasures of Sanskrit to European scholars. He founded the Madrissa or college for Mahometan education at Calcutta, primarily out of his own funds, and he projected the foundation of an Indian Institute in England. The Royal Asiatic Society was established under his auspices, though he yielded the post of president to Sir W. Jones. No Englishman ever understood the native character so well as Hastings; none ever devoted himself more heartily to the promotion of every scheme, great and small, that could advance the prosperity of India. Natives and Anglo-Indians alike venerate his name, the former as their first beneficent administrator, the latter as the most able and the most enlightened of their own class. If Clive's sword conquered the Indian empire, it was the brain of Hastings that planned the system of civil administration, and his genius that saved the empire in its darkest hour.

The bibliography dealing with Warren Hastings is not large. The histories of Mill and Thornton both adopt a standpoint that is on the whole adverse. The *Memoirs*, by Gleig, in 3 vols. (Lond., 1841) are too tedious to be read at the present day. The review of those *Memoirs* by Macaulay, despite its exuberance of colour, its Whig partiality, and its proved inaccuracies, will not easily be superseded as the one standard authority. There is a recent *Biography* by Captain Trotter (1878). Much interesting information, in correction or amplification of Macaulay, may be found in the *Memoirs of Francis, with Correspondence*, &c., by Parkes and H. Merivale (1867), and in the *Memoirs of Sir E. Impey* by his son (1846), who deposited his private MS. materials in the British Museum. In 1872 the British Museum also obtained by purchase from a Mrs Kinter 268 vols. of papers relating to Hastings, chiefly letters between 1757 and 1818. These have been partly utilized by Mr Beveridge in a series of articles contributed to the *Calcutta Review* for October 1877, April 1878, and April 1879. (J. S. CO.)

HASTINGS, FRANCIS RAWDON HASTINGS, FIRST MARQUIS OF (1754–1826), ranks among those governors-general of India who, completing the work of Clive and Warren Hastings, achieved the creation of the Indian empire of England. The services of Lord Hastings in this respect were special and important. He was both governor-general and commander-in-chief in India from 1813 till the end of 1822; during that period he carried two important wars, the Nepaulese and the Mahratta, to a successful issue; while adding to the territories of the East India Company, he in several respects altered and improved their policy; and by the sagacity and at the same time the generosity of his own administration (in which he exhibited the true qualities of a Christian proconsul) he won reverence from the natives and left a great name in India.

Lord Hastings was in no way connected with Warren Hastings; his family name was Rawdon. His father, Sir John Rawdon of Moira in the county of Down, fourth baronet, was created Baron Rawdon of Moira, and afterwards Earl of Moira, in the Irish peerage. His mother was the Lady Elizabeth Hastings, daughter of the ninth earl of Huntingdon. Both his father and mother appear to have been persons of considerable ability and high cultivation. Lord Rawdon, as he was then called, having gone at an early age to the university of Oxford, joined the army in his seventeenth year as ensign in the 15th foot. His life henceforth was entirely spent in the service of his country, and may naturally be divided into four periods—from 1773 to 1782 he was engaged with much distinction in the American war; from 1783 to 1813 he held various high appointments at home, and took an active part in the business of the House of Lords; from 1813 to 1823 was the period of his labours in India, after returning from which, in the last years of his life (1824–1826), he was governor of Malta.

In America Lord Rawdon served at the battles of Bunker's Hill, Brooklyn, White Plains, Monmouth, and Camden, at the attacks on Forts Washington and Clinton, and at the siege of Charleston. In fact he was engaged in all the chief operations of the war. Perhaps his most noted achievements were the raising of a corps at Philadelphia, called the Irish Volunteers, who under him became famous for their fighting qualities, and the victory of Hob kirk Hill which, when in command of only a small force, he gained by superior military skill and determination against an American corps of ... In 1782 he was invalided. The vessel in which he returned to England was captured and carried into Brest. This occasioned the loss of his papers and personal records of the war which would doubtless have been interesting. He was speedily released, and on his arrival in England was much honoured by George III., who created him an English peer (Baron Rawdon) in March 1783.

In 1793 Lord Rawdon succeeded his father as earl of Moira. In 1794 he was sent with 10,000 men from Southampton to Ostend to reinforce the duke of York and the allies in Flanders. The march by which he effected a junction was considered extraordinary. In 1803 he was appointed commander-in-chief in Scotland, and in 1804 he married Flora Muir Campbell, countess of Loudoun in her own right. He and Lady Loudoun lived at Duddingston House near Edinburgh, where they were very popular. The opposition coming into power in 1806, Lord Moira, who had always voted with them, received the place of master general of the ordnance. He was now enabled to carry a philanthropic measure, of which from his first entry into the House of Lords he had been a great promoter, namely, the Debtor and Creditor Bill for relief of poor debtors. Ireland was another subject to which he had given particular attention: in 1797 there was published a *Speech by Lord Moira on the Dreadful and Alarming State of Ireland.* Lord Moira's sound judgment on public affairs, combined with his military reputation and the honourable uprightness of his character, won for him a high position among the statesmen of the day, and he gained an additional *prestige* from his intimate relations with the prince of Wales. On two occasions, in 1809 and again in 1812 after the assassination of Perceval, there were negotiations for placing him at the head of affairs. As a further mark of the regent's regard Lord Moira received the order of the Garter, and in the same year was appointed governor-general and commander-in-chief of India. He landed at Calcutta, and assumed office in succession to Lord Minto in October 1813. He was now fifty-nine years of age. One of the chief questions which awaited him was that of relations with the Goorkha state of Nepaul. The Goorkhas, a brave and warlike little nation, failing to extend their conquests in the direction of China, had begun to encroach on territories held or protected by the East India Company; especially they had seized the districts of Bootwul and Seoraj, in the northern part of Oudh, and when called upon to relinquish these, they deliberately elected (April 1814) to go to war rather than do so. Lord Moira, having travelled through the northern provinces and fully studied the question, declared war against Nepaul (November 1814). The enemy's frontier was 600 miles long, and Lord Moira, who directed the plan of the campaign, resolved to act offensively along the whole line. It was an anxious undertaking, because the native states of India were all watching the issue and waiting for any serious reverse to the English to join against them. At first all seemed to go badly, as the British officers too much despised the enemy, and the Sepoys were unaccustomed to mountain warfare, and thus alternate extremes of rashness and despondency were exhibited. But this rectified itself in time, especially through the achievements of General (afterwards Sir David) Ochterlony, who before the end of 1815 had taken all the Goorkha posts to the west, and early in 1816 was advancing victoriously within 50 miles of Katmandoo, the capital. The Goorkhas now made peace; they abandoned the disputed districts, ceded some territory to the English, and agreed to receive a British resident. Ever since they have faithfully kept these terms; the northern frontier of India has been securely fixed, and the Goorkhas have entirely kept aloof from the machinations of disaffected native states. For his masterly conduct of these affairs Lord Moira was created Marquis of Hastings in 1816.

He had now to deal with internal dangers. A treacherous combination of Mahratta powers was constantly threatening the continuance of British rule, under the guise of plausible assurances severally given by the peshwah, Sindia, Holkar, and other princes. At the same time the existence of the Pindharee state was not only dangerous to the English, as being a warlike power always ready to turn against them, but it was a scourge to India itself. In 1816, however, the Pindharees entered British territory in the Northern Circars, where they destroyed 339 villages. On this, permission was obtained to act for their suppression. Before the end of 1817 the preparations of Lord Hastings were completed, when the peshwah suddenly broke into war, and the British were opposed at once to the Mahratta and Pindháree powers, estimated at 200,000 men and 500 guns. "The whole was utterly shattered in a brief campaign[1] of four months (1817–1818). The peshwah's dominion had been annexed, and those of Sindia, Holkar, and the rajah of Berar lay at the mercy of the governor-general, and were saved only by his exceeding and honourable moderation. There was at last, after sixty years from the battle of Plassy, no question of the supremacy of British power in India, now more perfectly established and more effectively dominant than that of Aurungzebe."[2] The Pindhárees had ceased to exist, and peace and security had been substituted for misery and terror.

> "It is a proud phrase to use," said Lord Hastings,[3] "but it is a true one, that we have bestowed blessings upon millions. Nothing can be more delightful than the reports I receive of the sensibility manifested by the inhabitants to this change in their circumstances. The smallest detachment of our troops cannot pass through that district without meeting everywhere eager and exulting gratulations, the tone of which proves them to come from glowing hearts. Multitudes of people have, even in this short interval, come from the hills and fastnesses in which they had sought refuge for years, and have reoccupied their ancient deserted villages. The ploughshare is again in every quarter turning up a soil which had for many seasons never been stirred, except by the hoofs of predatory cavalry."

While the natives of India appreciated the results of Lord Hastings's achievements, the court of directors grumbled at his having extended the British territory. They also disliked and opposed his measures for introducing education among the natives and his encouraging the freedom of the press. Posterity has, however, vindicated the policy of Lord Hastings in all respects. In 1819 he obtained the cession by purchase of the island of Singapore. In finance his administration was very successful, as notwithstanding the expenses of his wars he showed an annual surplus of two millions sterling. He laboured much at law reform, and he succeeded in greatly raising the status and character of the civil service of India. Lord and Lady Hastings by their stately and yet genial manners, and by their warm encouragement of literature and science, gave a high tone to the society of Calcutta. And he was the first governor-general to exhibit a personal interest in the exertions of the missionaries. Brilliant and beneficent as his career had been, Lord Hastings did not escape, any more than Clive, Warren Hastings, or Lord Wellesley, the assaults of unjust detraction. His last years of office were embittered by the discussions on a matter very notorious the time, namely, the affairs of the banking-house of W. Palmer and Company. The whole affair was mixed up with insinuations against Lord Hastings, especially charging him with having been actuated by favouritism towards one of the partners in the firm. From imputations which were inconsistent with his whole character he has subsequently been exonerated. But while smarting under them he tendered his resignation in 1821, though he did not leave India till January 1823. He was much exhausted by the arduous and almost incredible labours which for more than nine years he had sustained. Among his characteristics it is mentioned that "his ample fortune absolutely sank under the benevolence of his nature," and, so far from having enriched himself in the appointment of governor-general, he returned to England in circumstances which obliged him still to seek public employment. In 1824 he received the comparatively small post of governor of Malta, in which island he introduced many reforms and endeared himself to the inhabitants. He died in 1826, leaving a request that his right hand should be cut off and preserved till the death of the marchioness of Hastings, and then interred in her coffin.

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[1] For the interesting details of this campaign, as well as of the war in Nepaul, see Prinsep's *History of the Political and Military Transactions in India, during the administration of the Marquis of Hastings.*

[2] Meadows Taylor's *Student's Manual of the History of India*, p. 595.

[3] Reply to Address of Inhabitants of Calcutta; see *Asiatic Journal*, February 1819.

No "Life" of the marquis of Hastings has appeared, but a diary of his first years in India, written for his children, has been published, and gives interesting [illegible] of his character. For further particulars of his career see the *Annual Register* for November 1826, and the *Asiatic* [illegible] for 1826; and for details of his Indian administration, see Prinsep's work cited above, Wilson's continuation of Mill's *History of India*, and other Indian histories. (A. GR.)

HAT, a covering for the head worn by both sexes, and distinguished from the cap or bonnet by the possession of a brim. The modern hat can be traced back to the *petasus* worn by the ancient Romans when on a journey; and hats with brims were also used, probably on like occasions, by the earlier Greeks. It was not till after the Norman conquest that the use of hats began in England. A "hatte of bever" about the middle of the 12th century was worn by some one of the "nobels of the lande, mett at Clarendon," and Froissart describes hats and plumes which were worn at Edward's court in 1340, when the Garter order was instituted. In the 13th century the use of the scarlet hat which distinguishes cardinals was sanctioned by Pope Innocent IV. The merchant in Chaucer's *Canterbury Tales* had

"On his head a Flaundrish bever hat;"

and from that period onwards there is frequent mention of "felt hattes," "bever hattes," and other like names. Throughout mediæval times the wearing of a hat was regarded as a mark of rank and distinction. The caprices of fashion in hats during the reign of Elizabeth may be understood from an extract from Stubbes's *Anatomie of Abuses*, published about 1585:—

"Sometimes they use them sharpe on the crowne, pearking up like the spere or shaft of a steeple, standing a quarter of a yard above the crowne of their heads, some more, some lesse, as please the fantasies of their inconstant mindes. Othersome be flat, and broade on the crowne, like the battlements of a house. Another sorte have round crownes, sometimes with one kind of bande, sometimes with another; now blacke, now white, now russed, now redde, now greene, now yellowe; now this, now that; never content with one colour or fashion two daies to an end."

During the reign of Charles I. the Puritans affected a steeple crown and broad brimmed hat, while the Cavaliers adopted a lower crown and a broader brim ornamented with feathers. Still greater breadth of brim and a profusion of feathers were fashionable characteristics of the hats in the time of Charles II., and the gradual expansion of brim led to the device of looping or tying up that portion. Hence arose various fashionable "cocks" in hats, such as the "Monmouth cock," &c., and ultimately, by the looping up equally of three sides of the brim arose the cocked hat, the [illegible] which prevailed throughout the 18th century was [illegible]. Since the beginning of the present century the cocked hat as an ordinary article of dress has disappeared. The Quaker hat, plain, low in crown, and broad in brim, which originated with the sect in the middle of the 17th century, is also now becoming uncommon. See COSTUME.

HAT MANUFACTURE.—Until recent times hats were principally made by the process of felting, and as tradition ascribed the discovery of that very ancient operation to St Clement, he was assumed as the patron saint of the craft, and the annual festival of the trade continues to be held on St Clement's day, the 23d November. At the present day the trade is divided into two distinct classes. The first and most ancient is concerned with the manufacture of felt hats, and the second has to do with the recent but now most extensive and important manufacture of silk or dress hats. In addition to these there is the equally important manufacture of straw or plaited hats, which does not fall within the scope of this article; and hats are occasionally manufactured of materials and by processes not included under any of these heads, but such manufactures do not take a large or permanent position in the industry.

Felt Hats.—As now made, felt hats are of three different kinds, plain soft, plain hard, and "napped" or "ruffled" felts. There is a great range in the quality of felt hats, the finer and more expensive qualities being made entirely of fur; for commoner qualities a mixture of fur and Saxony wool is used; and for the lowest kinds wool alone is employed. The processes and apparatus necessary for making hats of fur differ also from those required in the case of woollen bodies; and in large manufactories machinery is now generally employed for operations which at no distant date were entirely manual. In the smaller factories, and for special objects, the old hand processes are still in operation. An outline of the operations by which the old beaver hat was and to some extent yet is made will give an idea of the manual processes in making a fur napped hat, and the apparatus and mechanical processes employed in making ordinary hard and soft felts will afterwards be noticed.

Hatters' fur consists principally of the hair of rabbits (technically called coneys) and hares, with some proportion of nutria, musquash, and beavers' hair; and generally any parings and cuttings from furriers are also used. Furs intended for felting are deprived of their long coarse hairs, after which they are treated with a solution of nitrate of mercury, an operation called carroting or *secrétage*, whereby the felting properties of the fur are greatly increased. The fur is then cut by hand or machine from the skin, and in this state it is delivered to the hat maker. Rabbits' fur for hat making now comes in large quantities from the Australian colonies; and it is also largely collected in the United Kingdom and in northern Europe. A considerable trade in rabbit fur for hat making is maintained between Great Britain and the United States.

The old process of making a beaver hat is as follows. The materials of a proper beaver consist, for the body or foundation, of rabbits' fur, and for the nap of beaver fur, although the beaver is often mixed with or supplanted by a more common fur. Such a hat may be regarded as the highest achievement of the hatter. In preparing the [illegible] the hatter [illegible] a sufficient quantity

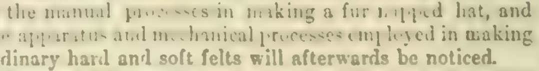


Fig. 1.

of rabbit fur for the body of the hat, which is [illegible] by the operation of bowing. The bow or string A (fig. 1) is about [illegible] D, which the [illegible] with a bow [illegible] and the [illegible] of tangled fur, which does not cover a space greater than that [illegible] of the [illegible] to the [illegible], and [illegible] to the [illegible] of the [illegible] half of the material [illegible] of the [illegible] about [illegible] inches [illegible]. In the [illegible] to work [illegible] the [illegible] of the fur [illegible] gentle pressure with the [illegible]. It is then [illegible] a [illegible] the [illegible], a piece of dry half-[illegible]. On this the [illegible] until the [illegible], in which it is then doubled up, [illegible]. By this process, [illegible], the hat has become [illegible], felted and thinned toward the [illegible]. The other half of the fur is next subjected to precisely the same processes, after which a cone-shaped sheet of [illegible] paper is laid [illegible], and the [illegible] of the hat are folded [illegible]. It is then laid paper side down [illegible], which is now [illegible] on the hurdle, and [illegible] the inverted sides of [illegible] to the whole body. In this [illegible] it is [illegible] between folds of damp linen cloth, [illegible] the [illegible], the knotting together of [illegible]. The paper is now withdrawn, and [illegible] cone is removed to the plank or battery.

The [illegible] consists of an [illegible] kettle A (fig. 2), filled with [illegible] hot water, with [illegible] B, C, partly of mahogany and partly of lead, sloping [illegible]. Here the body is first dipped in the [illegible] to cool and drain, when it is [illegible] with a pin tapering towards the ends, [illegible] to [illegible] and shrink it, and [illegible]. Stopping or thickening the thin spots which [illegible] looking through the body

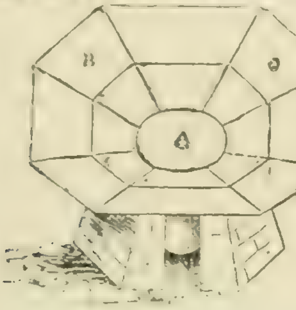


Fig. 2.

is carefully performed by [illegible] on additional stuff in successive [illegible] from the [illegible] with a brush frequently dipped into the kettle, until the body be shrunk sufficiently (about one half) and [illegible]. When quite dried, stiffening is performed with a brush dipped into a thin varnish of shellac, and rubbed into the body, [illegible] for the inside having much more [illegible] than the outer, while the brim is made to absorb many times the [illegible] applied to any other part.

On being again dried, the body is ready to be covered with a nap of beaver hair. For this, in inferior qualities, the hair of the otter, [illegible], or other fine fur is sometimes substituted. The requisite quantity of one or other of these is taken and mixed with a proportion of cotton, and the whole is bowed up into a thin uniform lap. The cotton [illegible] to give sufficient body to the material to enable the workman to handle the lap. The body of the hat being damped, the workman spreads over it a covering of this lap, and by [illegible] gentle patting with a brush the cut ends of the [illegible] and fix themselves in the felt body. The hat is next put into a coarse hair cloth, dipped and rolled in the hot liquor until the fur is quite worked in, the cotton being left on the surface loose and ready for removal. The blocking, dyeing and finishing processes, in the case of beaver hats are similar to those employed for ordinary felts, except that greater care and dexterity are required on the part of the workmen, and further that the coarse hairs or [illegible] which may be in the fur are cut off by [illegible] the surface with a razor. The nap also must be laid in one direction, smoothed, and rendered [illegible] by repeated wettings, [illegible]. A hat so finished is very durable, and it is [illegible], and [illegible]-fitting to the head than the silk hat which has now so largely superseded it.

[illegible] all attempts to apply machinery [illegible] processes in felt hat-making resulted in failure. As [illegible] the many other labour-saving appliances of recent introduction, the first efficient machinery for felt hat-making was devised in America and from the United States the machine-making processes were introduced into England about the year 18[illegible]; and now in all large establishments machinery such as that alluded to below is employed. For the forming of hat bodies two kinds of machine are used, according as the material employed is fur or wool. In the case of fur, the essential portion of the apparatus used consists of a cone of copper of the size and form of the body or hat to be made, perforated all over with small holes. The cone is made to revolve on its axis slowly over an orifice under which there is a powerful fan, which maintains a strong inward draught of air through the holes in the cone. At the side of the cone, and with an opening towards it, is a trunk or box from which the fur to be made into a hat is thrown out by the rapid revolution of a brush-like cylinder, and as the cloud of separate hairs is expelled from the trunk, the current of air being sucked through the cone carries the fibres to it and causes them to cling closely to its surface. Thus a coating of loose fibres is accumulated on the copper cone, and these are kept in position only by the exhaust at work under it. When sufficient for a hat body has been deposited, a wet cloth is wrapped round it, over which an outer cone is slipped and the whole is removed for felting, while another copper cone is placed in position for continuing the work. The felting of fur bodies is principally done by hand-labour, although machinery has recently been introduced by which it is partly done. The hat or body of wool hats is prepared by first carding in a modified form of carding machine. The wool is divided into two separate slivers as delivered from the cards, and these are wound simultaneously on a double conical block of wood mounted and geared to revolve slowly with a reciprocating horizontal motion, so that there is a continual crossing and recrossing of the wool as the sliver is wound around the cone. This diagonal arrangement of the sliver is an essential feature in the apparatus, as thereby the strength of the finished felt is made equal in every direction; and when strained in the blocking the texture yields in a uniform manner without rupture. The wool wound on the double block forms the material of two hats, which are separated by cutting around the median or base line, and slipping each half off at its own end. Into each cone of wool or hat an "inlayer" is now placed to prevent the inside from matting, after which they are folded in cloths, and placed over a perforated iron plate through which steam is blown. When well moistened and heated, they are placed between boards, and subjected to a rubbing action sufficient to harden them for bearing the subsequent strong planking or felting operations. The planking of wool hats is generally done by machine, in some cases a form of fulling mill being used; but in all forms the agency is heat, moisture, pressure, rubbing, and turning.

When by thorough felting the hat bodies of any kind have been reduced to dense leathery cones about one-half the size of the original hat, they are dried, and, if hard felts are to be made, the bodies are at this stage hardened or stiffened with a varnish of shellac. Next follows the operation of blocking, in which the felt for the first time assumes approximately the form it is ultimately to possess. For this purpose the conical body is softened in boiling water, and forcibly drawn over a hat-shaped wooden block. A string is passed round where the band is to be, and the brim is then flattened out from the string. Next follows the dyeing of the hat in a bath of suitable dyeing materials, according to the colour desired. In dealing with fine hats, each hat is separately dyed while on the block, but with commoner qualities it is the practice to dye before blocking. The finishing processes include shaping on a block, over which crown and brim receive accurately their ultimate form, and pouncing or pumicing, which consists of smoothing the whole surface with emery or glass paper while the hat is still stretched on the block. The trimmer finally binds the outer brim and inserts the lining, after which the brim may get more or less of a curl or turn over according to prevailing fashion. Machines of American invention for blocking and pouncing have to some extent been introduced.

Silk Hats.—The silk hat, which has now become coextensive with civilization, is an article of recent introduction. It was known in Florence about a century ago; but its manufacture was not introduced into France till about 1825, and its development has taken place entirely since that period. A silk hat consists of a light stiff body covered with a plush of silk, the manufacture of which in a brilliant glossy condition is the most important element in the industry; and in that manufacture the French are without equals. Originally the bodies were made of felt and various other materials, but now calico is almost exclusively used.

The calico is first stiffened with a varnish of shellac, and then cut into pieces sufficient for crown, side, and brim. The side-piece is wound round a wooden hat block, and its edges are joined by hot ironing, and the crown-piece is put on and similarly attached to

[illegible]

In all kinds of hat making the French excel, and in such centres as Amiens, Lyons, and Paris the trade is very extensive and important. In the United Kingdom the felt hat trade is principally centred at Denton and other localities in the neighbourhood of Manchester, and in America the States of New York and New Jersey enjoy the greater part of the industry. The value of the hats annually exported from the United Kingdom somewhat exceeds £1,000,000 sterling. (J. PA.)

HATFIELD, or BISHOP'S HATFIELD, a quiet, old-fashioned market-town of England, in the county of Hertford, is prettily situated on the side of a hill, 17½ miles N.N.W. of London by railway. The church of St Etheldreda dates its foundation from Norman times, though only a small portion of the original building is now standing. Hatfield is the seat of a poor-law union embracing four parishes. The population of parish in 1871 was 3898. In the vicinity is Hatfield House, on the site of a palace of the bishops of Ely, which was erected about the beginning of the 12th century. In 1538 the manor was resigned to Henry VIII. by Bishop Goodrich, in exchange for certain lands in Cambridge, Essex, and Norfolk; and after that monarch the palace was successively the residence of Edward VI. immediately before his accession, of Queen Elizabeth during the reign of her sister Mary, and of James I. The last named exchanged it in 1607 for Theobalds, near Cheshunt, in the same county, an estate of Sir Robert Cecil, afterwards earl of Salisbury, in whose family Hatfield House has since remained. The west wing of the present mansion, built for Cecil in 1608–11, was destroyed by fire in November 1835, the dowager-marchioness of Salisbury perishing in the flames. The grounds surrounding the house are extensive and beautifully laid out.

HATHRAS, or HATTRAS, a town in the Aligarh district, North-Western Provinces, India, in 27° 35' 31" N. lat., 78° 6' 9" E. long. It is well built, with numerous brick and stone houses, and is a prosperous trading centre. At the end of last century it was held by the Jat Thakur, Daya Ram, whose ruined fort still stands at the east end of the town, and was annexed by the British in 1803. A municipal hall and school-house stand upon the bank of a new tank; and the town also contains a post-office and Government charitable dispensary. Since it came under British rule, Hathras has rapidly risen to commercial importance, and now ranks second to Cawnpore among the trading centres of the Doáb. The exports include coarse sugar, grain of all sorts, oil-seeds, cotton, and *ghi*; and the imports embrace iron, metal vessels, European and native cloth, drugs, spices, and miscellaneous wares. Population (1872), 23,589, comprising 21,121 Hindus and 2468 Mahometans.

HATTINGEN, a town of Westphalia, Prussia, in the government district of Arnsberg and the circle of Bochum, is situated on the river Ruhr, about 21 miles N.E. of Düsseldorf. It is the seat of a commission of justice, and possesses a good school. The manufactures comprise cloth, woollen and silk goods, tobacco, iron, and steel. In the town are large iron-works, a brewery, and a brandy distillery. There are iron-stone and coal mines in the neighbourhood, and the scanty remains of the Isenburg, demolished in 1226. Hattingen was one of the Hanse towns of the Middle Ages. Its population in 1875 was 6995.

HATTO I. (*c.* 850–913), tenth archbishop of Mainz, was born of a Swabian family about the middle of the 9th century. Educated at the monastery of Ellwangen or at Fulda, he attracted the attention of the emperor Arnulf, who in 888 made him abbot of Reichenau, in 889 abbot of Ellwangen, and in 891 archbishop of Mainz. During his reign Hatto acquired much ecclesiastical as well as political power. He presided over the council at Tribur or Teuver (895), at which the emperor and twenty-six or twenty-seven bishops attended, and was employed as ambassador to Charles the Simple and the king of Lorraine at their conference at Saint Goar in 899. Twice he accompanied Arnulf to Italy, in 894 and 896. On the death of Arnulf in 900, Hatto became regent and guardian of Louis, and in the contest with the dukes of Babenberg treacherously betrayed into the emperor's hands Count Adalbert, who was one of their partisans. Under Louis's successor, Conrad I., Hatto retained his influence, but he died in 913, two years after Conrad's accession. Another but less probable account has it that he was killed at the battle of Heresburg in 912. Hatto was a zealous churchman and a bold and energetic statesman. By his influence the crown and the church combined to check the growing power of the great nobles. In a letter to Pope John IX., still extant, he defends the German bishops from certain charges made to the pope. There is a tradition, due probably to his ambition and violence, that his corpse was seized by the devil and thrown into the crater of Mount Etna. The tradition of the Mouse Tower on the Rhine at Bingen is connected with another Hatto, also archbishop of Mainz (968–970).

HATVAN, a market-town in the county of Heves, Hungary, is situated on the left bank of the Zagyva, at the junction of the Pest-Miskolcz, Hatvan-Rutka, and Hatvan-Szolnok lines of railway, about 30 miles E.N.E. of Budapest, 47° 40' N. lat., 19° 41' E. long. Hatvan possesses a handsome church and an elegant castle. There are two large cloth factories, and a court of assize is held there. Many of the inhabitants of the town and neighbourhood are employed in raising fruit and melons, in improving the breed of sheep and in tending large herds of horses, which graze wild on the spacious communal pasture-lands. Cattle fairs are frequently held in the town, and the trade in horses is considerable. In 1870 the population amounted to 4618, for the most part Magyars by nationality and Roman Catholics by creed.

As a fortified place Hatvan rose to some importance in the Middle Ages. In July 1525 a diet of Magyar nobles was held here. Subsequent to the catastrophe at Mohács (1526), Hatvan, along with many other Hungarian towns, fell into the hands of the Turks. After being besieged by the imperialists in 1594 and 1595, it was taken by them on the 3d September 1596. In 1678 it was almost completely destroyed by the Ottoman forces. On the 2d April 1849 the Austrians were defeated by the Hungarians in a [illegible] engagement near the town.

HATZFELD (Hungarian, *Zsombolya*), a market-town in the county of Torontal, Hungary, on the Austrian state line of railway, about 22 miles W. of Temesvar, 45° 48' N. lat., 20° 44' E. long. The most important buildings are the Roman Catholic church, the château of Count Csekonics, a district court-house, and the usual Government offices. The communal lands are large and very productive, more especially in wheat, barley, oats, Indian corn, and rape-seed. The rearing of horses is extensively carried on. In 1870 the population amounted to 7981, for the most part Germans by nationality and Roman Catholics by creed.

HAUCH, Johannes Carsten (1790-1872), Danish poet, was born of Danish parents residing at Frederikshald in Norway, on the 12th of May 1790. In 1802 he lost his mother, and in 1803 returned with his father to Denmark. In 1807 he fought as a volunteer against the English invasion. He entered the university of Copenhagen in 1808, and in 1821 took his doctor's degree. He became the friend and associate of Steffens and Oehlenschlager, warmly adopting the new views about poetry and philosophy. His first dramas, *The Journey to G[illegible]* and *The Power of Fancy*, appeared in 1816 and 1817, and were followed by *[illegible]*; but these works attracted little or no attention. Hauch therefore gave up all hope of fame as a poet, and resigned himself entirely to the study of science, to pursue which he went abroad. At Nice he had an accident which obliged him to submit to the amputation of one foot. He returned to dramatic production, and published *The Hamadryad*, *Bajazet*, *Tiberius*, *Gregory VII.*, *The Death of Charles V.* (1831), and *The Siege of Maestricht* (1832). These plays were violently attacked by the best critical organs, and enjoyed no success. Hauch then turned to novel writing, and published in succession four romances—*Vilhelm Zabern*, 1834; *Guldmageren*, 1836; *A Polish Family*, 1839; and *The Castle on the Rhine*, 1845. In 1842 he collected his shorter *Poems*. In 1846 he was appointed professor of the Scandinavian languages in Kiel, but returned to Copenhagen when the war broke out in 1848. About this time his dramatic talent was at its height, and he produced one admirable tragedy after another; among these may be mentioned *Svend Grathe*, 1841; *The Sisters at Kinnekullen*, 1849; *Marsk Stig*, 1850; *Honour Lost and Won*, 1851; and *Tycho Brahe's Youth*, 1852. From 1858 to 1860 Hauch was director of the Danish National Theatre; he produced three more tragedies—*The King's Favourite*, 1859; *Henry of Navarre*, 1863; and *Julian the Apostate*, 1868. In 1861 he published another collection of *Poems*, and in 1862 the historical epic of *Valdemar Atterdag*. From 1851, when he succeeded Oehlenschläger, to his death, he held the honorary post of professor of æsthetics at the university of Copenhagen. He died in Rome in 1872. Hauch was one of the most prolific of the Danish poets, and his writings are unequal in value. His lyrics and romances in verse are always fine in form and often strongly imaginative. In all his writings, but especially in his tragedies, he displays a strong bias in favour of what is mystical and supernatural. Of his dramas *Marsk Stig* is perhaps the best, and of his novels *Vilhelm Zabern* is admired the most.

HAUFF, Wilhelm (1802-1827), a popular German novelist, was born at Stuttgart, 29th November 1802. Having lost his father, who was a Government official, at the age of seven, he repaired with his mother to Tübingen, where he frequented the *[illegible]*. In 1818 he was sent to the *Klosterschule* at Blaubeuren, and two years later he entered the university of Tübingen. After having completed in 1824 his philosophical and theological studies and taken his degree, he acted for two years as private tutor, and assumed, in January 1827, the editorship of the *Morgenblatt*. In the following month he married, and led a happy and quiet life, which was ended by a fatal illness on 18th November of the same year. Hauff's literary activity is comprised within the short space of about two years. In his *Märchenalmanach* for 1826 he published the *Fairy Tales* he used to relate to his pupils during his tutorship. They were distinguished by an originality of conception, a playful though somewhat fantastic humour, and an elegance of style, not usually met with in similar productions. Those fanciful tales founded his fame as a narrator, and form, together with his subsequent novels, several of which belong to the same species, the basis of his permanent reputation as an author. His next publication, *Mittheilungen aus den Memoiren des Satans*, "Extracts from the Memoirs of Satan" (2 vols. 1826-27), was of a fragmentary kind, but gave additional proof of his talent as a humorist. In 1826 he wrote a novel—*Der Mann im Monde*, "The Man in the Moon"—with the intention of satirizing and parodying the sentimental sensualism of Clauren; but in the course of composition the projected parody became a regular imitation, and, as he issued the novel under the name of that romancer, the latter brought an action against him for the abuse of his name, and gained his lawsuit. Hauff succeeded, however, in morally annihilating that maudlin narrator by his witty *Controverspredigt*, "Controversial Sermon" (1826). Animated by the genius of Sir Walter Scott, Hauff wrote a historical romance called *Lichtenstein* (1826), which illustrated the most interesting period in the history of Wurtemberg, and, being one of the first historical German novels, acquired, in spite of its weakness as a literary composition, great popularity throughout Germany. His fanciful work, *Phantasien im Bremer Rathskeller* (1827), is pervaded, especially in the first portion of the book, by an exuberant spirit of conviviality, which exercises a cheering effect on the reader; but his most perfect fiction is the *Bettlerin vom Pont-des-Arts*. Hauff's works have gone, collectively and separately, through many editions, and some of his shorter poems have become regular "Volkslieder."

HAUG, Johann Christoph Friedrich (1761-1829), a German epigrammatist, was born March 19, 1761, at Niederstotzingen in Würtemberg, and received his early training from his father, who was afterwards professor and preacher at Stuttgart. From the gymnasium in this city Haug passed in 1776 to the Prince Charles academy, where he had Schiller as a fellow scholar, and, after finishing the philosophical and philological course, he devoted himself to the study of legal science with so much success that he attracted the attention of the duke. In 1784 he was appointed secretary of the private closet to his patron, in 1791 received the title of curial and palatine count, in 1794 became the duke's private secretary, and in 1817 was made *Hofrath* or aulic councillor and librarian of the public library at Stuttgart. In 1827 he travelled through northern Germany, and on 30th January 1829 he died. Haug began his career as an author by publishing *Sinngedichte von Friedrich Hophthalmos* (Frankfort, 1791), the pseudonym Hophthalmos being a jocular Greek equivalent of his own name ([illegible], the eye, equal to *Ophthalmos*, and therefore Haug equal to Hophthalmos).

Among his later works, which are as often characterized by a lack of fine taste as by pointed wit, it is enough to mention *Epigramme und [illegible]*, [illegible], 1805; *Hundert Epigramme auf [illegible]*, Zurich, 1806; *Epigrammatische Spiele*, 1807; *[illegible]*, Stuttgart, n.d.; *[illegible]*, Braun, [illegible]; *[illegible]*, Tübingen, 1826; and, perhaps more famous than any, *[illegible]*, Stuttgart, [illegible], new edition, Braun, 1822. Along with Weisser, Haug published *[illegible] Anthologie*, Stuttgart, 1807-1809, 10 vols. A selection from his poems appeared at Hamburg, 1827, 2 vols.

HAUG, Martin (1827-1876), Orientalist, was born at Ostdorf near Balingen, Würtemberg, January 30, 1827. As a self-taught lad he became a pupil in the gymnasium at Stuttgart at a comparatively late age; and in 1848 he entered the university of Tubingen, where he devoted himself to the study of the Oriental languages, and especially of Sanskrit under Roth. He afterwards for some time attended the lectures of Ewald and Benfey in Göttingen, and finally "habilitated" as a privat-docent at Bonn. In 1856 he removed to Heidelberg as collaborateur in the preparation of Bunsen's *Bibelwerk*; and in 1859 he accepted an invitation to India, where he became superintendent of Sanskrit studies and professor of Sanskrit in Poona. There his previous acquaintance with the Zend language and literature enabled him to associate with the Parsees on such terms as afforded the best opportunities for perfecting his knowledge in this department. The result of his researches was the volume of *Essays on the Sacred Language, Writings, and Religion of the Parsees* (Bombay, 1862). After a residence of six years in India, he was compelled by domestic circumstances to return to Wurtemberg in 1865; from Stuttgart he was called to Munich as first professor ordinarius of Sanskrit and comparative grammar in 1868. He died at Ragatz in Switzerland on the 3d of June 1876.

Besides the *Essays on the Parsees*, of which a new edition, by West, greatly enriched from the posthumous papers of the author, appeared in 1878, Haug published a number of works of considerable importance to the student of the literatures of ancient India and Persia. They include *Die Pehlewisprache u. der Bundehesh* (1854); *Die Schrift u. Sprache der zweiten Keilschriftgattung* (1855), *Die fünf Gathas*, edited, translated, and expounded (1858–60), an edition with translation and explanation of *The Aitareya Brahmana of the Rigveda* (1863); *A Lecture on an original Speech of Zoroaster* (1865); *An old Zend-Pahlavi Glossary* (1867), *Ueber den Charakter der Pehlewisprache* (1869); *Das 18te Capitel des Wendidad* (1869); *Ueber das Ardai-Viraf-nameh* (1870); *An old Pahlavi-Pazand Glossary* (1870); *Vedische Rathselfragen u. Rathselspruche* (1875).

HAUGE, Hans Nielsen (1771–1824), founder of a religious sect within the Lutheran Church of Norway and Denmark, was born in the former country, in the parish of Thunö, April 3, 1771. With the aid of various religious works which he found in his father's house, he laboured to supplement the scanty education which he had received as a peasant's son. In his twenty-sixth year, believing himself divinely commissioned, he began to preach in his native parish and afterwards throughout Norway. In 1800 he passed to Denmark, where, as at home, he gained many followers and assistants, chiefly among the lower orders. Proceeding to Christiansand in 1804, Hauge set up a printing-press to disseminate his views more widely, but was almost immediately arrested for holding illegal religious meetings, and for insulting the regular clergy in his books, all of which were confiscated. After being in confinement for ten years, he was released in 1814 on payment of a fine, and retiring to an estate at Breddwill, near Christiania, he died there, March 29, 1824. His adherents, called *Haugianer* or *Leser* (*i.e.*, Readers), are still to be found in the south of Norway. By his writing and preaching he unquestionably did much to revive the spiritual life of the northern Lutheran Church. Though he cannot be said to have rejected any article of the Lutheran creed, the peculiar emphasis which he laid upon the evangelical doctrines of faith and grace involved considerable antagonism to the rationalistic or sacerdotal views commonly held by the established clergy.

Hauge's principal writings are *Forsög til Afhandeling om Guds Viisdom*, 1796; *Anviisning til nogle merkelige Sprog i Bibelen*, 1798; *Forklaring over Evangelierne*, 1803. For an account of his life and doctrines, see Chr. Bang's *Hans Nielsen Hauge og hans Samtid*, Christiania, 1875.

HAUPT, Moritz or **Moriz** (1808–1874), one of the principal representatives at once of classical and of vernacular philology in Germany, was born at Zittau, in Lusatia, July 27, 1808. His early education was mainly conducted by his father, Ernst Friedrich Haupt, burgomaster of Zittau, a man of good scholarly attainment, who used to take pleasure in turning German hymns or Goethe's poems into Latin, and whose memoranda have been employed by Freytag in the 4th volume of his *Bilder aus der deutschen Vergangenheit*. From the Zittau gymnasium, where he spent the five years 1821–1826, partly under the tuition of Lindemann, Haupt removed to the university of Leipsic with the intention of prosecuting theology, but the natural bent of his mind and the influence of Professor G. Hermann soon turned all his energies in the direction of what were to be his life studies. On the close of his university course (1830) he returned to his father's house, and the next seven years were devoted to quiet work not only at Greek, Latin, and German, but at Old French, Provençal, and Bohemian. In 1834 he became acquainted with Endlicher, Karajan, and F. Wolff at Vienna, and formed with Lachmann at Berlin a friendship which had great effect on his intellectual development. In September 1837 he "habilitated" at Leipsic as privat-docent, and his first lectures, dealing with such diverse subjects as Catullus and the Nibelungenlied, indicated the twofold direction of his labours. A new chair of German language and literature being founded in his behoof, the new teacher received in succession the title of professor extraordinarius (September 1841) and professor ordinarius (November 1843); and in 1842 he married Louise Hermann, the daughter of his master and colleague. But the peaceful and prosperous course opening out before him at the university of Leipsic was brought to a sudden close. Having taken part in 1849 with Otto Jahn and Theodor Mommsen in a political agitation for the maintenance of the imperial constitution, Haupt was deprived of his professorship by a decree of the 22d April 1851. Two years later, however, he was called to succeed Lachmann at the university of Berlin; and at the same time the Berlin academy, which had made him a corresponding member in 1841, elected him an ordinary member. For one and twenty years he continued to hold a prominent place among the scholars of the Prussian capital, making his presence felt, not only by the prestige of his erudition and the clearness of his intellect, but by the tirelessness of his energy and the ardent fearlessness of his temperament. His death, which took place with very little warning, February 5, 1874, was the result of heart disease.

Haupt's critical work is distinguished by a happy union of the most painstaking investigation with intrepidity of conjecture, and while in his lectures and addresses he was frequently carried away by the excitement of the moment, and made sharp and questionable attacks on his opponents, in his writings he exhibits great self-control. The results of many of his researches are altogether lost, because he could not be prevailed upon to publish what fell much short of his own high ideal of excellence. To the progress of classical scholarship he contributed by *Quæstiones Catullianæ* (1837), *Observationes Criticæ* (1841), and editions of Ovid's *Halieutica* and the *Cynegetica* of Gratius and Nemesianus (1838), of Catullus, Tibullus, and Propertius (3d ed., 1868), of Horace (3d ed., 1871), and of Virgil (2d ed., 1873). As early as 1836 he with Hoffmann von Fallersleben started the *Altdeutsche Blätter*, which in 1841 gave place to the *Zeitschrift für deutsches Alterthum*, of which he continued editor till his death. Hartmann von Aue's *Erec* (1839) and his *Lieder*, *Büchlein*, and *Der arme Heinrich* (1842), Rudolf von Ems's *Guter Gerhard* (1840), and Conrad von Wurzburg's *Engelhard* (1844) are the principal German works which he edited. To form a collection of the French songs of the 16th century was one of his favourite schemes, but a little volume published since his death, *Französische Volkslieder* (1877), is the only monument of his labours in that direction. Three volumes of his *Opuscula* have appeared (Leipsic, 1875–1877). See Kirchhoff, "Gedächtnissrede," in *Abhandl. der königl. Akad. der Wissenschaften zu Berlin*, 1875; and Otto Belger, *Moriz Haupt als Lehrer*, 1879.

HAUPTMANN, Moritz (1792–1868), although a composer of ability, was of infinitely greater importance as a writer on the theory of music. He was born at Dresden, October 13, 1792, and studied music under Scholz, Lanska, Grosse, and Morlacchi, the rival of Weber. Afterwards he completed his education as a violinist and composer under Spohr, and till 1820 held various appointments in private families, varying his musical occupations with mathematical and other studies bearing chiefly on acoustics and kindred subjects. For a time also Hauptmann was employed as an architect, but all other pursuits gave place to music, and a grand tragic opera, *Mathilde*, belongs to the period just referred to. In 1822 he entered the orchestra of Cassel, again under Spohr's direction, and it was then that he first taught composition and musical theory to such men as Ferdinand David, Burgmüller, Kiel, and others. His compositions at this time chiefly consisted of motets, masses, cantatas, and songs. His opera *Mathilde* was performed at Cassel with great success. In 1842 Hauptmann obtained the position of cantor at the Thomas school of Leipsic (long previously occupied by the great Johann Sebastian Bach) together with that of professor at the conservatoire, and it was in this capacity that his unique gift as a teacher developed itself and was acknowledged by a crowd of enthusiastic and more or less distinguished pupils. He died on January 3, 1868, and the universal regret felt at his death at Leipsic is said to have been all but equal to that caused by the loss of his friend Mendelssohn many years before. Hauptmann's compositions are marked by symmetry and perfection of workmanship rather than by spontaneous invention.

Amongst his vocal compositions—by far the most important portion of his work—may be mentioned two masses, choral songs for mixed voices (op. 32, 47), and numerous part songs. The results of his scientific research were embodied in his book *Die Natur der Harmonik und Metrik* (1853), a standard work of its kind, in which a philosophic explanation of the forms of music is attempted.

HAURAN. See BASHAN.

HAUSER, KASPAR, a German youth whose life was remarkable from the circumstances of apparently inexplicable mystery in which it was involved. He appeared on May 26, 1828, in the streets of Nuremberg, dressed in the garb of a peasant, and with such a helpless and bewildered air that he attracted the attention of the passers-by. In his possession was found a letter purporting to be written by a poor labourer, stating that the boy was given into his custody on the 7th October 1812, and that according to agreement he had instructed him in reading, writing, and the Christian religion, but that up to the time fixed for relinquishing his custody he had kept him in close confinement. Along with this letter was enclosed another purporting to be written by the boy's mother, stating that he was born on the 30th April 1812, that his name was Kaspar, and that his father, formerly a cavalry officer in the 6th regiment at Nuremberg, was dead. The appearance, bearing, and professions of the youth corresponded closely with these credentials. He showed a repugnance to all nourishment except bread and water, was seemingly ignorant of outward objects, wrote his name as Kaspar Hauser, and said that he wished to be a cavalry officer like his father. For some time he was detained in prison at Nuremberg as a vagrant, but on July 18, 1828, he was delivered over to the care of Professor Daumer, who undertook to be his guardian and to take the charge of his education. On October 17, 1829, he was found to have received a wound in the forehead, which according to his own statement had been inflicted on him by a man with a blackened face. Having on this account been removed to the house of a magistrate and placed under close surveillance, he was visited by Earl Stanhope, who became so interested in his history that he sent him to Ansbach to be educated. After this he became clerk in the office of Feuerbach, president of the court of appeal, and his strange history was almost forgotten by the public when the interest in it was suddenly revived by his death on the 14th December 1833 from a deep wound on his left breast. He affirmed that the wound was inflicted by a stranger, but many believed it to be the work of his own hand, and that he did not intend it to be fatal, but only so severe as to give a sufficient colouring of truth to his story.

In 1830 a pamphlet was published at Berlin, entitled *Kaspar Hauser nicht unwahrscheinlich ein Betrüger*; but the truthfulness of his statements was defended by Daumer, who published *Mittheilungen über Kaspar Hauser* (Nuremberg, 1832), and *Enthüllungen über Kaspar Hauser* (Frankfort, 1859), as well as *Kaspar Hauser, sein Wesen, seine Unschuld*, &c. (Regensburg, 1873), in answer to Meyer's *Authentische Mittheilungen über Kaspar Hauser* (Ansbach, 1872). Feuerbach awakened considerable psychological interest in the case by his pamphlet *Kaspar Hauser, Beispiel eines Verbrechens am Seelenleben* (Ansbach, 1832), and Earl Stanhope also took part in the discussion by publishing *Materialien zur Geschichte K. Hausers* (Heidelberg, 1835). The theory of Daumer and Feuerbach was that the youth was the son of the grand-duke Charles of Baden, and that he had been kidnapped by the countess of Hochberg in order to secure the succession to the children of the grand-duke Charles Frederick; but this theory was set aside in 1875 by the publication in the Augsburg *Allgemeine Zeitung* of the official record of the baptism, post-mortem examination, and burial of the heir supposed to have been kidnapped. See *Kaspar Hauser und sein badisches Prinzenthum* (Heidelberg, 1876).

HAÜY, RENÉ JUST (1743–1822), an eminent French mineralogist, commonly styled the Abbé Hauy, from being an honorary canon of Notre Dame, was born at St Just, in the department of Oise, February 28, 1743. His parents were in a humble rank of life, and were only enabled by the kindness of friends to educate their son. He was sent to Paris to the college of Navarre, and afterwards to that of Lemoine, where he finished his course amid incredible privations and difficulties. He escaped from these when, in 1764, he was himself appointed one of the teachers in the first of the above-named colleges. He began to devote his leisure hours to the study of botany; but an accident directed his attention to another field in natural history. Happening to let fall a beautiful specimen of calcareous spar belonging to a friend, he discovered, by examining the fragments, the geometrical law of crystallization. By experimenting on a hexahedral crystal of this substance, he found that it could be so dissected, by dividing it by planes parallel to certain edges, as to exhibit a rhombohedral nucleus, and, by extending his experiments, he farther showed that the same result could be obtained from mechanical division of every crystal of the same species. This led him to the theory that crystals are composed of what he called "integrant molecules," which he held had each the same shape as the respective nuclei got at by mechanical division. To obtain the different crystalline forms these molecules were supposed to be built up in layers round the nucleus, each layer diminishing regularly in the number of rows of molecules, and the rows at the same time diminishing in the number of molecules according to the nature of the crystal. A full account of his mathematical theory of this subject is given by Haüy in his *Traité de Minéralogie* (see CRYSTALLOGRAPHY). Daubenton and Laplace immediately recognized the scientific value of the discovery, which, when communicated to the Academy, secured for its author a place in that society. Besides the important service which he rendered to crystallography, Haüy also greatly increased our knowledge of pyro-electricity. He demonstrated by experiment in the case of tourmaline that the positive and negative charges of electricity at the respective ends of the crystal diminish rapidly as we approach the middle point, where they disappear. He showed also that each particle of a broken pyro-electric crystal itself exhibits polarity; and he was likewise the first to observe that, in all minerals, the pyro-electric state has an important connexion with the want of symmetry of the crystals. In tourmaline, for instance, he found the vitreous charge always at the summit with six, and the resinous at the summit with three faces (see ELECTRICITY). When the Revolution broke out, Haüy was thrown into prison, and his life was even in danger, when he was saved by the intercession of Geoffroy Saint-Hilaire. Under Napoleon he became professor of mineralogy at the museum of natural history. He also obtained other scientific preferment, of which he was deprived by the feeble Government of the Restoration, though his royalism had been a serious bar to his promotion under the empire. His latter days were consequently clouded by the poverty which had threatened to blight his early career. But the courage and high moral qualities which had helped him forward in his youth did not desert him in his old age; and he lived cheerful and respected till his death, June 3, 1822.

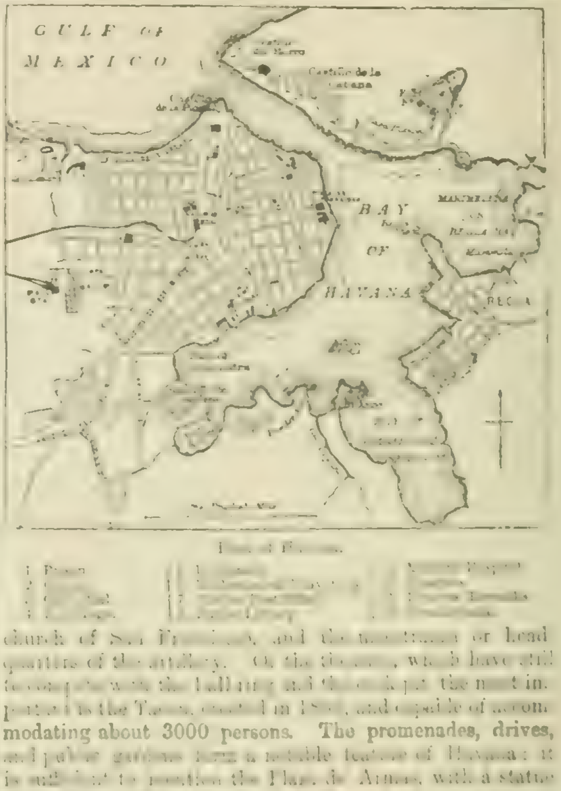
The following are his principal works:—*Essai d'une Théorie sur la Structure des Cristaux*, 1784; *Exposition raisonnée de la Théorie de l'Électricité et du Magnétisme, d'après les Principes d'Æpinus*, 1787; *De la Structure considérée comme Caractère Distinctif des Minéraux*, 1793; *Exposition abrégée de la Théorie de la Structure des Cristaux*, 1793; *Extrait d'un Traité Élémentaire de Minéralogie*, 1797; *Traité de Minéralogie*, 1802, 4 vols., 2d ed.; *Traité Élémentaire de Physique*, 1803, 1806, 2 vols.; *Tableau Comparatif des Résultats de la Cristallographie, et de l'Analyse Chimique relativement à la Classification des Minéraux*; *Traité des Pierres Précieuses*, 1817; *Traité de Cristallographie*, 1822, 2 vols. He also contributed papers to various scientific journals, particularly the *Journal d'Histoire Naturelle*, *Annales de Chimie*, *Journal de Physique*, *Magasin Encyclopédique*, *Annales du Muséum d'Histoire Naturelle*, and *Journal des Mines*.

HAVANA, HAVANNAH, or HABANA, more fully San Cristobal de la Havana, the capital of Cuba, and one of the principal seats of commerce in the New World, is situated on the northern coast of the island in 23° 9′ 24″ N. lat. and 82° 22′ 35″ W. long. From the sea it presents a picturesque appearance. The background is indeed tame; but the long lines of fortifications, the church towers, and the shipping relieve the somewhat tawdry effect of the gaily coloured houses. Though the walls, completed in 1702, have been almost entirely demolished since 1863, it is still usual to speak of the intramural and the extramural city. The former, lying close to the harbour, has streets of the narrowest possible description consistent with the existence of wheel traffic. The latter has been laid out on a spacious plan, with wide thoroughfares frequently fringed with trees. Most of the houses are built of solid stone and have flat roofs, after the manner in vogue in southern Spain, and, as the erection of wooden buildings has been illegal since 1772, it is only in the suburban districts that they are at all common. The lavish use of white marble in the decoration both of shops and dwelling-houses is one of the peculiarities of the popular taste, and it is worthy of remark that, though the native quarries would supply what is wanted, the marble is brought from Genoa. Cafés, restaurants, clubs, and casinos are both exceedingly numerous and largely frequented, forming a good indication of that general absence of domestic life among the white population which surprises the European visitant. Havana is still, as of yore, a city of smells and noises. There is no satisfactory cleansing of the streets or draining of the city, and the harbour is visibly [illegible] by the impurities of the town. Volantes,—of which it is the Cuban boast that there are 6000,—volantes, and other vehicles are driven through the thoroughfares with the utmost recklessness, and tramways and railways in the American fashion contribute to the confusion.

The principal defences of Havana are the Castillo de la Punta, to the west of the harbour entrance, the Castillo del Morro and San Carlos de la Cabaña to the east, the Santo Domingo de Atares, which lies at the head of the western arm of the bay and commands both the city and the neighbourhood, and the Castillo del Principe, situated on an eminence to the west, and forming the terminus of the great Paseo Militar. El Morro, as it is popularly called, was first erected in 1589, but additions have been frequently made. La Punta, a much smaller fort, is of the same period. The castle of Atares dates from about 1763, when the Conde de Riela was governor of the island. Cabaña, which alone has accommodation for 4000 men, fronts the bay for a distance of 800 yards, and is defended on the land side by three bastions. To the east there lies a smaller fort, No. 4, or San Diego, on a hill about 100 feet high.

Of the churches in the city, which number more than a score, the most noteworthy is the cathedral erected in 1724 by the Jesuits. Externally it is plain though symmetrical, but within it has richly frescoed walls, a floor of variegated marble, and costly altars. In the wall of the chancel, a second-rate medallion and a sorrier inscription distinguish the tomb of Columbus, whose remains were removed thither in 1796. It is enough to mention the churches of San Juan de Dios, dating from 1573, Santa Catalina (1658), San Agostino (1608), and San Felipe, which possesses a large library. Of monasteries and nunneries there is of course no lack; and the same may be said of charitable institutions. The most important of the seven hospitals is the Real Casa de Beneficencia, founded about 1790, and containing an orphan asylum, a home for vagrants, a lunatic asylum, and an infirmary.

Besides the university established in 1728, the city possesses a theological seminary, a military school, and a school of art. The governor and the bishop have their respective palaces, the former a large yellow stone building in the Plaza de Armas; a large prison, erected in 1771, capable of receiving 500 inmates, and with barracks for a regiment, forms a striking object in the general view of the city; and among the other public buildings are the exchange (El Muelle), the custom-house (formerly the church of San Francisco), and the maestranza or head quarters of the artillery. Of the theatres, which have still to compete with the bull-ring and the cockpit, the most important is the Tacon, erected in [illegible], and capable of accommodating about 3000 persons. The promenades, drives, and public gardens form a notable feature of Havana: it is sufficient to mention the Plaza de Armas, with a statue of Ferdinand VII.; the Prado or Paseo Isabel, a long and handsome boulevard laid out in the 18th century; the Campo del Marte or drill park; the Parque Isabel, the Paseo Tacon, the botanical gardens, and the gardens of Los Molinos, the suburban residence of the captain-general. The palm tree avenues of Los Molinos are unusually fine. Along the borders of the bay there are several fine embankments, of which the best is perhaps that called either the Salon O'Donnell or the Alameda de Paula. In the coral rock of the coast sea-baths have been excavated, so that the bathers may run no risk from the sharks; each apartment is about 12 feet square and 6 or 8 feet deep, and the water enters by two port holes. The city is supplied with water from the river Chorrera by an aqueduct (Canal Isabel II.) constructed by Antonelli under Philip II., and



Plan of Havana.

the number of fountains is considerable. The markets—of which the most noteworthy are the Mercado de Cristina, erected in 1836, and the Mercado de Tacon or Plaza de Vapor—are abundantly stocked with fruits and vegetables. Several of the suburban villages (e.g., Cherrera, Guanabacoa) are attractive places of resort.

The bay of Havana makes one of the finest harbours in the world, easy of access, spacious enough to contain about 1000 large vessels, deep enough to allow them to come close up to the wharves, and, except in the case of a hurricane, well protected on all sides. The entrance, encumbered by neither bar nor rock, is 980 feet wide and 4200 feet long. Within, the bay breaks up into three distinct arms, named respectively Marimelena or Regla Bay, Guanabacoa Bay, and El Fondo or Bay of Atares. The wharves are well built, and a good floating dock is maintained by a private company. On the left hand of the entrance stands a lofty lighthouse tower.

In 1865 1950 vessels entered with a barthen of 686,644 tons; in 1873 2164 vessels with a burthen of 921,632 tons; and in the first six months of 1878 741 vessels with a burthen of 449,785 tons. The average number of vessels annually in the ten years from 1864 to 1873 was 1951 (771,166 tons), and of this average 647 (324,373 tons) were American, 652 (182,221 tons) Spanish, 384 (131,216 tons) British, 56 (45,218 tons) French, 55 (18,200 tons) Norwegian, and 82 (31,625 tons) German.

In spite of high tariffs and civil wars, and the competition of Matanzas, Cardenas, Cienfuegos, and other Cuban ports opened to foreign trade in modern times, the commerce of Havana continues to increase. As indicated by the statistics just quoted, the chief foreign customers are Britain and the United States; but, while the latter are gradually taking a greater proportion of the trade, the British interest is gradually diminishing. The two staple articles of export are sugar and tobacco. While the average export of sugar for the first ten years of the century was only 177,998 boxes (71,199,200 lb), by 1855 it had reached 965,677 boxes (386,270,800 lb), and by 1875 145,621 boxes, 102,786 hogsheads, and 91,974 tons, or a grand total of nearly 448 millions of lb. In 1867 there were exported 7,716,852 lb of tobacco and 199,027 millions of cigars, and the corresponding numbers for 1875 were 13,864,800 lb and 174,555 millions. Other exports of importance are rum, wax, and honey. The nature and quantities of the imports on an average of the ten years 1868 to 1877 are 295,202 quintals (100 lb each) of jerked beef, 134,203 quintals of cod-fish (61,576 from Europe, and 41,019 from United States), 359,925 barrels of flour, 627,786 quintals of rice (mainly from the East Indies), 143,035 quintals of lard (from the United States), 85,593 pipes of wine, 145,559 tons of coal, 344,095 jars of olive oil, and 92,857 quintals of coal-oil.

The staple manufacturing industry of Havana is that of tobacco. Of the cigar factories, more than a hundred may be reckoned as of the first class. The Royal and Imperial Factory of La Honradez, which occupies a whole square, and is considered one of the great sights of the city, produces daily 2,532,000 cigarettes. Besides the making of boxes and barrels, and other articles necessarily involved in its sugar and tobacco trade, Havana also prosecutes to some extent the building of carriages and ships, and the manufacture of iron and machinery; but the weight of taxation is too great to allow the development of any business requiring great capital. There were six banks in the city in 1877, the most important being the Spanish Bank, through which all the Government paper is issued.

Havana has steam communication several times a week with New York; once a week with Baltimore, Philadelphia, and New Orleans; and about as frequently with several ports in England, Spain, and France. It is the terminus of a railway system which reaches Cardenas, Cienfuego, Matanzas, Batabano, &c.; and short lines run out to the Bay of Havana and Marianas. Telegraphs radiate to all parts of the island; and a submarine cable to Key West forms part of the line of communication between Aspinwall and New York.

The population of Havana and its suburbs was stated at 139,996 in 1817, at 196,994 in 1841, at 203,676 in 1863, and at 169,184 in 1871. Of this last number 108,754 were whites, 27,623 free negroes, mulattos, &c., and 22,807 slaves. By 1873 the total had reached, it is said, 230,000. None of these statistics can be received with much confidence as to their accuracy. Among the white population the proportion of males to females is extraordinarily high: according to the official returns, there die annually 3682 white males to 1204 white females. The average rate of mortality is 27 per thousand annually. Foreigners are subject to yellow fever, especially from June to September.

Havana, originally founded by Diego Velasquez in 1515 on an unhealthy site near the present harbour of Batabano on the south coast, was removed to its actual position about 1519, and soon began to be considered one of the most important places in the New World. In 1528 the buccaneers laid the settlement in ashes, but it was soon after restored by De Soto, who built the fortress of La Fuerza. The residence of the captain-general was transferred to Havana from Santiago de Cuba in 1551; and in 1589, to protect the city, which had been plundered by the pirate Jacob Sores in 1555 and threatened by Drake in 1585, Philip II. of Spain ordered the erection of the Bateria de la Punta and the castle of El Morro or Los Tres Reyes. In the course of the 17th century the port became the great rendezvous for the gold ships of Spain, and the commercial centre of the Spanish possessions in America. The English under Admiral Pocock and the duke of Albemarle captured Havana in 1762, but it was restored to the Spaniards on 10th Feb. 1763, in exchange for the Floridas. The *Gaceta de la Habana*, the first paper published in Cuba, appeared in 1782. In 1771 the port, which had formerly been, like the rest of Cuba, monopolized by Seville and Cadiz, was declared open to all nations in regard to certain articles of trade; and this liberty was extended in 1818 to all goods whatever. During the despotico-paternal administration of Tacon many improvements were introduced at Havana: the railway from Havana to Guines was commenced in 1835; a ferry between the city and the suburb of Regla was set on foot in 1837; and night watchmen, a police-force, and a fire-brigade were established. The first line of steamships from Cadiz to Havana dates from 1850. Like the rest of Cuba the city has frequently suffered severely from hurricanes, the most violent being those of 1768 (St Theresa's), 1810, and 1846.

See the works referred to under CUBA.

HAVELBERG, an ancient town of Brandenburg, Prussia, in the government district of Potsdam and the circle of Westpriegnitz, is situated on the Havel, about 6½ miles from its junction with the Elbe. The nearest station is Glöwen (6¼ miles), on the Berlin and Hamburg Railway. The town is built partly on an island in the Havel and partly on hills on the right bank of the river, on one of which stands the fine cathedral. The two parts, which are connected by a bridge, were incorporated as one town in 1875 Havelberg is the seat of a commission of justice. The inhabitants are chiefly engaged in farming, tobacco and pin manufacturing, sugar-refining, and shipbuilding, and in the timber trade. Population in 1875, 6907.

Otto I. founded a bishopric at Havelberg so early as 946; the bishop, however, generally resided at Plattenburg or Wittstock, a few miles to the north. In 1548 the bishopric was reduced, and the cathedral passed to the Protestant Church and retained its endowments till the edict of 1810, by which all former ecclesiastical possessions were assumed by the crown. The final secularization was delayed till 1819 Havelberg was formerly a strong fortress, but in the Thirty Years' War it was taken from the Danish by the imperial troops in 1627. Recaptured by the Swedes in 1631, and again in 1635 and 1636, it was in 1637 retaken by the Saxons under Klitzeng. It suffered severely from a conflagration in 1870.

HAVELOCK, SIR HENRY (1795–1857), an eminent British soldier, was the second of four brothers (all of whom entered the army), and was born at Ford Hall, Bishop-Wearmouth, Sunderland, on the 5th of April 1795. His parents were William Havelock, a wealthy shipbuilder in Sunderland, and Jane, daughter of John Carter, solicitor at Stockton-on-Tees. When about five years old Henry accompanied his elder brother William to Mr Bradley's school at Swanscombe, whence at the age of ten he removed for seven years to Charterhouse School. In accordance with the desire of his mother, who had died in 1811, he entered the Middle Temple in 1813, studying under Chitty the eminent special pleader. His legal studies having been abridged by a misunderstanding with his father, he in 1815 accepted a second lieutenancy in the Rifle Brigade (95th), procured for him by the interest of his brother William. During the following eight years of service in Britain he read extensively and acquired a good acquaintance with the theory of war. In 1823, having exchanged into the 21st and thence into the 13th Light Infantry, he followed his brothers William and Charles to India, first qualifying himself in Hindustani under Dr Gilchrist, a celebrated Orientalist. At the close of twenty-three years' service he was still a lieutenant, and it was not until 1838 that after three years' adjutancy of his regiment, he became captain. Before this, however, he had held several staff appointments, notably that of deputy assistant-adjutant-general of the forces in Burmah till the peace of Yandabo, of which he, with Lumsden and Knox, procured the ratifications at Ava from the "Golden Foot," who bestowed on him the "gold leaf" insignia of Burmese nobility. His first command had been at a stockade capture in the war, and he was present also at the battles of Napadee, Patanago, and Pagham. He had also held during his lieutenancy various interpreterships and the adjutancy of the king's troops at Chinsurah. In 1828 he published at Serampore *Campaigns in Ava*, and in 1829 he married Hannah Shepherd, daughter of Dr Marshman, the eminent missionary. About the same time he became a Baptist, being baptized by Mr John Mack at Serampore. During the first Afghan war he was present as aide-de-camp to Sir Willoughby Cotton at the capture of Ghazni, July 29, 1839, and at the occupation of Cabul. After a short absence in Bengal to secure the publication of his *Memoirs of the Afghan Campaign*, he returned to Cabul in charge of recruits, and became interpreter to General Elphinstone. In 1840, being attached to Sir Robert Sale's force, he took part in the Khurd-Cabul fight, in the celebrated passage of the defiles of the Ghilzees (1841), and in the fighting from Tezeen to Jellalabad. Here, after many months' siege, his column in a sortie *en masse* defeated Akbar Khan, April 7, 1842. He was now made deputy adjutant-general of the infantry division in Cabul, and in September he assisted at Jugdulluk, at Tezeen, and at the release of the British prisoners at Cabul, besides taking a prominent part at Istaliff. Having obtained a regimental majority he next went through the Mahratta campaign as Persian interpreter to Sir Hugh (Viscount) Gough, and distinguished himself at Maharajpúr in 1843, and also in the Sikh campaign at Mudki, Firozeshah, and Sobraon in 1845. For these services he was made deputy adjutant-general at Bombay. He exchanged from the 13th to the 39th, then as second major into the 53d at the beginning of 1849, and soon afterwards left for England, where he spent two years. In 1854 he became quartermaster-general, then full colonel, and lastly adjutant-general of the troops in India. In 1857 he was selected by Sir James Outram for the command of a division in the Persian campaign, during which he was present at the actions of Mohummarah and Ahwaz. Peace with Persia set him free just as the mutiny broke out; and he was chosen to command a column "to quell disturbances in Allahabad, to support Lawrence at Lucknow and Wheeler at Cawnpore, to disperse and utterly destroy all mutineers and insurgents." At Futtehpúr, July 12th, at Aong and Pandoo-nuddee on the 15th, at Cawnpur on the 16th, at Oonao on the 29th, at Busseerutgunge on the 29th and again on August 5th, at Boorhiya on August 12th, and at Bithoor on the 16th, he defeated overwhelming forces. Twice he advanced for the relief of Lucknow, but twice prudence forbade a reckless exposure of troops wasted by battle and disease in the almost impracticable task. Reinforcements arriving at last under Outram, he was enabled by the generosity of his superior officer to crown his successes on the 25th of September 1857 by the capture of Lucknow. There he died, November 24, 1857, of dysentery, brought on by the anxieties and fatigues connected with his victorious march, and with the subsequent blockade of the British troops. He lived long enough to receive the intelligence that he had been created K.C.B. for the first three battles of the campaign, but of the major-generalship which was soon afterwards conferred he never knew. On November 26th, before the news of his death had reached England, letters patent were drafted to create him a baronet, and a pension of £1000 a year was voted at the assembling of parliament. The baronetcy was afterwards bestowed upon his eldest son; while to his widow, by royal order, was given the rank to which she would have been entitled had her husband survived and been created a baronet. To both widow and son pensions of £1000 were awarded by parliament. See Marshman's *Life of Havelock*, 1860.

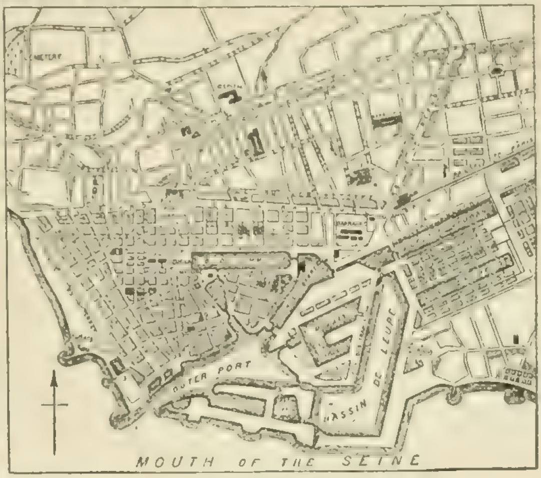
HAVERCAMP, Sigebert (1683–1742), classical editor and numismatist, was born at Utrecht in December 1683. After studying at the university of his native town and at Leyden, he entered the church, and became minister of Stad aan-'t Haringvliet, in the island of Overflakkee. There he remained till 1721, when he succeeded Gronovius in the Greek chair at Leyden, becoming shortly afterwards professor of history and rhetoric also. He died at Leyden, April 23, 1742.

His editions of Latin and Greek authors are useful and learned compilations, rather than original critical commentaries, and bear frequent traces of the rapidity with which they were produced. They are the following:—*Tertullian*, 1718; *Lucretius*, 1725; *Josephus*, 1726; *Eutropius*, 1729; *Orosius*, 1738; *Sallust*, 1742; and *Censorinus*, 1743. See Dibdin's *Classics* under these names. His principal numismatic works are *Dissertationes de Alexandri Magni Numismate*, 1722; *Thesaurus Morellianus*, 1734; *Universal History, illustrated from Medals* (in Dutch), 1736; *Nummophylacium reginæ Christinæ*, 1742. He was also the author of *Sylloge Scriptorum qui de linguæ Græcæ vera et recta Pronuntiatione commentarios reliquerunt*, 1740; *Introductio in Historiam Patriæ*, 1739; and *Introductio in Antiquitates Romanas*, 1740.

HAVERFORDWEST (in Welsh **Hwlffordd**), the chief town of Pembrokeshire, a seaport, market-town, parliamentary and municipal borough, and county by itself, is picturesquely situated on a hill overlooking the West Cleddau river, 8 miles N.N.E. of Milford, and 276 miles W.N.W. of London. The town is clean and well built, though somewhat irregular, owing to its position. Its principal buildings are the guildhall and the market-house, both modern, and the church of St Mary, one of the finest churches in South Wales. The old church of St Martin is close to the castle, of which, built on a rocky eminence overhanging the river, only a wall and the keep remain, the latter with considerable additions being till lately used as the county prison. It was built by Gilbert de Clare, first earl of Pembroke; and during the insurrection of Owen Glendower was defended for Henry IV. against the French allies of the Welsh. In the civil wars of the 17th century it was held by the royalists. The castle was visited in 1188 by Giraldus Cambrensis and Archbishop Baldwin. Below the end of the Parade, a public walk overlooking the river, are the ruins of a priory of Black Canons of the order of St Augustine, dedicated to St Mary and St Thomas. Dating from the 12th century it was endowed though not founded by Robert de Hwlffordd, whose liberal grants were confirmed by Edward III. The old wall and fortifications that formerly surrounded the town have totally disappeared. On the north side of the river is the suburb of Prendergast, containing the remains of an ancient mansion, formerly occupied by a family of that name. Haverfordwest is the seat of an assize court and quarter sessions, and with the contributory boroughs of Fishguard and Narberth returns one member to parliament. The river is navigable as high as the bridge for small craft. Timber, tea, and spirits are imported, and coal, cattle, butter, and grain are exported. In 1105, the Flemings, who had been driven from their own country by inundations, were settled in this locality by Henry I., and the Flemings who had served under Stephen afterwards increased the colony. Their influence is still to be traced in the non-use of the Welsh language among the townspeople, and in the peculiar shape of the cottages in the surrounding country. Population in 1871, 66[illegible]; area, 1130 acres.

HAVERHILL, a city in Essex county, Massachusetts, United States, is situated on the north bank of the Merrimack river 18 miles from its mouth, and opposite the towns of Bradford and Groveland, with which it is connected by two fine bridges. It has railway communication with Boston, which is 32 miles south, and with Portland, 78 miles north. The city contains a handsome soldiers' monument of white marble, erected in 1869, several public halls, including the city hall, the Freemasons' and the Oddfellows' halls, and a public library with 30,000 volumes. Haverhill derives its prosperity from the manufacture of boots and shoes, chiefly of the finer kinds, in which about 150 firms are engaged, employing from 6000 to 8000 hands, and turning out goods to the annual value of about £2,000,000. Besides these there are about forty manufactories of different articles used in this trade, as heels, lasts, shoe-nails, &c. The other manufactures include hats, paper-boxes, and woollen goods. The first settlement at Haverhill was made in 1640, and for 70 years as a frontier town it suffered much from savage attacks. A fine granite and bronze monument has been recently erected to commemorate the heroism of the early settlers. Haverhill was incorporated in 1645, and received its city charter in 1870. The population in 1870 amounted to 13,092, of whom 2003 were foreigners. In 1879 the number was estimated at 15,000.

HAVRE, Le (originally Havre de Grâce), a town of France, the second to Marseilles in importance as a seaport, capital of an arrondissement in the department of Seine-Inferieure, is situated on the north bank of the estuary of the Seine, 143 miles N.W. of Paris and 55 W. of Rouen by rail. The greater part of the town stands on a level plain, but from the heights on which Ingouville, since 1856 united to Havre, is situated, a charming and varied prospect is obtained. In the lower part of the town the streets run chiefly in straight lines, and they are grouped round the basins or docks, which communicate by lockgates and are placed so as to form a triangle entered from the Outer Port. The old fortifications surrounding the town were demolished in 1856, and it is now defended by forts erected on the heights of Ingouville and Sainte-Adresse. The principal street is the Rue de Paris, running from north to south in the centre of the town, and among the principal promenades may be mentioned the Boulevard de Strasbourg, the Place Louis XVI., and the Jetée du Nord, which terminates in a lighthouse. Havre possesses a tribunal of the first instance, a tribunal of commerce, an exchange and chamber of commerce, a chamber of agriculture, a hydrographic school, and a communal college. The principal buildings are the churches of Notre Dame and St Francis, the new Hôtel de Ville, the Musée, containing apartments for a library, and for art, antiquities, and natural history, and with statues in front of Bernardin de St Pierre and Casimir Delavigne, natives of Havre, by David Angers; the theatre, the club-house called the *Cercle du Commerce*, the new palace of justice, the marine arsenal, the town-house, the custom house, and the Frascati bath-house. The docks are among the finest in the world, and consist of eight separate basins, which, with the late enlargement of the outer harbour, afford 150 acres of accommodation for vessels. The new entrance to the harbour has a width of 100 metres or 328 feet. Lines of rails have lately been laid along the docks. As these have absorbed much of the space on the quays, lading is frequently a slow and tedious process, but the completion of the lately projected harbour will afford all the facilities necessary in this respect. The completion of the proposed canal between Havre and the Seine near Tancarville would be a great commercial benefit to the port whose prosperity has, notwithstanding its advantages as the port of Paris, and its unsurpassed facilities for dock accommodation, been much hampered by the system of centralization, which has both retarded improvements and led to the levying of exorbitant shipping rates. [illegible] on this account, not only has France been unable to maintain the transit of goods for Belgium, Switzerland, and Germany, but even much of the traffic of its own northern and eastern provinces has been directed to Antwerp. The latter port is served by an abundant network of railroads and canals, while Havre has only one convenient railroad (that to Paris by Rouen), and the river Seine with its dangers and high tariff. The completion of the scheme for a railway over Montivilliers to Dieppe will afford partial remedy for this state of matters. In the extensive shipbuilding yards of Havre the finest vessels of France are built, and many are also built for other countries. The construction of two new dry-docks has lately been proposed, one of which is to afford accommodation for the largest Atlantic steamers. Havre is now fortified as a fleet station and harbour of war. The port has regular steam communication with London, Liverpool, Southampton, Dublin, Glasgow, Hull, Swansea, Bristol, Dunkirk, Brest, Cherbourg, Rotterdam, Hamburg, Copenhagen, St Petersburg, Constantinople, West Indies, San Francisco, Vancouver Island, and New York. The total number of vessels which entered the port in 1878 was 6491 with a tonnage of 2,192,778, while 6458 cleared with a tonnage of 2,148,517. For the 5 years ending 1878 the average number of vessels that entered was 6641 with a tonnage of 1,841,265, the number that cleared 6006 with a tonnage of 1,818,189. The average annual value of exports and imports is about 2800 million francs. The trade of Havre with the United States is very large, and it has always retained its superiority in the importation of cotton, one third of which, however, it imports from other countries than America. It is also the chief port for the exportation of French goods to the United States, and an important point of emigration. Besides cotton its principal imports are petroleum, coals, wheat, woollen, silk, flax, mohair and jute tissues, spices, sugar, coffee, hides, dyewoods, and building timber. The principal exports are various French manufactured cloths, leather, jewellery, agricultural and dairy produce, wine, brandy, and oil. Fishing is extensively prosecuted. Besides the various industries connected with shipbuilding, Havre possesses sugar-refining works, tobacco manufactories, iron foundries, salt works, breweries, vitriol works, and manufactures of *faience*, lace, silk, and paper. It is also much frequented for sea-bathing. The population in 1872 was [illegible] it was 85 407.



Plan of Havre.

1. Prison.
2. Hôtel de Ville.
3. Exchange.
4. Tribunal of Commerce.
5. Theatre.
6. College.
7. Marine Arsenal.
8. Church of St Francis.
9. Courthouse.
10. Church of Notre Dame.
11. Musée.
12. Custom House.
13. Frascati Bath House

Until 1516 Havre was only a fishing village possessing a chapel dedicated to Notre Dame de Grâce, to which it owes its original name Havre, or harbour, de Grâce. The building of the harbour was begun by Francis I., who gave the town the name of Franciscopolis. At the entrance to the harbour he erected a tower which served as a lighthouse for ships until it was demolished in 1862. The town in 1562 was delivered over to the keeping of Queen Elizabeth by the Prince de Condé, leader of the Huguenots, and the command of it was entrusted to Ambrose Dudley, earl of Warwick; but the English were expelled within a year, after a most obstinate siege, the progress of which was pressed forward by Charles IX. and his mother, Catherine de' Medici, in person. The defences of the town were greatly strengthened by Henry II. and Louis XIII., and under Louis XIV. it became an important fortress. In the 18th century it was several times unsuccessfully besieged by the English, who also bombarded it in 1759, 1794, and 1795. It was a port of considerable importance as early as 1572, and despatched vessels to the whale and cod fishing at Spitzbergen and Newfoundland. In 1672 it became the entrepôt of the French East India Company and afterwards of the Senegal and Guinea companies. Its development was greatly furthered by Louis XVI., and Napoleon I. raised it to a war harbour of the first rank. Havre is the birthplace of Bernardin de St Pierre, author of *Paul and Virginia*, Casimir Delavigne, Madeleine de Scudéry, and the naturalists Ancelot and Lesueur.

See Lemale, *Histoire de la ville et des environs du Havre*, 1852; *Mémoires sur la fondation et origine de la ville françoise de Grâce, composés par Guillaume de Marceilles*, first published by M. Morin, 1847; *Le Havre, son passé, son présent, et son avenir*, by Frederick de Coninck, new edition 1862; Nerval, *Documents relatifs à la fondation du Havre*, 1875.

Plate XIII. HAWAIIAN or SANDWICH ISLANDS, The, a group of eight inhabited and four uninhabited islands in the North Pacific Ocean, lying between 18° 54′ and 22° 2′ N. lat. and 155° and 161° W. long. The group has a trend of about N. 64° W., which is nearly the trend of all the Pacific groups. From Honolulu, the capital, on Oahu, the distance to San Francisco is 2100 miles; to Auckland, New Zealand, 3810 miles; to Sydney, New South Wales, 4484 miles; to Yokohama, 3440 miles; to Hongkong, 4893 miles; to Tahiti, 2380 miles. The first of the names by which the group is designated above is taken from that of the largest island Hawaii, and is the name adopted by the inhabitants. The other name was given to it by Captain Cook the discoverer, in honour of the earl of Sandwich, first lord of the Admiralty at the time of the discovery.

History.—These islands, the most important Polynesian group in the North Pacific, were discovered by Captain Cook in 1778.[1] He was received by the natives with many demonstrations of astonishment and delight; and offerings and prayers were presented to him by their priest in one of the temples; and though in the following year he was killed by a native when he landed in Kealakeakua bay in Hawaii, his bones were preserved by the priests and continued to receive offerings and homage from the people, until the abolition of idolatry. At the time of Cook's visit each island had its chief. On the death of the chief who ruled Hawaii at that time there succeeded one named Kamehameha, who appears to have been a man of quick perception and great force of character. When Vancouver visited the islands in 1792, this chief being desirous of possessing a vessel on the European model, the keel of one was laid down for him. Ten or twelve years later Mr Turnbull found him with 20 vessels of from 25 to 50 tons which traded amongst the islands, and he afterwards purchased others from foreigners. Having encouraged a warlike spirit in his people and introduced firearms, Kamehameha attacked and overcame the chiefs of the other islands one after another, until he became undisputed master of the whole group. He encouraged trade with foreigners, and derived from its profits a large increase of revenue as well as the means of consolidating his power. He died in 1819, and was succeeded by his son, a mild and well-disposed prince, but destitute of his father's energy. One of the first acts of Kamehameha II. was to abolish idolatry and idolatrous rites throughout the islands. Some disturbances were caused thereby, but the insurgents were defeated and the peace of the islands has been scarcely broken since. In 1820 missionaries arrived from America and commenced their labours at Honolulu. A short time afterwards the British Government presented a small schooner to the king, and this afforded an opportunity for the Rev William Ellis, the well-known English missionary, to visit Honolulu, along with a number of Christian natives from the Society Islands. Finding the language of the two groups nearly the same, Mr Ellis, who had spent several years in the southern islands, was able to assist the American missionaries in reducing the Hawaiian language to a written form. In 1824 the king and queen of these islands paid a visit to England, and both died there of measles. For many years the Hawaiians have continued to advance steadily in intelligence, resources, and civilization, but their progress has been at times interrupted by the conduct of the officers of foreign powers. On one occasion a British officer went so far as to take possession of Oahu and establish a commission for its government; and French officers abrogated the laws, dictated treaties, and by force of arms established the Roman Catholic religion in the country. The act of the British officer was disavowed by his superiors as soon as known; and these outrages led to a representation on the part of the native sovereign to the Governments of Great Britain, France, and the United States of America, and the independence of the islands was guaranteed by these powers in 1844. Kalakaua, the reigning monarch (1880), was elected king by ballot on Lunalilo's death without heirs in 1874. The heir to the throne is a sister of the king, Lelia Kamakaeha, and is married to an American.

Inhabitants.—By the census taken in December 1878 the population of the whole group amounted to 57,985 persons, instead of 56,897 as in 1873. The number of natives of pure Hawaiian race was 44,088, of half castes 3420, Chinese 5916, Americans (U.S.) 1276, British 883, Portuguese 430, Germans 272, French 81, other foreigners 666, and Hawaiians born of foreign parents 947.

The natives belong to the Malayo-Polynesian race. Their reddish-brown skin has been compared to the hue of tarnished copper. The hair, usually raven black, is straight or at most wavy; the beard is thin, the face broad, the profile not prominent, the nose rather flattened, and the lips thick. The bulk of the population are of moderate stature, but the chiefs and the women of their families are remarkable for height.

"The inhabitants of these islands," says Mr Ellis,[2] "are, considered physically, amongst the finest races in the Pacific, bearing the strongest resemblance to the New Zealanders in stature, and in their well-developed muscular limbs. The tattooing on their bodies is less artistic than that of the New Zealanders, and much more limited than among some of the other islanders. They are also more hardy and industrious than those living nearer the equator. This may partly arise from their salubrious climate, and the comparative sterility of their soil, rendering them dependent upon the cultivation of the ground for the yam, the arum, and the sweet potato, their chief articles of food. Though, like all undisciplined races, the Sandwich Islanders have proved deficient in firm and steady perseverance, they manifest considerable intellectual capability. Their moral character, when first visited by Europeans, was not superior to that of other islanders, and, excepting where improved and preserved by the influence of Christianity, it has suffered much from the vices of intemperance and licentiousness introduced by foreigners. Polygamy prevailed among the chiefs and rulers, and women were subject to all the degrading restrictions of the tabu system, which forbade them to eat many provisions, and kept them absolutely in a condition of inferiority to the other sex. Infanticide was practised to a large extent, the children destroyed being chiefly females. [illegible]

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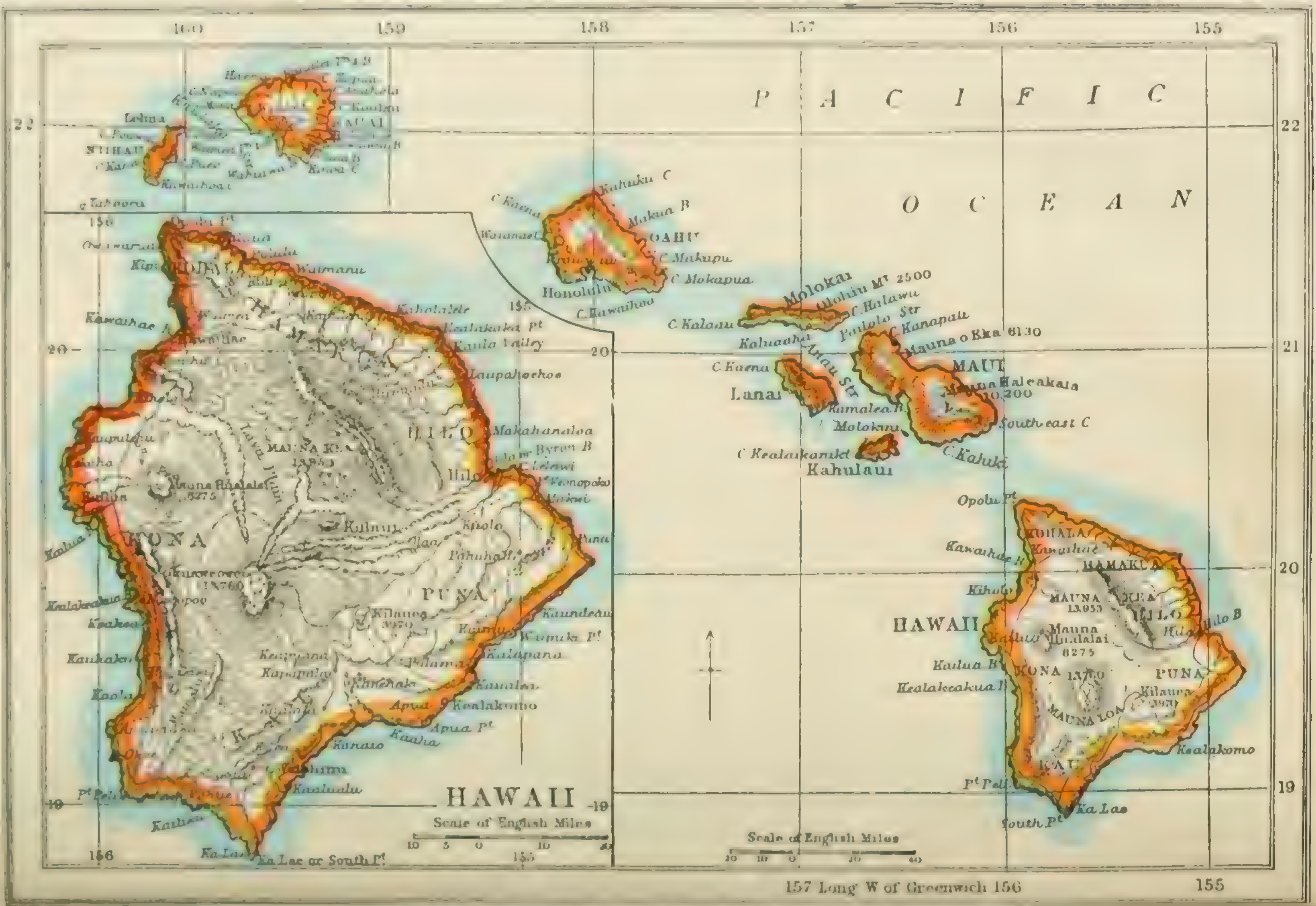
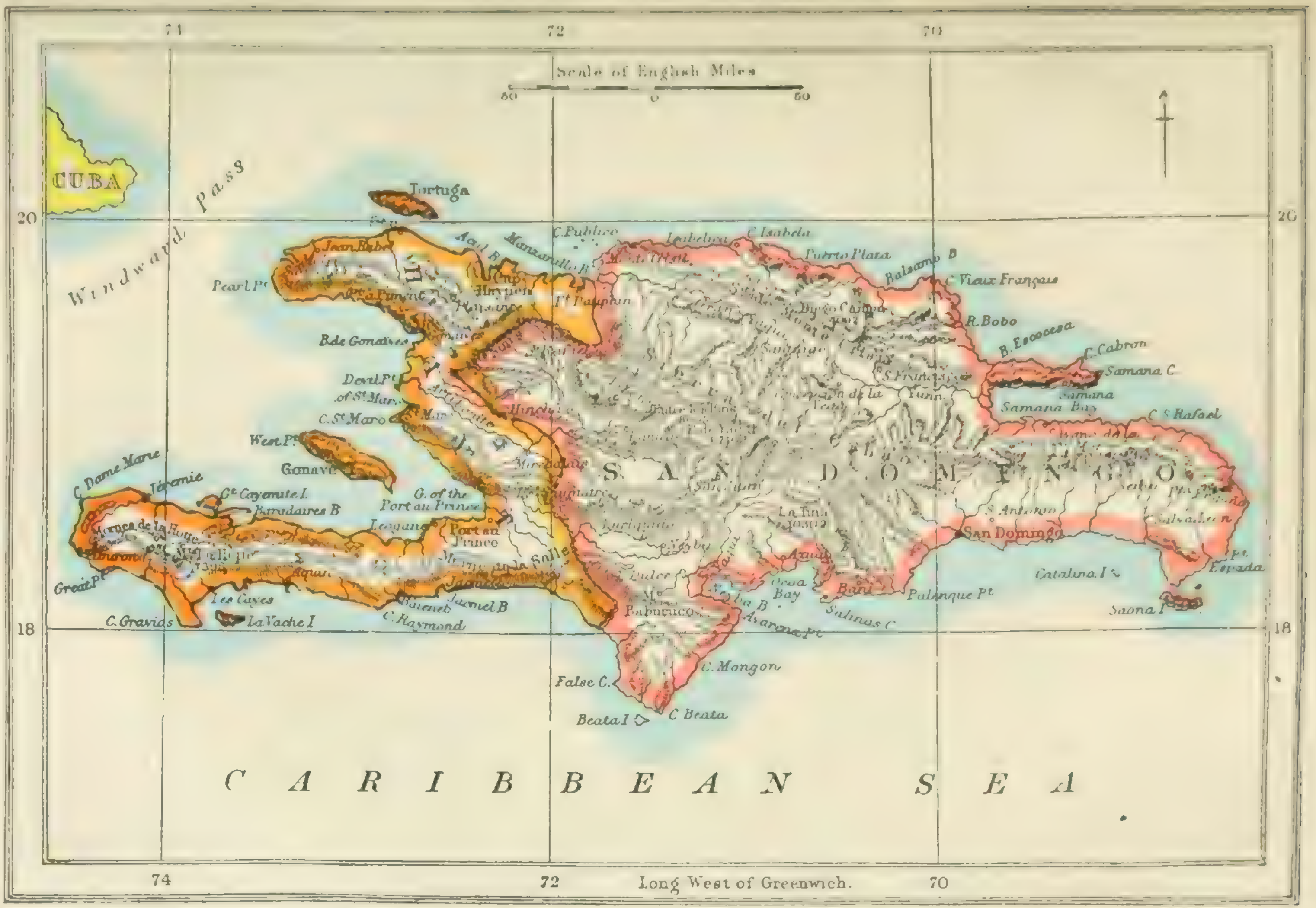
[1] [illegible] 1877, that [illegible]

[2] Mr Ellis was the writer of the article Polynesia, which [illegible] of the Hawaiian Islands, in the 8th edition of this work.

HAWAIIAN ISLANDS



HAYTI (OR SAN DOMINGO)



ology of the other islands, the supernatural beings supposed to reside in the volcanoes and the frequent exhibition of subterranean fires rendered the gods objects of peculiar terror. Human sacrifices were slain on several occasions, and vast offerings presented to the spirits supposed to preside over the volcanoes, especially during the periods of actual eruptions. The requisitions of their idolatry were severe, and its rites cruel and bloody. Grotesque and repulsive wooden figures, animals, and the bones of chiefs were the objects of worship. Human sacrifices were offered whenever a temple was to be dedicated, a chief was sick, or a war was to be undertaken; and these occasions were frequent. The apprehensions of the people with regard to a future state were undefined, but fearful. The lower orders expected to be slowly devoured by evil spirits, or to dwell with the gods in burning mountains. The several trades, such as that of the fisherman, the tiller of the ground, and the builder of canoes and houses, had each their presiding deities. Household gods were also kept, which the natives worshipped in their habitations. One merciful provision, however, had existed from time immemorial, and that was sacred enclosures, places of refuge into which those who fled in time of war, or from any violent pursuer, might enter and be safe. To violate their sanctity was one of the greatest crimes of which a man could be guilty."

In the former state of society the habits of the people were extremely licentious; men were living with several wives, and women with several husbands. Female virtue was an unknown thing, and there is no native word for it. This state of things has, however, been greatly altered by the exertions of the missionaries.

As regards cannibalism, it appears that the heart and liver of the human victims offered in the temples were eaten as a religious rite, and that the same parts of any prominent warrior slain in battle were devoured by the victor chiefs in the belief that they would thereby inherit the valour of the dead man. When, on the death of the great warrior Kamehameha I., the chiefs assembled to deliberate what should be done with his body, one suggested that they should eat it, but this did not find favour with the others.

The Hawaiians are a good-tempered, light-hearted, and pleasure-loving race. They have many games and sports, and the women spend much time in making flower garlands. Both sexes are passionately fond of riding, almost every one being in possession of a horse. They delight to be in the water, and swim with remarkable skill and ease. In the exciting sport of surf swimming, which always astonishes strangers, they balance themselves whilst standing or sitting on a small board which is carried landwards on the curling crest of a great roller.

In spite of moral and material progress—better food, better clothing, improved dwellings, and many other advantages of civilization—the race is dying out, and, indeed, is threatened with extinction in the course of a few years. Captain Cook estimated the number of natives at 400,000; in 1823 the American missionaries calculated them to be only 142,000; the census of 1832 showed the population to be 130,313; and the census of 1878 proved that the number of natives was no more than 44,088. To account for this it is said that the blood of the race has become poisoned by the introduction of foreign diseases. The women are much less numerous than the men; and the married ones have few children at the most; two out of three have none. Moreover the mothers appear to have little maternal instinct, and there is consequently a neglect of the offspring. Whilst the Hawaiians are decreasing, the Chinese are coming in large numbers, and threaten in time to take their place. To counteract this, as well as to supply the pressing need for labourers, the Government has considered many schemes for introducing other immigrants. Polynesians from other islands have been brought over, and a considerable number of Portuguese have come from Madeira.

The language is a branch of the widely-diffused Malayo-Polynesian tongue; and Hawaiians and New-Zealanders, although occupying the most remote regions north and south at which any of their race have been found, can understand each other without much difficulty. This language is soft and harmonious, being highly vocalic in structure. The only consonants are *k*, *l*, *m*, *n*, and *p*, which with the gently aspirated *h*, the five vowels, and the vocalic *w*, make up all the letters in use. The letters *r* and *t* have been suppressed of late years in favour of *l* and *k*, so that, for example, *taro*, the former name of the *Colocasia* plant, is now *kalo*. The language was not reduced to a written form until after the arrival of the missionaries.[1]

In the days of idolatry the only dress worn by the men was a narrow strip of cloth wound round the loins and passed between the legs. Women wore a short petticoat made of *tapa* (cloth prepared from the inner bark of the paper mulberry), which reached from the waist to the knee. But now the common class of men wear a shirt and trousers, whilst the better class are attired in the European fashion. The women are clad universally in the *holoku*, a loose white or coloured garment with sleeves reaching from the neck to the feet. A coloured handkerchief is twisted round the head or a straw hat is worn. Both sexes delight in adorning themselves with garlands (*leis*) of flowers and necklaces of coloured seeds.

The natives derive their sustenance chiefly from pork and fish both fresh and dried, and from the *kalo* (*Colocasia esculenta*), the banana, sweet potato, yam, bread-fruit, and cocoa-nut. The root of the *kalo* affords the national dish called *poi*; after having been baked and well beaten on a board with a stone pestle it is made into a paste with water and then allowed to ferment for a few days, when it is fit to eat. There was formerly a particular breed of dog which, after being fed exclusively on *poi*, was considered a great delicacy. The filthy liquor called *awa* or *kawa* is still relished by the natives, and though it is only allowed to be made under licence, it is often prepared clandestinely.

The native dwellings are constructed of wood, or more frequently are huts thatched with grass at the sides and top. What little cooking is undertaken is done outside. The oven consists of a hole in the ground in which a fire is lighted and stones made hot; and the fire having been removed, the food is wrapped up in leaves and placed in the hole beside the hot stones and covered up until ready.

Leprosy is prevalent amongst the natives, and the Government has established a settlement on the island of Molokai where all persons found to be affected with the disease are kept entirely isolated from the healthy part of the community. The lepers number about 800.

Agriculture and Commerce.—Large capital has been embarked, chiefly by Americans, in the production of sugar, the soil and climate being well suited to the cane in those localities where the water supply is ample. There are between 60 and 70 sugar estates, and more are being planted. The principal difficulty is the want of labour. The average yield of sugar per acre is 2½ tons, whilst in some favoured spots as much as 7 tons has been obtained. In 1878 the exports of sugar amounted to 17,187 tons. Rice is also largely cultivated, 2455 tons having been exported in the same year. Coffee is produced only to a small extent. Arrow-root is prepared from the root of the *Tacca pinnatifida*. The *kalo* plant (*Colocasia esculenta*) is extensively grown in wet places. It is said that a patch of *kalo* measuring 40 feet square yields sufficient food for a native for a whole year; a square mile of it would therefore support 17,000 persons. Maize and wheat are raised, and flour is manufactured. Pine apples, oranges, mangoes, custard apples, guavas, and many other fruits have been introduced, and flourish in gardens. A silky fibre called *pulu*, growing on the crown of tree-fern stems belonging to the genus *Cibotium*, is exported in large quantities to America, where it is used for stuffing cushions.

The owners of sheep are few, but they have large flocks, and the wool exported in 1878 amounted to 523,000 lb. Some districts are well suited for cattle raising. The wild cattle on the mountains—a very inferior breed, descended from some left by Captain Vancouver—are shot or taken with the lasso for the sake of their hides, which are exported in large quantities. In one island 11,000 were killed in a single year. The natives used to entrap them by digging pits near pools of water, and it was through falling into one of these pits that Douglas, the botanical collector, met his death by being gored by a bull.

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[1] See Chamisso, *Ueber die Hawaiische Sprache* (Leipsic, 1837); and Andrews, *Grammar of the Hawaiian Language* (Honolulu, 1854), and *Dictionary* (Honolulu, 1865).

Owing to their geographical position the commercial development of the islands has advanced even more rapidly than the material improvement in the circumstances of the people. A treaty of commerce was concluded in 1876 between the United States and the Hawaiian Islands, under which the manufactures of the former and the chief productions of the latter are reciprocally allowed to enter duty free. This treaty has been of great benefit to the islands, more especially by stimulating the cultivation of the sugar cane. The principal exports are sugar, rice, coffee, hides, skins, tallow, and wool. In 1878 the total amount of exports reached the value of about 3,500,000 dollars, whilst the value of imports amounted to about 3,000,000 dollars. The United States are by far the largest customers for the articles exported, and supply the great bulk of the imported goods. In 1878 there were 54 vessels registered under the Hawaiian flag, of which 11 were engaged in whaling and foreign trades, whilst 43 were coasters, making a total of 8000 tons. In 1878, besides the mail steamers, 216 merchant vessels of various foreign nations entered the Hawaiian ports.

Many good roads have been made, and railways have been projected; a telegraph line was opened in 1878 between Wailuku and Lahaina in Maui (40 miles), and has since been extended; considerable capital has been brought in by foreigners; and the price of land is rising. A Government survey of the islands is in progress.

Climate and Meteorology.—The climate in general is warm but very salubrious. The temperature is equable and the sky usually cloudless. The N.E. trades blow for nine months; and the leeward coast, being protected by high mountains, is refreshed by regular land and sea breezes. During January, February, and March the wind blows strongly from the S.W.; and at this season an unpleasant hot damp wind from the equatorial region occasionally makes itself felt. Very much more rain falls on the windward side of the principal islands than on the leeward. Thus at Hilo, on the east coast of Hawaii, the usual rainfall is said to amount to 80 inches, and in some years to more than twice that quantity, whilst at Honolulu on the south coast of Oahu, out of the reach of the windward rains, the mean annual rainfall for the five years ending 1877 varied from 32·30 to 46·40 inches, the average being about 38. The mean annual temperature at the same place for the same period was 75° Fahr. The mean temperature of the coldest month during the five years was 62° Fahr., and that of the hottest month 81° Fahr. Strong gales blow once or twice during the winter, but destructive hurricanes are entirely unknown.

Zoology.—When Cook arrived at the islands he found only hogs, dogs, and rats. There is a day-flying bat; a small lizard is found, but no other reptiles. Cattle, goats, and hogs at the present day run wild upon the mountains in the larger islands, and do much damage to the woods. As to the birds, fifty-three species have been enumerated by Mr Sanford Dole in *Proceedings of Boston Soc. of Natural History* (cf. Sclater's paper in *Ibis*, 1871), but it is thought that many more species remain to be discovered in the mountain districts. In former times the chiefs exacted as a tax from the people the gay feathers of certain species (*Drepanus* and *Moho*), and employed them to ornament their state robes, only one of which is now in existence, and that is kept with the greatest care for the king's use on state occasions. Mr Dole's list includes of *Falconidæ* 2 species, *Strigidæ* 1, *Promeropidæ* 10, *Meliphagidæ* 4, *Turdidæ* 2, *Ampelidæ* 1, *Corvidæ* 1, *Fringillidæ* 5, *Charadriidæ* 2, *Scolopacidæ* 3, *Ardeidæ* 2, *Rallidæ* 5, *Anatidæ* 3, *Procellaridæ* 2, *Laridæ* 5, and *Pelicanidæ* 3. One of the *Rallidæ*, now nearly extinct, is remarkable for having rudimentary wings, like the moa of New Zealand, hidden in long, loose, hairy feathers. Dr Otto Finsch, who visited Honolulu in 1879, says that the native birds, as well as the native plants, are being ousted by introduced species. The house sparrow from Europe and the mina (*Acridotheres tristis*) and the turtle-dove (*Turtur* [illegible] from China), are almost the only birds to be seen in and about the town; and in order to obtain specimens of indigenous species he had to go far inland. (See *Proceed. Roy. Geog. Soc.*, Jan. 1880.)

Botany.—The ravines and mountain slopes on the windward side of the larger islands contain much forest growth, whilst the leeward uplands and plains are comparatively bare. Amongst the more noteworthy trees are a *Pandanus*, or screw pine, and the *Aleurites*, or candle-nut tree, so named from the natives stringing together the kernels, which are very oily, and so making a candle. Sandal-wood, formerly plentiful, is now exhausted. The cocoa-nut palm grows in abundance on the coast. For the following valuable notes on the flora, we are indebted to Dr William Hillebrand, who for many years studied the subject on the spot with the view of publishing a complete work upon it:—

"The flora of these islands according to my researches has [illegible] genera, 829 species of phanerogamous and 147 species of vascular cryptogams [illegible]. There are 144 species of monocotyledons, of which 45 belong to the *Cyperaceæ* and 43 to the *Gramineæ*. Only 3 species of orchids have been found. Of the 829 species of phanerogamous plants 94 are known to have been introduced since the advent of the white man, whilst 597 species are peculiar to the islands, leaving only 138 species which are found elsewhere. With few exceptions the peculiar genera are the richest in species, but some of the genera not entirely Hawaiian are also remarkable for the number of their species; for example, *Cyrtandra* has 29 species, *Piperomia* 21, *Pittosporum* 12, and *Euphorbia* 10. Amongst the peculiar dicotyledonous plants there is not a single annual; and by far the greater number are arborescent or frutescent. There are only two native species of palm, both belonging to the genus *Pritchardia*. Of ferns there are 130 species, including 35 of *Asplenium*, 16 of *Aspidium*, 16 of *Polypodium*, and 8 of *Phegopteris*. The tree ferns number 5 species, 3 belonging to the genus *Cibotium*, and 2 to *Sadleria*. As to the derivation of the flora a distinction must be made between the lower and middle regions and the upper mountainous region. The two former are manifestly connected with the south-western Polynesian and Malaysian flora, so far as the latter is represented by the Moluccas and New Guinea, and connected by Wallace with the Australian continent. Some of the prevailing forest trees of the lower region are identical with the species found in the localities just mentioned, *e.g.*, *Aleurites moluccana*, *Jambosa malaccensis*, *Alphitonia excelsa*, *Dodonæa viscosa*, *Thespesia populnea*, *Cordia subcordata*, *Artocarpus incisa*, *Paritium tiliaceum*, *Broussonetia papyrifera*, and *Cordyline terminalis*. Most of the forest trees of the middle belt, although peculiar as species, have very near congeners in the same direction, as *Metrosideros polymorpha*, *Acacia Koa* (with phyllodia), the *Peleas*, *Pseudopanax*, *Gouldia*, *Sophora*, *Elæocarpus*, *Pittosporum*, *Bobea*, *Straussia*, *Caprosma*, *Maba*, *Sapota*, *Myrsine*, *Olea*, *Pisonia*, *Santalum*, *Charpentiera*, &c. But with regard to the flora of the highest region in the Hawaiian Islands, there are many plants and some entire orders which point to the American continent as the land of their nearest allies,—for instance, the *Compositæ* with few exceptions, the *Rosaceæ*, *Geraniaceæ*, and most of the *Labiatæ*."

Geology and Mineralogy.—Though the islands are mountainous, none of the eminences reach the limit of perpetual snow. All the islands are of volcanic origin and are entirely composed of the products of eruption. On one of them (Hawaii) the volcanic forces are still in operation; on all the others they have been quiescent for an indefinite period, and the superficial rocks are in a more or less advanced state of decay. Where volcanic action has long ceased deep ravines have been excavated on the sides of the mountains, and this is especially the case on the windward side of Hawaii, where the rainfall is very large. The headlands frequently terminate in lofty cliffs, sometimes overhanging the sea to a height of 2000 feet; and these afford additional evidence of a prolonged period of repose. The products of the Hawaiian volcanoes are rather scanty. According to Mr Brigham they consist of hydrochloric, sulphuric, and sulphurous acids, native sulphur, pyrites, common salt, sal ammoniac, hæmatite, quartz, palagonite, felspar, chrysolite, thomsonite, gypsum, solfatarite, copperas, nitre, arragonite, labradorite, and limonite. Evidence of slight upheaval is furnished by those parts of the shore where old coral reefs are found, sometimes as high as 100 feet above the sea.

Government and Laws.—The form of government is a constitutional monarchy, with a legislature composed of 20 nobles appointed by the king for life, and 28 representatives elected every two years by the people—the two classes sitting together. An annual income of 75 dollars is the qualification of an elector. The king has a cabinet of ministers and a privy council. The Government is regularly organized, its departments are efficiently managed, and the laws are justly administered. Many of the principal offices are filled by foreigners, chiefly Americans, who have become Hawaiian subjects. It is somewhat of a burlesque of the proceedings of royalty in Europe that here, where the whole body of subjects is less than the population of a small English county, we find in full display the titles of majesty, royal highness, prince, excellency, &c., as well as knights grand cross and other grades of two royal orders! A governor is appointed by the king for each of the larger islands. Diplomatic representatives of Great Britain, France, and the United States of America are resident at Honolulu, and also consuls of these and other foreign powers. At London, Paris, New York, and several other foreign cities there are Hawaiian diplomatic and consular agents. An efficient postal system has been established, and there is a standing army of about 70 men. The laws are modelled on those of the United States. There is a supreme court of justice, as well as circuit judges and district justices, assisted by a police force.

Religion and Education.—The ancient idolatrous religion has been abandoned since 1819 and the whole population has embraced Christianity. All forms are tolerated, and at Honolulu there are six churches belonging to the Roman Catholic, Protestant Episcopal, and Congregational communions. The bishop of the Church of England is styled the bishop of Honolulu, and the Roman Catholics have also a bishop. The Congregationalists are most numerous. Originally started by the foreign missionaries, the question of education has been taken up by the Government, who have established a board to superintend the affairs connected with this subject. Nearly every native can read and write. In 1878 there were 222 schools, attended by [illegible] boys and [illegible] girls. In the majority of these schools the instruction is communicated in Hawaiian, but in some of a higher grade English is employed, and as the people themselves desire it, that language is more and more introduced.

Revenue and Commerce.—The annual revenue of the Government amounts to about [illegible] dollars, derived chiefly from custom duties ([illegible] dollars in 1878), taxes on real and personal property, and a poll tax. It does not equal the expenditure, and there is a funded debt of from [illegible] to [illegible] dollars. Accounts are kept in dollars, and the coins in circulation are those of American States.

The Capital.—Honolulu (population 14,114), the capital of the island group, stands on the S.W. coast of Oahu, in 157° 51′ 48″ W. long. and 21° 17′ 59″ N. lat., at the mouth of the valley of Nuuanu, which runs back between tall cliffs to two peaks about 3000 feet high in the great eastern range of mountains. It is the seat of the central government and the residence of the king. Although consisting largely of one-story wooden houses, mingled with grass huts half smothered by foliage, Honolulu is said to present to approaching vessels more of the appearance of a civilized place with its churches and public buildings than any other town in Polynesia. The streets, laid out in the American style, are straight, neat, and clean. Water works supply the town from a neighbouring valley. Among the stone erections are the king's house, a hospital, a large hotel built by the Government, and the Government buildings, in which are a fair library of English books and a museum containing corals, shells, and other natural curiosities, as well as specimens of ancient weapons and other native articles. Amongst the brick buildings are large iron works, a brass foundry, an establishment for working up wool, and rice mills. All the necessaries and most of the luxuries of civilized life can be obtained in Honolulu. There are several hotels for the accommodation of strangers, and numerous agencies of both British and American insurance offices, American and English medical men and lawyers have settled in the town; two weekly newspapers in English, and two in the Hawaiian language are published. Honolulu has a good natural harbour, with wharves, a custom house, and warehouses. It is connected by regular lines of mail steamers with San Francisco, Sydney, and New Zealand. There are also lines of steamers to Liverpool and Glasgow, New York and Boston, Bremen, China, and Peru. Small steamers ply between the islands. Commerce is almost entirely carried on by foreigners, and chiefly by Americans, British, Germans, and Chinese. The last are the most numerous; they are acquiring property rapidly, and some of them are wealthy. The foreigners are very sociable, and have established numerous clubs, benevolent societies, &c. American influence and customs are said to be dominant. In the neighbourhood of the town is a college, where for a small sum boys and girls receive a good English education.

The Separate Islands.—The following description of the separate islands begins with the largest and most easterly, giving the others in the order of their position.

Islands	Length in Miles.	Width in Miles.	Estimated Area in Acres.	Population. Census 1878
Hawaii	100	90	2,500,000	17,034
Maui	54	25	400,000	12,109
Kahulawi	12	5	30,000	60
Lanai	20	9	100,000	214
Molokai	35	7	200,000	2,581
Oahu	35	21	350,000	20,236
Kauai	30	28	350,000	5,634
Niihau	20	5	70,000	117
			4,000,000	57,985

In older English works Hawaii is called Owhyhee and Maui Mowee. The four uninhabited islets are named Nihoa, Kaula, Lehua, and Molokini.

Hawaii has an area nearly double that of all the other islands put together. In shape it is a rude triangle, with sides of 85, 75, and 65 geographical miles in length. Almost the whole of its surface is occupied by the gentle slopes of four volcanic mountains, Mauna Kea on the N., 13,805 feet in height, the highest peak in the Pacific Ocean; Mauna Loa on the S., 13,675 feet; Mauna Hualalai on the W., 8275 feet; and Mauna Kohala on the N.W., 5505 feet.

The highest points of Mauna Kea are terminal cones with craters rising from plains of clinkers and gravel, ashes and sand; but no modern streams of lava are visible, nor is there record of any eruption of this mountain. The slopes on the west side are so gentle that the base of the terminal cones may be reached on horseback. On the windward side cryptogamous vegetation reaches as high as 12,000 feet, but the forest ceases at 6000 feet.

Mauna Loa is the most interesting mountain of the whole group from its being still an active volcano. The circular terminal crater, 8000 feet in diameter, is quite perfect, with nearly vertical walls from 500 to 600 feet high on the inner side; and the bottom between the terminal cones is usually covered with solid lava, from the fissures of which issue steam and sulphurous vapours; but its features change with every eruption. There is no record of any eruption from Mauna Loa before 1832, when lava flowed from the summit crater on several sides. In 1843 a vast flood of lava was discharged, which formed three streams 5 or 6 miles wide and between 20 and 30 miles long. There were eruptions in 1851, 1852, 1855, and 1859, but in none of these did the lava reach the sea except on the last occasion, when the eruption continued for two months, and a winding current 50 miles long, from 1 to 5 miles wide, and from 10 to some hundreds of feet thick, arrived at the west coast in eight days. Its surface is now black, shining, brittle, and very porous. In 1868 occurred another eruption attended by many earthquakes. One of these caused a huge sea wave 40 feet high to break on the shore, occasioning the loss of many lives and the destruction of much property. The wave crossed the Pacific to the Californian coast. Later in the same year, at a time when earthquakes were taking place on the coast of South America and the town of Iquique in Peru was destroyed, a great wave came across the Pacific, struck the Hawaiian Islands, and made itself felt in New Zealand. The last eruption took place in February 1877, when a stream of lava flowed for six hours.

Sixteen miles to the S.E. of Mauna Loa is a hill called Kilauea, with a crater which is the largest active one in the world. The earliest recorded eruption was in 1789, and there was another in 1832. This volcano was first made known to the civilized world in 1823, when Mr Ellis and a party of American missionaries visited it. At an elevation of 4400 feet above the sea they found in the midst of a plain an oval crater 9 miles in circumference with vertical sides 1000 feet deep, covered at the bottom with a lake of liquid lava at one end red and boiling. Around the edge or from the midst of this fiery lake, 51 conical craters sent forth jets of lava or smoke and flame. A stony ledge round the inside of the crater, and 300 or 400 feet above the lake, indicated that the lava had risen to that height and had then run off by a subterranean channel to the sea, where some miles of coast had been filled up with liquid lava a few weeks previously. Since that time many travellers have ascended to the craters of both Mauna Loa and Kilauea, and have given vivid descriptions of the very grand and wonderful phenomena they witnessed.[1] In 1840 the commander and officers of the United States Exploring Expedition spent three weeks on the summit of Mauna Loa and made an accurate survey of the crater. In that year there was a great outburst from a crater 8 miles from the summit of Kilauea, when a stream of lava half a mile broad and 40 miles long reached the sea.

Over the whole summit of Hualalai, another of the four mountains of Hawaii, are scattered many pit craters from 300 to 500 feet deep and from 700 to 1000 feet in diameter, their solid walls being nearly vertical. On the edge of one of the deepest craters there is a mound about 50 feet high, composed of drops of lava and fragments of all sizes, coloured yellow, orange, red, blue, and black. They seem to have been ejected in a viscid state, for they are slightly agglutinated together. In the centre of the mound is a blow-hole 25 feet in diameter and about 1800 feet deep. The inside of this hole is grooved horizontally, but otherwise smooth as if turned. More than 150 cones have been counted on the sides of Hualai. The last eruption took place in 1801, when a copious flow of lava reached the coast, where it filled up a deep bay.

The lavas of Hawaii are distinguishable according to the aspect of their surface into three classes. 1. The *pahoehoe* of the natives, or velvety lava, is folded and twisted in a manner that shows it was once a viscid fluid. This is the common form when the flow has passed over rocks or dry ground on a gentle slope. 2. The clinkers or scoriaceous lava is rough and covered with fragments. This is found wherever the stream has passed through woods or has been impeded by inequalities of the ground, or where its heat has caused the explosion of caverns beneath the floor of older beds. 3. The *a-a* or spongy lava, which, on account of its extreme roughness and hardness, is carefully avoided by all travellers. This form is thought to owe its origin to the fact that, just as the lava was granulating, impediments that stood in its course gave way, when the spongy mass rolled over and built up piles from which the liquid portion drained off. The natives are in the habit of making holes in the *a-a*, and planting in them banana shoots or sweet-potato cuttings, and though the holes are simply filled with stones or fern leaves the plants grow and in due time are productive.

The plain lying between the mountains of Hawaii is many square miles in extent, and is intersected by lava streams which have issued from the three nearest volcanoes. The rocks forming the north point of Kealakeakua bay, where Captain Cook was killed, are part of a flow which may be traced up the steep ascent and over a precipice where it must have fallen like a cascade, the surface being curiously marked with waves and curves as if the molten stone had been solidified instantaneously. A sheet of copper with an inscription, attached to the stump of a cocoa-nut palm, for many years served as the only memorial of Captain Cook's death; but in 1874 a monument was erected at the spot by the residents of Honolulu. The east coast of Hawaii from Hilo to Laupahoehoe, a distance of 30 miles, is very remarkable for the streams, 85 in number, running at the bottom of ravines 1500 or 2000 feet in depth which are cut into the side of Mauna Kea, and render travelling along this coast a work of extreme labour. The ridges between the ravines terminate at the sea in precipices from 100 to 500 feet high, so that the road is obliged to run inland into and across the ravines.

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[1] Amongst the many phenomena they speak of the delicate glassy fibres called Pele's hair by the Hawaiians, which are spun by the wind from the rising and falling drops of liquid lava and blown over the edge or into the crevices of the crater. Pele in idolatrous times was the dreaded goddess of the volcano. It is noteworthy that a substance resembling Pele's hair is made from the slag of iron furnaces, by driving steam or air against a thin current of the melted slag. The filamentous material thus made has been termed mineral or slag wool; it can be woven into sheets which are useful for coating steam boilers, &c., as the substance is a very bad conductor of heat.

At a point midway between the three southern mountains, and at a height of 5000 feet, are the ruins of the ancient temple of Kaili, 92 feet long, which formerly contained many idols.

Hilo (population 4200), the residence of the governor, is a straggling village half hidden in sugar-cane and other vegetation on the east coast. It lies in a bay that is little more than an open roadstead, but is partly protected from heavy seas by a sunken coral reef.

MAUI, lying 25 miles N.W. of Hawaii, is composed of two mountains connected by a sandy isthmus 7 or 8 miles long by 6 miles across, and so low that the depression of a few feet would convert Maui into two islands. Haleakala, the mountain to the N.W., has a height of 10,032 feet, and forms a great dome-like mass with a circumference at the base of 90 miles, and with regular slopes of only 8° or 9°, so that travellers may ride to the top on horseback. The extinct crater on its summit, the largest in the world, has a length from E. to W. of 7½ miles, and a width of 2¼ miles, with an area of about 16 square miles. The circuit of the walls, which are composed of a hard grey clinkstone much fissured, is from 18 to 20 miles. The depth, measured from the highest point of the rim, is 2720 feet. At the bottom are 16 cones 500 or 600 feet high, formed long after the top of the great crater had been destroyed, perhaps by explosions. On the east and north are two great gaps in the walls from 1 to 3 miles wide, through each of which has poured a copious flood of lava which nearly reached the sea. These streams, though of unknown date are comparatively modern, for they have blocked up several ravines in their progress. A little impure sulphur is found in the crater, but there is not the least sign of igneous activity at present on the island. Eeka, the mountain at the south-east of Maui, is 5820 feet high. Volcanic action appears to have ceased here at a much earlier period than on Haleakala, there being no craters on the summit or sides, whilst the slopes have been denuded into deep valleys separated by narrow sharp ridges.

Lahaina (population 3000), on the north-west shore, is the residence of the governor. It is a decaying place situated in a grove of cocoanut and other tropical trees. The roadstead is roomy and sheltered, and there is regular steam communication with Honolulu, about 72 miles distant. A native Hawaiian college in the neighbourhood is supported by Government. Foreigners reside at Lahaina, as well as at *Wailuku* (population 4000), a town on the east shore of the island. They are principally employed in the cultivation of sugar.

KAHULAWE is a small island 6 miles west of Maui. Though the vegetation is scanty and there are no streams, it has been leased by the Government for sheep pasture. The highest point is only about 1130 feet above the sea, and there are no ravines.

LANAI is another small island on the west of Maui, from which it is 9 miles distant. At the north-east end there is a mountain 3000 feet high without a crater. Vegetation is stunted on the exposed slopes, but the ravines contain a rich growth of trees and shrubs. Sheep in large numbers are pastured here. Lanai and Kahulawe are remarkable for presenting high cliffs to the leeward and gentle slopes to the windward, the reverse being the case in all the other islands.

MOLOKAI is a long narrow island 9 miles distant from the north-west end of Maui. A ridge of hills forms its backbone, and [illegible] of lateral spurs enclosing ravines. At the west end are some lofty broken peaks, the highest of which is about 3500 feet above the sea. There are wild cattle on the hills, the descendants of tame cattle which belonged to a former king. The leper settlement of Molokai has been already mentioned.

OAHU, 23 miles N.W. of Molokai and 67 miles S.E. of Kauai, has an irregular quadrangular form. It is traversed from S.E. to N.W. by two parallel ranges of hills separated by a low plain. The highest point in the island is Kaala, 4000 feet, in the western range, but the eastern range is much longer than the other, and its crest is very broken. On the land side there are many ravines formed by lateral spurs, but for 30 miles on the other side it presents to the sea a nearly vertical wall without a break. The valleys are remarkable for beautiful scenery,—precipitous cliffs, lateral ravines, cascades, and tropical vegetation combining to charm the eye. There are few craters on the loftier heights, volcanic activity appearing to have long ceased, but on the coast there are several groups of small cones with craters, some of lava, others of tuff. The greater part of the coast is surrounded by a coral reef, often half a mile wide. In several localities an old reef has been upheaved, sometimes to the height of 100 feet, and now forms part of the land. By such an upheaval a bay of the sea a mile wide and two miles long has been converted into a plain some 25 feet above the level of the ocean, and upon this plain stands Honolulu, the capital of the kingdom, noticed above.

KAUAI, 67 miles N.W. of Maui and 25 miles from Molokai, has an irregularly circular form; and at the centre is the basaltic mountain Waialeale, 5000 feet high, which has a swampy top and sides deeply furrowed by ravines, showing that volcanic action has been long extinct. To the west of the mountain is a tableland with an elevation of 4000 feet and an area of 40 square miles, terminating at the sea in a precipice of 2000 feet. The valleys are numerous, deep, and very picturesque with wood and waterfalls. The soil is fertile, the lavas of nearly the whole island being much decomposed. In some places, however, are cones which have preserved their craters. Numerous dykes are exposed in the valleys, and there are large caverns in several localities which are thought to have been great bubbles in the lava. In one place near the shore is a bank of calcareous sand which on being set in motion gives out a curious noise. When the grains were examined with the microscope they were found to contain cavities, and it is supposed that these minute hollows are the cause of the resonance, for when the sand is wet the noise is not heard. A district on the north side of the island is considered to be the best watered and most fertile in the entire group; it contains several sugar plantations. In this part the rainy season extends over nine months. The chief town is *Waimea* (population 1200), which affords the best anchorage in Kauai; it is situated at the mouth of a stream navigable by boats for three quarters of a mile.

NIIHAU, the most westerly island of the group, is 15 miles west of Kauai. Two-thirds of it consist of a low plain composed of an uplifted coral reef and matter washed down from the mountains. The hilly portion is destitute of cones, craters, peaks, and ridges. The coast on the side towards Kauai is formed of high cliffs, and from the similarity of the structure of the rocks on the two sides of the strait it is thought that the islands were once united. The soil of Niihau is dry, yet fertile. The island is the property of a foreigner who pastures about 75,000 sheep upon it. The uninhabited islets of Kaula and Lehua, close to Niihau, have each of them a tufa cone.

See G. Mortimer, *Observations during a Voyage to the . . . Sandwich Islands, &c.*, Lond., 1791; G. F. Mathison, *Narr. of a Visit to the Sandwich Islands*, 1825; W. Ellis, *Narrative . . . with Remarks on the Sandwich Islands*, 1826; *Voy. of H.M.S. Blonde to the Sandwich Islands*, 1824-25, Lond. 1826; J. Jarves, *Hist. of the Sandwich Islands*, Boston, U.S., 1843; H. T. Cheever, *Life in the Sandwich Islands*, 1851; W. Ellis, *Polynesian Researches*, 1859; S. S. Hill, *Travels in the Sandwich Islands*, 1856; Ch. Wilkes, U.S.N., *Narrative of Exploring Expedition round the World*, 1838-42, New York, 1856; T. Williams, *The Sandwich Islands*, Lond., 1858; Hopkins, *Hawaii, Past, Present, and Future*, Lond., 1866; Jules Remy, *Récits d'un vieux sauvage pour servir à l'histoire ancienne de Hawaii*, Châlons-sur-Marne, 1859; Id., *Ka Mooolelo Hawaii, histoire de l'archipel havaiien*, text and translation, Paris, 1862; H. Mann, *Flora of the Hawaiian Islands*, Boston, 1866, and his papers in *Mem. Boston Soc.*, 1869, and in *Proc. of Amer. Acad.*, vol. vii., 1868; Brigham, "Notes on Hawaiian Volcanoes," in *Mem. Bost. Soc. Nat. Hist.* (Boston, 1868, &c.), and his papers in the *Geol. Mag.* 1876 and the *Athenæum* 1876; Haun, "Karte der Sandwich Inseln," in *Zeitschrift der Gesellsch. für Erdk.*, viii., 1873; W. R. Bliss, *Paradise in the Pacific*, New York, 1873; Nordhoff, *Northern California, Oregon, and the Sandwich Islands*, London, 1874; C. de Varigny, *Quatorze ans aux îles Sandwich*, Paris, 1874; H. M. Whitney, *The Hawaiian Guide-book*, Honolulu, 1875; Thrum, *Hawaiian Almanac for 1875*, Honolulu, 1875; Ferreiro, "Las islas de Sandwich descubiertas por los Españoles," in *Boletin de la Soc. Geogr. de Madrid*, 1877. For further bibliographical details see *Hawaiian Club Papers*, Boston, 1868, and W. Martin, *Cat. d'ouvrages relatifs aux îles Hawaii*, Paris, 1867. A map of Hawaii is given in Petermann's *Mittheilungen*, 1876, and one of the other islands, *ibid.*, 1878. (J. Y. J.)

HAWARDEN, a market town of Flintshire, North Wales, 8 miles S.W. of Chester, is a clean and tolerably well-built place, situated on an eminence commanding an extensive prospect. It lies in the midst of a coal district, and near it are valuable clay beds. Coarse earthenware, draining tiles, and fire-clay bricks form the chief manufactures of the district. The family of Maude derive the title of viscount from the town. Population (1871) of the township, 6782, of the parish (including Saltney), 8683. In the neighbourhood is Hawarden Castle, built in 1752, and added to and altered in the Gothic style in 1814; it stands near the ruins of the old castle of that name which was granted by the Conqueror to his nephew Hugh Lupus, and which after many vicissitudes came into the possession of Serjeant Glynne lord chief justice of England under Cromwell. On the death in 1874 of Sir Stephen R. Glynne, the last of a line of baronets, the castle passed to his brother-in-law the eminent statesman Mr W. E. Gladstone.

HAWES, Stephen, a minor English poet of the 16th century. Neither the date of his birth nor that of his death has been ascertained, and all the known facts of his life may be stated in a few lines. He was probably a member of a Suffolk family, studied at Oxford, with what success we can only conjecture, travelled in England, Scotland, and France, and having acquired the reputation of a man of culture was appointed groom of the chamber to King Henry VII. He was still alive in January 1520-21, as appears by an entry, *Item to Mr Hawse for his play vj li. xiij s. iiij d.* Of the play thus mentioned nothing further is known. The writer's chief work was *The Historie of Graunde Amoure and la Bell Pucell, called the Pastime of Pleasure, conteyning the knowledge of the Seven Sciences and the Course of Man's Life*, a long allegorical poem in the style of Lydgate. Its general method may be guessed from such a heading as *How Science first sent him to Gramer where he was received by Dame Congruitie*; and, though it must be confessed that portions of the poem are better both in matter and in workmanship than might be expected, it is now of interest almost exclusively because, in Warton's words, it is "almost the only effort of imagination and invention which had appeared in our poetry since Chaucer." Probably written about 1506, and first printed, it is said, by Wynkyn de Worde, it afterwards went through several editions (J. Wayland, 1554; Richard Tottel, 1555; J. Waley, 1559); a reprint of Tottel's was made for the Percy Society in 1842. Among the minor poems attributed to Hawes it is sufficient to mention his *Conversyon of Swerers* and his *Joyful Medytacyon to all Englonde of Kynge Henry the Eyght*. The former, a dry didactic production, was printed by Wynkyn de Worde (1509?) and William Copland (1551). Of the latter the only copy preserved is among Bishop More's books in the public library of the university of Cambridge. Both were edited for the Abbotsford Club by David Laing (1854). For further details see Hazlitt's edition of Warton's *History of English Poetry* (1874), and the Percy and Abbotsford reprints.

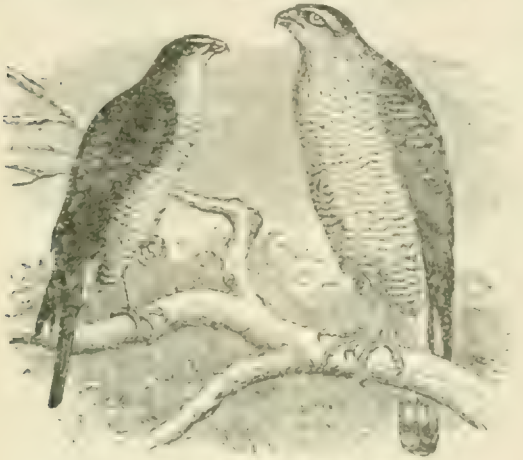
HAWES, William (1785-1846), an English musician of some merit, is remembered chiefly by the fact that through his instrumentality Weber's *Der Freischutz* was for the first time performed in England. This event took place July 24, 1824, and led eventually to Weber's removal to London. Hawes was born in London in 1785, and was for eight years (1793-1801) a chorister of the Chapel Royal, where he studied music chiefly under Dr Ayrton. He subsequently held various musical posts, being in 1817 appointed master of the children of the Chapel Royal. He also, in conjunction with Welsh, carried on the business of a music publisher, and was for many years musical director of the Lyceum Theatre, then devoted to English opera. It was in the last-named capacity that he introduced Weber's masterpiece, at first slightly curtailed, but soon afterwards in its entirety. Winter's *Interrupted Sacrifice*, Mozart's *Cosi fan Tutte*, Marschner's *Vampyre*, and other important works were also brought out under his auspices. Hawes also wrote or compiled the music for numerous pieces, none of which however has survived or deserves mention. Better were his glees and madrigals, of which he published several collections. He also superintended a new edition of the celebrated *Triumph of Oriana*. Hawes died February 18, 1846.

HAWFINCH, a bird so called from the belief that the fruit of the hawthorn (*Cratægus Oxyacantha*) forms its chief food, the *Loxia coccothraustes* of Linnæus, and the *Coccothraustes vulgaris* of modern ornithologists, one of the largest of the Finch family (*Fringillidæ*), and found over nearly the whole of Europe, in Africa north of the Atlas, and in Asia from Palestine to Japan. It was formerly thought to be only an autumnal or winter-visitor to Britain, but later experience has proved that, though there may very likely be an immigration in the fall of the year, it breeds in nearly all the English counties to Yorkshire, and abundantly in those nearest to London. There seems also to be good reason for supposing that it is yearly extending its range in the British Islands. In coloration it bears some resemblance to a Chaffinch, but its much larger size and enormous beak make it easily recognizable, while on closer inspection the singular bill-hook form of some of its wing-feathers will be found to be very remarkable. Though not uncommonly frequenting gardens and orchards, in which as well as in woods it builds its nest, it is exceedingly shy in its habits, so as seldom to afford opportunities for observation. As the genus *Coccothraustes* is now commonly restricted, it includes but this single species,—the Japanese form, at one time regarded as distinct, being considered by the latest authorities to be inseparable. (A. N.)

HAWICK, a municipal and parliamentary borough of Roxburghshire in Scotland, 10 miles S.W. of Jedburgh, and 53 miles S.S.E. of Edinburgh by rail, is situated on the south bank of the Teviot at its junction with the Slitrig, a wild and irregular stream that flows through the town. A handsome bridge, spanning the Teviot, connects Hawick with the manufacturing village of Wilton, which is practically a suburb. The town is fairly well built, the main street being broad and well paved. The ancient tower of the barons of Drumlanrig is now occupied as an inn; and many of the older houses testify by their massive proportions to the former dangers of Hawick's position as a border town. The tower was the only building not burned down in 1570 by the earl of Sussex. The parish church of St Mary has succeeded one mentioned in the *Chronicle of Melrose* as having been consecrated in 1214,—a fact which speaks for the antiquity of the town. Additional testimony is afforded by the Moathill at one end of the town, an earthen mound of great antiquity, about 30 feet high. The present town-charter, granted in 1537 by a baron of Drumlanrig, was confirmed in 1545 by Queen Mary during a residence in the town. Hawick, with Wilton, was in 1868 erected into a parliamentary burgh, uniting with Galashiels and Selkirk in sending a member to parliament. The municipal government is vested in a town council, consisting of a provost, four magistrates, and ten councillors. The exchange, built in 1865, contains a free public library. Hawick possesses a very complete system of underground drainage, in connexion with purification works,—this being the first experiment of the kind on a large scale in Scotland.

The manufactures of Hawick are mentioned in the burgh records so far back as 1640, but they must have been flourishing for some time before that, as the weavers already formed an important part of the population. The weavers then worked each for himself, executing his private orders; and it is not till the middle of the following century that a number of looms under one employer are heard of. Linen was at first the chief article of manufacture, but woollen plaidings were also made. Wool was also spun and sold to be manufactured elsewhere. A carpet factory was begun in 1752, and the manufacture of linen tapes or inkle started a few years afterwards, but both industries became extinct towards the beginning of the present century. The manufacture of tweeds is the most important industry of Hawick. In this branch the annual turn-over is about £800,000; while in the whole woollen trade it is about £2,000,000. The manufacture of hosiery, to which the town owes so much of its prosperity, was introduced in 1771, when four looms, employing six men and five women, produced annually about 2400 pairs of coarse stockings. Hawick has gradually become the chief seat of this trade in Scotland. Some of the yarn spun at Hawick is sent to England and to other parts of Scotland to be woven; while the merino yarn used for the finer goods is chiefly obtained from Pleasley and Nottingham. Besides the staples, tweeds and hosiery, Hawick manufactures shawls, plaids, blankets, gloves, and leather. There are also an oil-work, for extracting oil from the soapy refuse of the fulling-mills, an iron-foundry, and a factory-engineering establishment. The population of the burgh in 1871 was 11,356; in 1879 it was estimated at about 15,000.

HAWK (Anglo-Saxon, *Hafoc*), a word of somewhat indefinite meaning, being often used to signify all diurnal Birds-of-prey which are neither Vultures nor Eagles, and again more exclusively for those of the remainder which are not Buzzards, Falcons, Harriers, or Kites. Even with this restriction it is comprehensive enough, and will include more than a hundred species, which have been arrayed in genera varying in number from a dozen to above a score, according to the fancy of the systematiser. Speaking generally, Hawks may be characterized by possessing comparatively short wings and long legs, a bill which begins to decurve directly from the cere (or soft bare skin that covers its base), and has the cutting edges of its maxilla (or upper mandible) sinuated[1] but never notched. To these may be added as characters, structurally perhaps of less value, but in other respects quite as important, that the sexes differ very greatly in size, that in most species the irides are yellow, deepening with age into orange or even red, and that the immature plumage is almost invariably more or less striped or mottled with heart-shaped spots lengthwise, while that of the adults is generally transversely barred, though the old males have in most cases the breast and belly quite free from markings. Nearly all are of small or moderate size—the largest among them being the Gos-Hawk (vol. x. p. [illegible]) and its Australian allies, and the [illegible] of the smallest, A. *tinus*, is not bigger than a Song-Thrush. They are all birds of great boldness in attacking a quarry, but if foiled in the first attempt they but rarely renew the pursuit. Thoroughly arboreal in their habits, they seek their prey, chiefly consisting of birds, [illegible] often in hiding, patiently waiting for a victim to show itself, and gliding upon it when it appears to be unaware, with a rapid swoop, clutching it in their talons, and bearing it away to eat it in some convenient spot.



[illegible] Sparrow Hawk (*Accipiter nisus*).

It is of course impossible here to enter into details of the numerous forms which, notwithstanding the limitation above adopted, are to be called Hawks, or to describe the distinguishing characters, so far as any have been given, of the different groups or sections into which it has pleased systematic ornithologists to break them up, since hardly any two are agreed in the latter respect. There is at the outset a difference of opinion as to the scientific name which the largest and best known of these sections should bear—some authors terming it *Nisus*, and others, who seem to have the most justice on their side, *Accipiter*. In Europe there are two species—first, *A. nisus*, the common Sparrow Hawk, which has a wide distribution from Ireland to Japan, extending also to northern India, Egypt, and Algeria, and secondly, *A. brevipes* (by some placed in the group *Micronisus* and by others called an *Astur*), which only appears in the south-east, and the adjoining parts of Asia Minor and Persia. In North America the place of the former is taken by two very distinct species, a small one, *A. fuscus*, usually known in Canada and the United States as the Sharp-shinned Hawk, and Stanley's or Cooper's Hawk, *A. cooperi* (by some placed in another genus, *Cooperastur*), which is larger and has not so northerly a range. In South America there are four or five more, including *A. tinus*, before mentioned as the smallest of all, while a species not much larger, *A. minullus*, together with several others of greater size, inhabits South Africa. Madagascar and its neighbouring islands have three or four species sufficiently distinct, and India has *A. badius*. A good many more forms are found in South-eastern Asia, in the Indo-Malay Archipelago, and in Australia three or four species, of which *A. cirrhocephalus* most nearly represents the Sparrow Hawk of Europe and Northern Asia, while *A. radiatus* and *A. approximans* shew some affinity to the Gos Hawks (*Astur*) with which they are often classed. The differences between all the forms above named and the much larger number here unnamed are such as can be only appreciated by the specialist, and could not possibly be pointed out within the limits of this article. It may be observed in conclusion that the so-called "Sparrow Hawk" of New Zealand (*[illegible]*), does not belong to this group of birds at all, and by many authors has been deemed akin to the Falcons. For Hawking, see FALCONRY. (A. N.)

HAWKE, EDWARD HAWKE, BARON (17[illegible]–17[illegible]), an English admiral, was the son of a barrister, and was born in 17[illegible]. He entered the navy at an early age, and in 1733 became commander of the "Wolf." In the engagement off Toulon in 1744, he broke from the line of battle in order to engage the "Poder," and although he succeeded in causing her to strike her colours, his breach of discipline was punished by dismissal from the service. He was, however, almost immediately restored by the king's commands, and in 1747 was promoted to the rank of rear-admiral of the white. In October of the same year he was sent in command of a squadron intended to intercept a fleet of merchant vessels bound for the West Indies under a convoy of nine men of war, and coming up with them on the 14th of the month near the isle of Aix, he succeeded after a severe struggle in capturing six of the men-of-war, but darkness coming on before the close of the contest the whole of the merchant vessels escaped. For his victory Hawke was created a knight companion of the Bath. In December of the same year he was chosen member of parliament for [illegible]. In May 1748 he became vice-admiral of the blue, and in January 17[illegible] admiral of the white. In the following year he superseded Admiral Byng as commander of the fleet in the Mediterranean, but arrived too late to prevent Minorca [illegible] and in none of the commands which he subsequently held did he have an opportunity of distinguishing himself till 1759, when he took charge of a squadron sent to cruise off Brest. On the morning of the 20th November he sighted the French fleet under Admiral Conflans off Belleisle, and notwithstanding that the French, trusting to their knowledge of the rocks and shallows, retired towards the shore, he determined to engage them, which he did with such impetuosity that their fleet was only saved from total destruction by the approach of nightfall. As it was, more than half their vessels were either disabled, captured, or driven on shore. For this brilliant victory, gained in such circumstances of difficulty and danger, with the loss of only two vessels, Hawke received the thanks of the House of Commons and a pension of £2000 per annum. In 1765 he was appointed vice admiral of Great Britain and first lord of the admiralty. In 1776 he was raised to the peerage by the title of Baron Hawke of Towton. He died at Shepperton, Middlesex, 17th October 1781.

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[1] [illegible]

HAWKESWORTH, JOHN (c. 1715 1773), an author of the last century, was born in London, according to one account in 1715, but according to another in 1719. He is said to have been apprenticed first to a clockmaker and afterwards to an attorney, but at any rate he was indebted for the education requisite for the prosecution of a literary career chiefly to his own perseverance. In 1744 he succeeded Dr Johnson as compiler of the parliamentary debates for the *Gentleman's Magazine*. Eight years later he started in company with Johnson, Bathurst, and Warton a periodical called the *Adventurer*. This journal had a great success, and ran to 140 numbers, of which 70 were from the pen of Hawkesworth himself. On account of what was regarded as its powerful defence of morality and religion, Hawkesworth was rewarded by the archbishop of Canterbury with the degree of LL.D. In 1761 he published a volume of fairy tales, and an edition of Swift's works and letters, with a life prefixed which Johnson has referred to in highly laudatory terms in his *Lives of the Poets*. The reputation he obtained by these and other works was such that he was commissioned by Captain Cook to edit his papers relative to his first voyage. The work appeared in 1773 in three volumes, and as a reward of his labours Hawkesworth received from the Government the sum of £6000. His descriptions of the manners and customs of the New World were, however, regarded by many critics as hurtful to the interests of morality, and the severity of their strictures is said to have hastened his death, which took place November 17, 1773. He was buried at Bromley in Kent, where a monument has been erected to his memory. Hawkesworth was a close imitator of Johnson both in style and thought, but his independent literary talent is considerable.

HAWKINS, SIR JOHN (c. 1532-1595), was born in Plymouth about 1532, and was bred a sailor. Learning that negroes from the coast of Guinea were good merchandize for traffic in the West Indies, he made trial of this in three voyages, the first in 1562, the second in 1564. The third, made in company with young Drake in 1567, ended in disaster, the story of which is related by Hawkins himself. He was returned M.P. for Plymouth in 1572; and the next year he was made treasurer and comptroller of the navy. In the expedition against the Armada he was appointed vice-admiral, hoisting his flag on board the "Victory," and for his services on that occasion he was afterwards knighted. His last expedition (1595) was undertaken, once more with Drake, mainly with a view to rescue his son Richard, who three years before had fallen into the hands of the Spaniards off the coast of Quito. It was unsuccessful; and, worn out with fatigue and broken-hearted, he died off Puerto Rico on the 12th of November 1595. Hawkins was the first to use chain pumps and fighting nettings for ships. Stow speaks of him as a very wise, vigilant, and true-hearted man. Along with Sir Francis Drake, he founded in 1588 the "Chest at Chatham," the forerunner of Greenwich Hospital, where it is now preserved. A portrait of Hawkins once adorned the Armada tapestry in the House of Lords.

HAWKINS, SIR JOHN (1719-1789), will be permanently remembered as the author of an important work on the history of music. He was born March 30, 1719, in London, the son of an architect who destined his son for his own profession. Ultimately, however, Hawkins took to the law, devoting his leisure hours to his favourite study of music. A wealthy marriage in 1753 enabled him to indulge his passion for acquiring rare works of music, and he bought, for example, the collection formed by Dr Pepusch, and subsequently presented by Hawkins to the British Museum. It was on such materials that Hawkins founded his celebrated work on the *General History of the Science and Practice of Music*, in 5 vols. (republished in 2 vols., 1876). It was brought out in 1776, the same year which witnessed the appearance of the first volume of Burney's work on the same subject. The relative merits of the two works were eagerly discussed by contemporary critics. Burney no doubt is infinitely superior as a literary man, and his work accordingly comes much nearer the idea of a systematic treatise on the subject than Hawkins's, which is essentially a collection of rare and valuable pieces of music with a more or less continuous commentary. But by rescuing these from oblivion Hawkins has given a permanent value to his work. Of Hawkins's literary efforts apart from music it will be sufficient to mention his occasional contributions to the *Gentleman's Magazine*, his edition of the *Complete Angler*, and his biography of Dr Johnson, with whom he was intimately acquainted. He was one of the original members of the Ivy Lane Club, and ultimately became one of Dr Johnson's executors. If there were any doubt as to his intimacy with Johnson, it would be settled by the slighting way in which Boswell refers to him. Speaking of the Ivy Lane Club, he mentions amongst the members "Mr John Hawkins, an attorney," and adds the following footnote, which at the same time may serve as a summary of the remaining facts of Hawkins's life:—"He was for several years chairman of the Middlesex justices, and upon presenting an address to the king accepted the usual offer of knighthood (1772). He is the author of a *History of Music* in five volumes in quarto. By assiduous attendance upon Johnson in his last illness he obtained the office of one of his executors,—in consequence of which the booksellers of London employed him to publish an edition of Dr Johnson's works and to write his life." Sir John Hawkins died on the 21st of May 1789, and was buried in the cloisters of Westminster Abbey.

HAWKWOOD, SIR JOHN (*ob.* 1394), an English adventurer who attained great wealth and renown by his services as a condottiere in the Italian wars of the 14th century. According to the accepted if not the authenticated account of his life, he was the son of a tanner of Sible Hedingham in Essex, and was apprenticed to a tailor in London. Pressed into the army, he served with honour in France, obtained the favour of the Black Prince, and received knighthood from King Edward III. On the peace of Bretigny in 1360, he collected a band of men-at-arms, and moved southward to Italy, where we find him assisting the Pisans to defeat the Florentines in 1364. His services were sought in succession by Bernabo Visconti, by the legate of Bologna, and by Pope Gregory XI. In 1375 the Florentines entered into an agreement with him, by which they were to pay him and his companion 130,000 gold florins in three months on condition that he undertook no engagement against them; and in the same year the priors of the arts and the gonfalonier decided to give him a pension of 1200 florins per annum for as long as he should remain in Italy. His subsequent services to Florence as captain-general of the city were numerous and important. Hawkwood married Donnana, an illegitimate daughter of Bernabo Visconti, and one of his own daughters became the wife of the count of Porziglia. His latter years were spent in a villa in the neighbourhood of Florence. On his death in 1394 the republic gave him a public funeral of great magnificence and decreed the erection of a marble monument in the cathedral. This, however, was never executed; but Paolo Uccelli painted his portrait in terre-verte on the inner façade of the building, where it still remains, though damaged by removal from the plaster to canvas. Richard II. of England, probably at the instigation of Hawkwood's sons, who returned to their native country, requested the Florentines to let him remove the good knight's bones, and the Florentine Government signified its consent.

The fullest account of Sir John Hawkwood in English is in Nichols's *Bibliotheca Topographica Britannica*, vol. vi. He is one of Richard Johnson's *Nine Worthies of London* (published in *Harleian Misc.*, 1808), and Fuller includes him in his *Worthies of England*. An elaborate life by Manni is given by Tartini in *Rer. Ital. Script.*; and Hawkwood is naturally treated of in Ammirato and the other Florentine chroniclers. The compact with the Florentines is printed in *Archivio Storico*, 1862.

HAWTHORN (Anglo-Saxon, *hægu-*, *hæg-*, or *hege thorn*), *Cratægus*, L., a genus of plants of the natural order *Rosaceæ* and suborder *Pomeæ*. The common hawthorn, termed also whitethorn, quickthorn, quickset, and May tree, May bush, or May (German, *Hagedorn* and *Christdorn*; French, *Aubépine*), *C. Oxyacantha*, L., is a shrub or small tree having a smooth blackish bark; numerous branches, beset usually with thorns, which represent aborted twigs; alternate, long-stalked, obovate-wedge-shaped, 3- or 5-lobed, incised or serrate smooth leaves; flowers sweet-scented, arranged in corymbs, and having caducous bracts, broad, white, pink, or scarlet petals, and 1 to 3 styles; and fruit or "haw" an oblong or nearly globular mealy pome, commonly dark red, but occasionally yellow, black, or even greenish-orange or dull white, and of 1 or 2 cells. The common hawthorn is a native of Europe as far north as 63½° in Sweden, and of North Africa, Western Asia, and Siberia, and has been naturalized in North America and Australia. It thrives best in dry soils, and in height varies from 4 or 5 to 12, 15, or, in exceptional cases, as much as between 20 and 30 feet. There are several varieties of the plant. It may be propagated from seed or from cuttings. The seeds must be from ripe fruit, and if fresh gathered should be freed from pulp by maceration in water. They germinate only in the second year after sowing; in the course of their first year the seedlings attain a height of 6 to 12 inches. In England the hawthorn has been employed for enclosure of land since the Roman occupation, but for ordinary field hedges it is believed it was not generally in use till about the end of the 17th century. James I. of Scotland, in his *Quair*, ii. 14 (early 15th century), mentions the "hawthorn hedges knet" of Windsor Castle. The first hawthorn hedges in Scotland are said to have been planted by soldiers of Cromwell at Inch Buckling Brae in East Lothian, and Finlarig in Perthshire. On the planting and use of hawthorn fences, see AGRICULTURE, vol.. i. pp 296, 310. The wood of the hawthorn is white in colour, with a yellowish tinge. Fresh cut it weighs 68 lb 12 oz per cubic foot, and dry 57 lb 3 oz. It can seldom be obtained in large portions, and has the disadvantage of being apt to warp; its great hardness, however, renders it valuable for the manufacture of various articles, such as the cogs of mill wheels, flails and mallets, and handles of hammers. Both green and dry it forms excellent fuel. The bark possesses tanning properties, and in Scotland in past times yielded with ferrous sulphate a black dye for wool. The leaves are eaten by cattle, and have been employed as a substitute for tea. Birds and deer feed upon the haws, which are used in the preparation of a fermented and highly intoxicating liquor, and for their astringency are sometimes resorted to in dysentery. The hawthorn serves as a stock for grafting other trees. As an ornamental feature in landscapes, it is worthy of notice; and the pleasing shelter it affords, and the beauty of its blossoms, have frequently been alluded to by poets. The custom of employing the flowering branches for decorative purposes on the first of May is of very early origin; but since the alteration in the calendar (see vol. iv. p. 677) the tree has rarely been in full bloom in England before the second week of that month. In Cornwall, however, in 1846, the flowers, though scarce, were gathered on the 18th April; and in the Scotch Highlands they may be seen as late as the middle of June. The hawthorn has been regarded as the emblem of hope, and its branches are stated to have been carried by the ancient Greeks in wedding processions, and to have been used by them to deck the altar of Hymen. The supposition that the tree was the source of Christ's crown of thorns gave rise doubtless to the tradition current among the French peasantry that it utters groans and cries on Good Friday, and probably also to the old popular superstition in Great Britain and Ireland that ill-luck attended the uprooting of hawthorns. Branches of the Glastonbury thorn, *C. Oxyacantha*, var. *præcox*, which flowers both in December and in spring, were formerly highly valued in England, on account of the legend that the tree was originally the staff of Joseph of Arimathea (see GLASTONBURY, vol. x. pp. 674, 675). Sub-species of *C. Oxyacantha* are *C. monogyna*, Jacquin, and *C. oxyacanthoides*, Thuill. *C. Pyracantha* and *C. Crus-galli* are among the cultivated species of *Cratægus*.

See Lauder, *Gilpin's For. Scenery*, i., 1834; Loudon, *Arboretum*, ii. 834; Selby, *Hist. of Brit. For. Trees*, 1842; Bentham, *Illustr. Handb. of Brit. Flora*, i. 270, 1865; C. A. Johns, *The Forest Trees of Britain*, p. 83.

NATHANIEL HAWTHORNE.

NATHANIEL HAWTHORNE was born at Salem, Mass., July 4, 1804. The family name, according to Julian Hawthorne, was either Hawthorne or Hathorne, the pronunciation being the same. Nathaniel preferred the name with the "w" in it. William Hawthorne, a man of restless energy and marked ability, the head of the American branch of the Hawthornes, came in 1630 from Wiltshire, England, with John Winthrop in the "Arbella," and settled in Dorchester, Mass.

In 1636 he removed to Salem, larger grants of land than he had received at Dorchester having been tendered him by that town if he would take up his residence there, on the ground that such a citizen would be "a public benefit." He justified their action by his subsequent conduct, for he cleared the woods, fought the Indians, treated with them, laid plans for the creation of a great fur company, and led adventurous expeditions into the untrodden wilderness.*

He was a Puritan of the sternest character, a "Separatist," and as magistrate ordered the whipping of Arne Coleman and four other Quakers. His son John followed in the father's footsteps, persecuting the Quakers, and presiding as chief judge in the famous Salem witch trials with great harshness and cruelty. One of the witches is reported to have invoked a heavy curse upon him and upon his children's children. The third son of John carried on the family name. He was a quiet, home keeping farmer, while the other male members of the family were noted as sea faring men. Joseph's son, Daniel, born in 1731, earned the name of

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* *Nathaniel Hawthorne and His Wife*, by Julian Hawthorne, Vol I p 10

"bold Daniel," as commander of a privateer called the "Fair American" during the Revolutionary War.

Nathaniel, the third son of Daniel, was born in 1775, and about the beginning of this century married Elizabeth Clarke Manning, a beautiful and gifted young lady five years his junior. "He was a silent, reserved, severe man," Julian Hawthorne says, "of an athletic and rather slender build, and habitually of a rather melancholy cast of thought." He died at the age of thirty-three, leaving three children, one of whom was Nathaniel, to the care of their mother. Madame Hawthorne came of a family as reserved and peculiar in their own way as the Hawthornes were in theirs. Both from father and mother, therefore, Nathaniel Hawthorne inherited that shy, reserved nature which was his characteristic all through life. The secluded widowhood of his mother, who lived a strict hermit to the end of her long life, or for more than forty years after Captain Hawthorne's death, and the witch-haunted memories of the quaint old town in which he was living, made a profound impression upon the young, solitary Hawthorne. At the age of seven he attended the school taught by the lexicographer, Dr. Joseph E. Worcester. During his early life he pored over the works of Spenser, Shakspeare, Pope and Milton, and devoured "Pilgrim's Progress," "Froissart's Chronicles" and "Clarendon's History."

In August, 1820, he issued for a few weeks a little sprightly manuscript periodical, at Salem, called the *Spectator*. In 1825 he was graduated from Bowdoin College, Brunswick, Me. Among his classmates were Henry W. Longfellow, George B. Cheever, John S. C. Abbott and Horatio Bridge. Franklin Pierce, afterward president of the United States, was in the class before him. While in college he evinced no unnatural and feverish thirst for college honors. After his graduation he resided with his mother in Salem. While here he published in different periodicals occasional articles, mostly short, entertaining stories.

In 1826 he published at his own expense—$100—"Fanshawe," an unsuccessful romance. Mr. Goodrich (Peter Parley) said it would have been successful if it had had an enterprising publisher. In 1836 he was called to Boston to edit *The American Magazine*, an illustrated periodical, on a salary of $500 a year. Of this amount he received but little, and the magazine was soon bankrupt. Hawthorne compiled for the company, publishing the magazine, a "Universal History," the foundation of the famous works of Peter Parley. His compensation was $100.

In 1837 Hawthorne's previous contributions to "The Token," begun in 1828 by Mr. Goodrich, were published as "Twice Told Tales." Longfellow favorably reviewed the book in the *North American Review*. Attention now began to be drawn towards the author, and another series soon appeared. In 1839, the historian, Bancroft, then collector of customs at Boston, appointed him as weigher and ganger, at a salary of $1,200. In 1841 he published the first part of "Grandfather's Chair." In 1842 he became connected for a short time with the Brook Farm experiment. In July of the same year he married Miss Sophia Peabody, who had been one of his earnest admirers, and took up his residence in an old manse at Concord on the Concord River, afterward immortalized by him in *Mosses From an Old Manse*, published in 1846. Here he devoted himself to literature, and enjoyed the friendship of Emerson, Thoreau, William Ellery Channing and other notable men.

From 1846 to 1850 he was surveyor of the port of Salem. In 1850 his most important work, *The Scarlet Letter*, was given to the world. From 1850 to 1852 he lived in Lenox, Mass., and published in 1851 the *House of Seven Gables*, and in 1852 the *Blithedale Romance*. In the latter part of the same year he wrote a life of Franklin Pierce, then the democratic candidate for the presidency. Hawthorne wrote it, declaring that he would accept no office in case Mr. Pierce were elected. Urgent friends overcame his scruples, and he served as United States consul at Liverpool, England, from 1853 to 1857.

In 1851 he published *True Stories from History*, etc., and *The Wonderbook*, which were followed by *The Snow Image* (1852), *Tanglewood Tales* (1853), *The Marble Faun* (1860, in some particulars his best effort), and *Our Old Home* (1863), *and English Notes*.

From 1860 to 1864 he lived in Concord, Mass., and died while journeying for his health, at Plymouth, N. H., May 19, 1864. After his death were published a series of *Notebooks* (1868-1872), *Septimius Felton* (1872), and portions of the unfinished *Dolliver Romance*.

There would appear, on a slight view of the matter, no reason for the little notice which Hawthorne's early productions received. The subjects were mostly drawn from the traditions and written records of New England, and gave the "beautiful strangeness" of imagination to objects, incidents and characters which were familiar facts in the popular mind. The style, while it had a purity, sweetness and grace which satisfied the most fastidious and exacting taste, had at the same time more than the simplicity and clearness of an ordinary school-book. But though the subjects and the style were thus popular, there was something in the shaping and informing spirit which failed to awaken interest, or awakened interest without exciting delight. Misanthropy, when it has its source in passion,—when it is fierce, bitter, fiery, and scornful, —when it vigorously echoes the aggressive discontent of the world, and furiously tramples on the institutions and the men luckily rather than rightfully in the ascendant,—this is always popular; but a misanthropy which springs from insight,—a misanthropy which is lounging, languid, sad and depressing,—a misanthropy which remorselessly looks through cursing misanthropes and chirping men of the world with the same sure, detecting glance of reason,—a misanthropy which has no fanaticism, and which casts the same ominous doubt on subjectively morbid as on subjectively moral action,—a misanthropy which has no respect for impulses, but has a terrible perception of spiritual laws, —this is a misanthropy which can expect no wide recognition; and it would be vain to deny that traces of this kind of misanthropy are to be found in Hawthorne's earlier, and are not altogether absent from his later, works. He had spiritual insight, but it did not penetrate to the sources of spiritual joy; and his deepest glimpses of truth were calculated rather to sadden than to inspire. A blandly cynical distrust of human nature was the result of his most piercing glances into the human soul. He had humor, and sometimes humor of a delicious kind; but this sunshine of the soul was but sunshine breaking through or lighting up a sombre and ominous cloud. There was also observable in his earlier stories a lack of vigor, as if the power of his nature had been impaired by the very process which gave depth and excursiveness to his mental vision. Throughout, the impression is conveyed of a shy recluse, alternately bashful in disposition and bold in thought, gifted with original and various capacities, but capacities which seemed to have developed themselves in the shade, without sufficient energy of will or desire to force them, except fitfully, into the sunlight. Shakespeare calls moonlight sunlight *sick*; and it is in some such moonlight of the mind that the genius of Hawthorne found its first expression. A mild melancholy, sometimes deepening into gloom, sometimes brightened into a "humorous sadness," characterized his early creations. Like his own Hepzibah Pyncheon, he appeared to be "walking in a dream;" or rather, the life and reality assumed by his emotions "made all outward occurrences unsubstantial, like the teasing phantasms of an unconscious slumber." Though dealing largely in description, and with the most accurate perceptions of outward objects, he still, to use again his own words, gives the impression of a man "chiefly accustomed to look inward, and to whom external matters are of little value or import, unless they bear relation to something within his own mind." As psychological portraits of morbid natures, his delineations of character might have given a purely intellectual satisfaction; but there was audible, to the delicate ear, a faint and muffled growl of personal discontent, which showed they were not mere exercises of penetrating, imaginative analysis, but had in them the morbid vitality of a despondent mood.

Many of the stories in *Twice-Told Tales* are at once a representation of early New England life and a criticism on it. They have much of the deepest truth of history in them. *The Legends of the Province House*, *The Gray Champion*, *The Gentle Boy*, *The Minister's Black Veil*, *Endicott and the Red Cross*, not to mention others, contain important matter which cannot be found in Bancroft or Grahame. They exhibit the inward struggles of New England men and women with some of the darkest problems of existence, and have more vital import to thoughtful minds than the records of Indian or revolutionary warfare. In the *Prophetic Pictures*, *Fancy's Show-Box*, *The Great Carbuncle*, *The Haunted Mind*, and *Edward Fane's Rose-Bud*, there are flashes of moral insight which light up, for the moment, the darkest recesses of the individual mind; and few sermons reach to the depth of thought and sentiment from which these seemingly airy sketches draw their sombre life. Interspersed with serious histories and moralities like these, are others which embody the sweet and playful, though still thoughtful and slightly saturnine action of Hawthorne's mind,—like *The Seven Vagabonds*, *Snow-Flakes*, *The Lily's Quest*, *Mr. Higginbotham's Catastrophe*, *Little Annie's Ramble*, *Sights from a Steeple*, *Sunday at Home*, and *A Rill from the Town Pump*.

The *Mosses From an Old Manse* [illegible] artistically [illegible] *Twice-Told Tales*. [illegible] of their kind [illegible] productions of Addison, but [illegible]

[illegible] more interested in [illegible] without [illegible] to the patient [illegible] The [illegible] *The Celestial Railroad*, *The Procession of Life*, *Earth's Holocaust*, *The Bosom Serpent* [illegible] In the *Mosses From an Old Manse* we are [illegible] into the belief that [illegible]

In the romance of *The Scarlet Letter* he first made his genius [illegible]

Two characteristics of Hawthorne's genius stand plainly out in [illegible] of the romance of *The Scarlet Letter* [illegible] in his previous works. [illegible] The [illegible] of [illegible] or crime are to him [illegible]

The second characteristic of his genius is connected with the first. [illegible]

The House of the Seven Gables [illegible] *The* *Scarlet Letter*, includes a wider range of observation, reflection, and character, and the morality, dreadful as fate, which hung like a black cloud over the personages of the previous story, is exhibited in more relief.

In the [illegible] stories of *The Wonder Book* and *Tanglewood Tales* Hawthorne's genius distinctly appears in its most lovable though not in its deepest forms. *The Blithedale Romance* very much better than these illustrates the operation, indicates the quality and expresses the power of the author's genius. In regard to *The Marble Faun* there is room for widely varying opinions. Hilda, Miriam and Donatello will be generally received as superior in power and depth to any of Hawthorne's previous creations of character. Donatello especially must be considered one of the most original and exquisite conceptions in the whole range of romance.

Our Old Home and *The English Note Books* reveal the true artist in the author. His pen and ink portraits are drawn with unrivalled power in that English which was absolutely unique. We find in these sketches or impressions always the best word in the best place. [illegible] In summing up these brief accounts of Hawthorne's works we may say that in [illegible] and penetration in the faculty of discerning spirits and detecting [illegible] he has had no equal among the novelists of the century. His genius by its seemingly irresistible force of heredity was drawn towards the dark paths of the soul, haunted by shadowy shapes of gloom and mystery. George S. Hillard once asked him to write a story which should be cheerful and sunny from beginning to end. He smiled and replied that it was impossible, that the dark cloud would come over the sun, that the spectral form would glide in and hush the noise of mirth. This tendency prevented him from winning that hold upon the great mass of the people which he otherwise would have obtained.

(See *Nathaniel Hawthorne and His Wife*, by Julian Hawthorne. *The English Note Books of Nathaniel Hawthorne*, by G. S. Hillard, *Atlantic Monthly*, June, 1870.)

(E. P. W.; S. F.)

HAXTHAUSEN, August Franz Ludwig Maria von (1792–1867), baron of Haxthausen-Abbenburg, was born on his father's estate near Paderborn in Westphalia, February 3, 1792. Educated at first at home, he proceeded in 1811 to the school of mining at Klausthal in the Harz, and after serving in the Hanoverian army in 1813–15, entered the university of Gottingen. On finishing his course there in 1818, he occupied himself with the management of his estates, and the study of the land laws and the legal rights of the peasantry. The result of his studies appeared in 1829 in *Die Agrarverfassung und ihre C[illegible]*, a work which attracted much attention, and procured for him an official commission to investigate and report upon the land laws of the Prussian provinces with a view to a new code. After nine years spent in laborious collation, he published in 1839 an exhaustive treatise, *Die ländliche Verfassung in den Provinzen Ost- und West-Preussen*. In 1843–44, at the request of the emperor Nicholas, he undertook a similar labour for Russia. The fruits of his investigations in that country are contained in *Studien über die inneren Zustände, das Volksleben, und insbesondere die ländlichen Einrichtungen Russlands* (3 vols 1847–52), in *Die Kriegsmacht Russlands* (1852), and in *Die ländliche Verfassung Russlands* (1866). In 1836 he received the honorary title of privy state councillor, and afterwards of hereditary chamberlain of the principality of Paderborn. In 1847–48 he sat as a member of the combined diet at Berlin, and afterwards of the first Prussian chamber. After travelling through a large part of Europe, Baron Haxthausen retired to his estate. He died at Hanover, January 1, 1867.

Besides the foregoing works, Haxthausen was the author of *The* [illegible] and *Transcaucasia*, *Sketches of the Nations and Races between the Black Sea and the Caspian* (in English, 1854, German, 1856); in 1864 he edited *Das [illegible] Princip*, a collection of political writings by various authors.

HAYDN, Joseph (1732–1809), one of the most celebrated composers of the 18th century, was born at Rohrau, a village in Lower Austria, March 31, 1732. Schindler relates that when Beethoven, not long before his death, received a picture of Haydn's birthplace, he exclaimed—"How wonderful that so great a man should have been born in a peasant's cottage." This cottage, which is still standing, had been built by Haydn's father, a worthy wheelwright, of whose twelve children the composer was the second. At an early age the child evinced so decided a talent for music that one Johann Mathias Frankh, a distant relation of the family, proposed to undertake his musical and general education, and for that purpose invited him to Hainburg, a neighbouring town where Frankh kept a school. To Hainburg accordingly young Haydn went in 1738, and there he received instruction in the elementary knowledge of his art, including a practical acquaintance with most instruments, at the hands of the musical schoolmaster. Having developed a remarkable soprano voice, young Haydn was by the intervention of the dean of Hainburg promoted to a post among the choir boys of St Stephen's cathedral, Vienna, where he remained from 1740-50, doing duty in the church services, and at the same time enlarging his musical knowledge and experience. His artistic education was, however, almost exclusively practical, and it is said that he received only two theoretical lessons from Reuter the chapel-master. As a composer, therefore, Haydn was in every sense self-taught. Of his early attempts at composition he was in the habit of talking with pride in later years, and several works of sacred music were the first fruit of his early studies. In 1749 or 1750 his beautiful boyish voice changed, and he lost his position accordingly. Being now thrown on his own resources, he had to undergo various forms of musical drudgery, such as giving lessons (at the modest stipend of two florins per month) and even playing in the orchestra at dances and the like. His condition was somewhat improved by his acquaintance with Metastasio, the celebrated operatic poet, in fact the Scribe of the 18th century, who introduced him to Señor Martinez, a Spaniard living in Vienna, whose daughter Haydn instructed for several years. It was through Metastasio also that Haydn came into contact with Porpora the composer, best known as the singing master of the great Farinelli. For a considerable time Haydn remained in constant intercourse with him, acting as his accompanist, and occasionally it is said as his valet. In return he obtained a perfect acquaintance with Porpora's method, besides his knowledge of the Italian language, both invaluable to a composer in those days. The works of Emmanuel Bach, son of the great Sebastian, at the same time became his model for chamber music. Fux's excellent work *Gradus ad Parnassum* was his guide in his studies of counterpoint. A mass in F, and a farce *Der neue krumme Teufel*, both written in or about 1752, were Haydn's first important attempts at composition. The former is still in existence, but of the latter the libretto by Kurz only remains. It was produced early in 1752, and seems to have met with considerable success. Haydn's acquaintance with Gluck also dates from this period. An important event in Haydn's life was his acquaintance with Baron Fürnberg, an accomplished amateur, for whose private concerts he wrote his first string quartet, a form of composition in which he earned some of his greatest and most permanent triumphs. It is in the key of B flat, and was followed in rapid succession by seventeen other works of the same class, written during the years 1755 and 1756. To his new protector Haydn also owed his still more important acquaintance with Count Ferdinand Morzin. Count Morzin in 1759 appointed him conductor of his small but excellent band. The opportunities of hearing his own works performed by competent musicians Haydn did not neglect, and his first symphony in D belongs to the year 1759. Soon afterwards Count Morzin was compelled to dissolve his band, but Haydn's position was by this time sufficiently established, and very soon afterwards he found employment as second chapel-master to Prince Paul Esterhazy, one of the richest Austrian nobles, whose love of art was as great as his wealth. The Esterhazy family have been amongst the foremost patrons of music in Vienna from the days of Haydn to those of Beethoven and Schubert. Prince Paul died in 1762 and left his title and fortune to his brother Nicholas, surnamed the Magnificent. He immediately enlarged his orchestra, and also increased the salaries of its members, including that of Haydn (from 400 to 600 florins), and on the death of his colleague Werner, a scholarly but dry musician, appointed him first conductor. This position, or at least its title and emoluments, Haydn retained till his death, and his attachment to the Esterhazy family remained unchanged by his subsequent fame and fortune. The events just referred to determined Haydn's career for the next twenty-eight years. During this period he was in the active service of his protector, residing at Esterhaz, the splendid country seat of the family, described as a second Versailles, or in Vienna, conducting the orchestra of the prince, and writing for his concerts and theatre a number of works, including symphonies, cassationes, quartets, sonatas, and numerous vocal compositions, including several operas, none of which, however, had any permanent success. Thus the opera *La vera Costanza*, written for the court theatre of Vienna in 1776, was withdrawn by the composer owing to intrigues against him, it is said, and we are not told that it met with a much better fate on its revival fourteen years later. Another dramatic work, *L'isola disabitata* (1779), procured for the composer the membership of the Accademia Filarmonica at Modena, and a gold snuff box from the king of Spain. But with its companions it has not escaped oblivion. The truth is that Haydn was without the true dramatic spirit, and of this he was himself well aware. According to his own confession his operas were fitted only for the small stage at Esterhaz; in a large theatre, and before a miscellaneous audience, they lost their effect. The scores of most of the operas are preserved in the archives of Eisenstadt, another seat of the Esterhazy family. Of his life during this period little need be said. It was eventless and to a certain extent monotonous, but free from care and exclusively devoted to art. His own words, quoted by Herr Pohl, sum up all that it is necessary to relate. "My prince was always satisfied with my work; I not only had the encouragement of constant approval, but as conductor of an orchestra I could make experiments, observe what produced an effect and what weakened it, and was thus in a position to improve, alter, make additions or omissions, and be as bold as I pleased. I was cut off from the world; there was no one to confuse or torment me, and I was forced to become original." The only person that could have wished to "confuse or torment" the harmless composer was fortunately kept at distance by the strict order of the prince's household, that none of his musicians was to be accompanied by his wife. Haydn at an early age became attached to the daughter of a hairdresser, Keller by name, and after her death was persuaded to marry her sister, three years older than himself. The marriage was an unhappy one, and the pair separated soon after their union, Haydn's inflammable heart subsequently causing him more or less serious trouble on more than one occasion. In the meantime the composer's fame had begun to spread from an early period of his career. As early as 1766 a journal speaks of him as the "favourite of the nation," and foreign countries were not slow in acknowledging his merits. Thus one of his works, *The Seven Words of our Saviour on the Cross*, a series of orchestral interludes for the church service on Good Friday, was written by special invitation for the cathedral of Cadiz. In Paris his works were performed with immense success at the Concert Spirituel, and a single English firm bought the copyright of no less than 129 of his works, including 82 symphonies. The appreciation of Haydn's work in England led to important results in his latter years. Several pressing invitations to visit that country had been declined by the composer on account of his services being required at Esterház. But when in 1790 Prince Nicholas died, and his successor dissolved the orchestra, allowing Haydn a considerable pension, the latter was at last at liberty to accept a munificent offer from Salomon, the violinist and entrepreneur, in whose company he started for London, where Salomon occupied a leading position in the musical world. They left Vienna in December 1790, and travelled by way of Bonn, where Salomon had been born. There, accordingly, a halt was made, and Haydn was received by the elector with every honour due to his fame. The amusing description of a dinner given during his stay at Bonn may be read in Thayer's biography of Beethoven, who at that time was a member of the electoral chapel, and not unlikely made on this occasion Haydn's acquaintance. On the latter's return journey the young man submitted a cantata to the celebrated composer, whom he soon afterwards followed to Vienna to become his pupil. It is well known that the relations between the great master and his greater pupil were not altogether what might have been desired. Beethoven's genius was of too individual a type to bear the impress of a nature so different as Haydn's, and the latter may not always have taken sufficient trouble to enter into the ways of his wilful pupil. Certain it is that, at one time of his career, Beethoven delighted in speaking slightingly of "Papa Haydn," and, for instance, refused to call himself Haydn's pupil, because, as he bluntly said, he never learnt anything under his tuition. He even went so far as to suspect Haydn of wilfully trying to keep him back in his studies. It was only in his later years that this animosity gave way to the more genial appreciation of his great predecessor, an expression of which is quoted at the beginning of this notice.

Haydn's visit to London was a succession of triumphs. Dr Burney welcomed him with a laudatory poem; the various musical societies of the metropolis vied for his presence; and on July 8, 1791, he was created doctor of music by the university of Oxford. At court also he was received with every distinction, and the aristocracy followed the royal example. Neither were more substantial rewards wanting. Haydn's engagement with Salomon was to write and conduct at the concerts in the Hanover Square Rooms six symphonies, and the success of these may be judged from the fact that at Haydn's benefit concert, for which £200 had been guaranteed to him, the receipts rose to £350. He also appeared at other concerts (one given by himself at Hanover Square Rooms, where amongst other works the *Seven Words* already referred to was performed), always with equal success. The same events were repeated in the following year, when the Salomon concerts began in February, and concluded with an extra concert in June. The symphonies known as the "Salomon Set," comprising some of Haydn's finest instrumental works, are the permanent record of the connexion of the two artists. In 1792 Haydn also went to hear the charity children at St Paul's, whose singing produced on him as deep an impression as it did on Berlioz many years later. "I was more touched by this innocent and reverent music," he wrote in his diary, "than by any I ever heard in my life." Haydn left London in June 1792, but only to return in January 1794. In addition to his earlier works six new symphonies were played at the concerts of Salomon, which in the following year were given at the King's Concert-room and terminated on June 1, 1795, when Haydn appeared for the last time in England. In addition to valuable presents from royalty and other persons, he realized £1200 by his second English visit, from which he returned to Vienna in the autumn of 1795, to resume once more his functions in the newly organized chapel of Prince Esterhazy. He was now well stricken in years, and might have rested on his laurels. But so far from this being the case, the two works on which—apart from his symphonies and sonatas—his immortality must mainly rest, belong to this last epoch of his life. These were the oratorio *The Creation*, and the cantata *The Seasons*. They were both written to German translations of English libretti, the former being compiled from *Paradise Lost*, the latter from Thomson's *Seasons*. *The Creation* was first performed in public on March 19, 1799, when its success was as immediate as it has since proved permanent. *The Seasons* was begun soon after the completion of *The Creation*, and finished in very little time. No one, delighted by the charm and spontaneity of its melodies, would suspect it to be the work of a feeble old man. Such, however, Haydn had now become. He wrote little after *The Seasons*, and his public appearances were few and far between. His old age was surrounded by the love of his friends and the esteem of the musical world, but his failing health did not admit of much active enjoyment. He was seen in public for the last time at a performance of *The Creation* in 1808. But his own music made so overpowering an impression on him that he had to be carried out of the hall. He died on May 31, 1809, during the occupation of Vienna by Napoleon's army, and many French officers followed his body to the grave.

Haydn's compositions comprize almost every form of vocal and instrumental music. Of his dramatic works the operas are of infinitely less importance than *The Creation* and *The Seasons*. In the former there are points of grand and truly epical conception, surpassed by few masters except Handel, and the idyllic charm of the latter is as fresh to-day as it was eighty years ago. At the same time the great importance of Haydn in the history of music lies elsewhere. It was as an instrumental composer that he opened a new epoch of musical development. That amongst his 125 orchestral symphonies there are many extremely slight efforts is a matter of course. Even his finest symphonies, such as the celebrated *Surprise*, or the one in E flat surnamed in Germany "mit dem Paukenwirbel," on account of the characteristic drum-roll occurring in it, are pigmies if compared with Beethoven's colossal efforts. At the same time it is true that without Haydn's modest substruction Beethoven's mighty edifice would have been impossible. It was Haydn who first fixed the form of the symphony and gave it consistency of development. The lucid and harmonious treatment of his themes and the symmetrical structure of his symphonic movements remain still unsurpassed. And the same may be said in almost the same words of his string quartets, of which he wrote no less than eighty-three. It is by such works as these that Haydn has earned the name of father of instrumental music, generally and justly applied to him. At the same time it cannot be denied that there is in his works a certain want of intensity and depth. He avoids the high places of thought and passion; his path lies mostly in the smiling plains of humour and agreeable sentiment. In the former especially he excels, and it ought to be noted that his humour is of that peculiarly Viennese type which is as harmless as it is charming, and to the genial influence of which even such serious composers as Beethoven and Brahms have had to submit. Some of Haydn's minuets especially seem to spring immediately from the consciousness of the people. How much he was at one with his nation is further proved by such a song as his "Gott erhalte Franz den Kaiser," which has become the Austrian national hymn, and is one of the rare instances in which a genuine volkslied can be traced to a celebrated composer,—for generally the songs of the people are produced by the people. To sum up, Haydn's place in the history of his art will remain unassailed by all the changes musical taste has undergone since his time, or may still undergo. His melodies, though simple, are genuinely inspired, and will never lose their charm; and his workmanship will remain an invaluable model of clearness and symmetry. Haydn's life has been written by many pens and in many languages, Stendhal, the celebrated novelist, being amongst his French biographers. But all these earlier attempts have been thrown into the shade by the excellent works of Herr C. F. Pohl (*Mozart und Haydn in London*, 1867; *Joseph Haydn*, vol. i., 1875, and the article "Haydn" in Grove's *Dictionary of Music and Musicians*), which are full of accurate and comprehensive research. To Herr Pohl all students of Haydn's life must confess themselves deeply indebted.

Two of Haydn's brothers acquired a certain amount of celebrity. JOHN MICHAEL HAYDN, born at Rohrau, September 14, 1737, and like his brother a choir boy at St Stephen's cathedral, became a prolific and able composer of masses and all kinds of church music. He lived during the greater part of his life at Salzburg, and his name is frequently mentioned in the biography of Mozart. Of his numerous compositions few have been printed. A mass in D is perhaps his masterpiece. He died August 10, 1806. The youngest brother, JOHANN HAYDN (born December 23, 1743, died May 20, 1805), had some reputation as a vocalist, and became, most probably by his brother's intercession, a singer in Prince Esterhazy's chapel. (F. H.)

HAYDON, BENJAMIN ROBERT (1786-1846), historical painter and writer, was born at Plymouth, January 26, 1786. His mother was the daughter of the Rev. Benjamin Cobley, rector of Dodbrook, Devon, whose son, General Sir Thomas Cobley, signalized himself in the Russian service at the siege of Ismail. His father, a prosperous printer, stationer, and publisher, was a man of literary taste, and was well known and esteemed amongst all classes in Plymouth. Haydon, an only son, at an early date gave evidence of his taste for study, which was carefully fostered and promoted by his mother. At the age of six he was placed in Plymouth grammar school, and at twelve in Plympton St Mary school. He completed his education in this institution, where Sir Joshua Reynolds also had acquired all the scholastic training he ever received. On the ceiling of the school room was a sketch by Reynolds in burnt cork, which it used to be Haydon's delight to sit and contemplate. Whilst at school he had some thought of adopting the medical profession, but he was so shocked at the sight of an operation that he gave up the idea. A perusal of Albinus, however, inspired him with a love for anatomy; and Reynolds's discourses aroused within him a smouldering taste for painting, which from childhood had been the absorbing idea of his mind. Sanguine of success, full of energy and vigour, he started from the parental roof, May 14, 1804, for London, and entered his name as a student of the Royal Academy. He began and prosecuted his studies with such unwearied ardour that Fuseli wondered when he ever found time to eat. At the age of twenty-one (1807) Haydon exhibited, for the first time, at the Royal Academy, The Repose in Egypt, which was bought by Mr Thomas Hope the year after. This was a good start for the young artist, who shortly received a commission from Lord Mulgrave and an introduction to Sir George Beaumont. In 1809 he finished his well-known picture of Dentatus, which, though it brought him a great increase of fame, involved him in a life-long quarrel with the Royal Academy, whose committee had hung the picture in a small side room instead of the great hall. In 1810 his difficulties began through the stoppage of an allowance of £200 a year he had received from his father. His disappointment was embittered by the controversies in which he now became involved with Sir George Beaumont, for whom he had painted his famous picture of Macbeth, and Mr Payne Knight, who had denied the beauties as well as the value of the Elgin Marbles. The Judgment of Solomon, his next production, gained him £700, besides £100 voted to him by the directors of the British Institution, and the freedom of the borough of Plymouth. To recruit his health and escape for a time from the cares of London life, Haydon joined his intimate friend Wilkie in a trip to Paris; he studied at the Louvre; and on his return to England produced his Christ's Entry into Jerusalem, which afterwards formed the nucleus for the American Gallery of Painting, which was erected by his cousin John Havilland of Philadelphia. Whilst painting Lazarus his pecuniary difficulties increased, and for the first time he was arrested but not imprisoned, the sheriff officer taking his word for his appearance. Amidst all these harassing cares he married in October 1821 a beautiful young widow, Mrs Hyman, to whom he was devotedly attached. In 1823 Haydon was lodged in the King's Bench, where he received consoling letters from the first men of the day. Whilst a prisoner he drew up a petition to parliament in favour of the appointment of "a committee to inquire into the state of encouragement of historical painting," which was presented by Mr Brougham. He also, during a second imprisonment in 1827, produced the picture of the Mock Election, the idea of which had been suggested by an incident that happened in the prison. The king (George IV.) gave him £500 for this work. Among Haydon's other pictures were—1829, Eucles, and Punch; 1831, Napoleon at St Helena, for Sir Robert Peel; Xenophon, on his Retreat with the "Ten Thousand," first seeing the Sea; and Waiting for the *Times*, purchased by the marquis of Stafford; 1832, Falstaff, and Achilles playing the Lyre. In 1834 he completed the Reform Banquet, for Lord Grey—this painting contained 197 portraits; in 1843, Curtius Leaping into the Gulf, and Uriel and Satan. When the competition took place at Westminster Hall, Haydon sent two cartoons, The Curse of Adam, and Edward the Black Prince, but had not the good fortune to gain a prize for either. He then painted The Banishment of Aristides, which was exhibited with other productions under the same roof where Tom Thumb was then making his début in London. The exhibition was unsuccessful; and the artist's difficulties increased to such an extent that, whilst employed on his last grand effort, Alfred and the Trial by Jury, overcome by debt, disappointment, and ingratitude, he wrote "Stretch me no longer on this rough world," and put an end to his existence with a pistol-shot, June 22, 1846, in the sixty-first year of his age. He left a widow and three children (various others had died), who, by the generosity of their father's friends, were rescued from their pecuniary difficulties and comfortably provided for; amongst the foremost of these friends were Sir Robert Peel, Count D'Orsay, Mr Justice Talfourd, and Lord Carlisle.

Haydon began his first lecture on painting and design in 1835, and afterwards visited all the principal towns in England and Scotland. His delivery was energetic and imposing, his language powerful, flowing, and apt, and replete with wit and humour; and to look at the lecturer, excited by his subject, one could scarcely fancy him a man overwhelmed with difficulties and anxieties. The height of Haydon's ambition was to behold the first buildings of his country adorned with historical representations of her glory. He lived to see the acknowledgment of his principles by Government in the establishment of schools of design, and the embellishment of the new houses of parliament; but in the competition of artists for the carrying out of this object, the commissioners (amongst whom was one of his former pupils) considered, or affected to consider, that he had failed. Haydon was well versed in all points of his profession; and his *Lectures*, which were published shortly after their delivery, showed that he was as bold a writer as painter. It may be mentioned in this conclusion that he was the author of the long and elaborate article, "Painting," in the 7th edition of the *Encyclopaedia Britannica*.

To form a correct estimate of Haydon it is necessary to read his autobiography. This is one of the most natural books ever written, full of various and abundant power, and fascinating to the reader. The author seems to have daguerreotyped his feelings and sentiments without restraint as they rose in his mind, and his portrait stands in these volumes limned to the life by his own hand. His love for his art was both a passion and a principle. He found patrons difficult to manage; and, not having the tact to lead them gently, he tried to drive them fiercely. He failed, abused patrons and patronage, and intermingled talk of the noblest independence with acts not always dignified. He was self-willed to perversity, but his perseverance was such as is seldom associated with so much vehemence and passion. With a large fund of genuine self-reliance he combined a considerable measure of vanity. To the last he believed in his own powers and in the ultimate triumph of art. In taste he was deficient, at least as concerned himself. Hence the tone of self-assertion which he assumed in his advertisements, catalogues, and other appeals to the public. He proclaimed himself the apostle and martyr of high art, and believed himself to have on that account a claim on the sympathy and support of the nation. It must be confessed that he often tested severely those whom he called his friends. Every reader of his autobiography will be struck at the frequency and fervour of the short prayers interspersed throughout the work. Haydon had an overwhelming sense of a personal, overruling, and merciful providence, which influenced his relations with his family, and to some extent with the world. His conduct as a husband and father entitles him to the utmost sympathy. In art his powers and attainments were undoubtedly very great, although his actual performances mostly fall short of the faculty which was manifestly within him; his general range and force of mind were also most remarkable, and would have qualified him to shine in almost any path of intellectual exertion or of practical work. His eager and combative character was partly his enemy; but he had other enemies actuated by motives as unworthy as his own were always high-pitched and on abstract grounds laudable. Of his three great works—the Solomon, the Entry into Jerusalem, and the Lazarus—the second has generally been regarded as the finest. The Solomon is also a very admirable production, showing his executive power at its loftiest, and of itself enough to place Haydon at the head of British historical painting in his own time. The Lazarus, now in the National Gallery, is a more unequal performance, and in various respects open to criticism and censure; yet the head of Lazarus is so majestic and impressive that, if its author had done nothing else, we must still pronounce him a potent pictorial genius.

The chief authorities for the life of Haydon are *Life of B. R. Haydon, from his Autobiography and Journals*, edited and compiled by Tom Taylor, 3 vols., 1853, and *B. R. Haydon: Correspondence and Table Talk*, with a memoir by his son, F. W. Haydon, 2 vols., 1876. (W. M. R.)

HAY FEVER, HAY ASTHMA, or SUMMER CATARRH, a term applied to a catarrhal affection of the respiratory mucous membrane occurring in some individuals during the hay season, and generally believed to be due to the inhalation of the emanations from the spring grass (*Anthoxanthum odoratum*). It is an ailment of comparatively rare occurrence. The symptoms are those commonly experienced in the case of a severe cold or influenza, consisting of headache, violent sneezing, and watery discharge from the nostrils and eyes, together with dry hard cough, and occasionally severe asthmatic paroxysms. The attack usually runs a course of from two to six weeks, unless cut short by appropriate treatment, to which the complaint is in a considerable measure amenable. There is generally an annual recurrence of the disorder in those liable to it if they are exposed to its exciting cause, namely, the presence of hay. Symptoms of a similar character are produced in certain persons by the aroma of various flowers, by ipecacuan, and by the odour from cats, dogs, and rabbits. All such cases are examples of idiosyncrasy, and the individual is in general permanently susceptible to the influence of the excitant. In not a few instances an hereditary liability is traceable. The most effectual method of treatment in hay fever is to avoid the exciting cause, namely, the neighbourhood of grass fields, during the particular season. Removal to the seaside often succeeds in putting an end to an attack, and many persons who are liable to the complaint make such a change annually before its expected onset, and thus escape. For those who are unable to accomplish this, and must remain exposed to the noxious emanation, the use of a respirator is recommended. Of medicinal agents for affording relief during an attack, the usual remedies for asthma may be advantageously resorted to (see ASTHMA), while the use of the nasal douche with a weak solution of quinine and the employment of creosote or carbolic acid inhalations have been suggested.

HAYLEY, WILLIAM (1745-1820), the friend and biographer of Cowper, and grandson of William Hayley, dean of Chichester, was born in that city on the 9th November 1745. On account of mismanagement during a fever which he had while in a boarding school at Kingston, he was reduced to such prostration that the preservation of his life appeared to present only the promise of hopeless lameness and idiocy, but by careful nursing his health was gradually completely restored, and after some years' private tuition he pursued his studies at Eton and at Trinity College, Cambridge. In 1766 he procured a certificate of admission to the Middle Temple, London, but a short trial of legal studies was sufficient to dissipate the unexperienced preference which he had cherished for the profession of law. After his marriage in 1769 he stayed for some years chiefly in London, but in 1774 he retired to his patrimonial estate of Eartham in Sussex, resolved to spend the remainder of his days in rural quiet, with only such an amount of literary activity as might defy ennui and give a zest to life. Hayley made more than one attempt to succeed as a dramatic author, but first won fame by his poetical *Essays on Painting, History, and Epic Poetry*, and by his poem the *Triumphs of Temper*. The success of these poems was partly attributable to the general dearth of poetic talent at the time, but they had also certain external qualities fitted to secure for them at least a temporary popularity; and his notes to his poetical essays also displayed very extensive reading, and exerted considerable influence in directing attention in England to the literature of Italy and Spain. On the death of Warton, Hayley was offered the laureateship, but declined it. In 1792 he made the acquaintance of the poet Cowper; and this acquaintance ripened into a friendship which remained unbroken until Cowper's death in 1800. This bereavement was separated by only a week from that caused by the death of Hayley's natural son Thomas Alphonso, who had given great promise of excellence as a sculptor, and, shrinking from the associations now connected with Eartham, Hayley retired to what he called a "marine hermitage," which he had built at Felpham, and there resided till his death, November 20, 1820. Besides the *Life of Cowper*, published in 1803, Hayley was the author of a number of works in prose, which were not, however, so successful as his early poetical productions. Indeed the estimation in which he was held even during his lifetime depended perhaps more on his personal and [illegible] and his position in society than on his achievements in literature. The *Memoirs of Hayley*, 2 vols., for writing which, to be published posthumously, he received a considerable allowance during the last twelve years of his life, appeared in 1823.

HAYNE, ROBERT YOUNG (1791-1840), American statesman, was born in St Paul's parish, Colleton district, South Carolina, on November 10, 1791. He studied law at Charleston, S.C., and in his twenty-first year was admitted to the bar there, but in the same year (1812) served for a short time as a soldier in the war with Great Britain. Returning to practise in Charleston, Hayne was elected a member of the State legislature in 1814, and four years later became speaker. Shortly afterwards he accepted the post of attorney-general for his native State, though he declined the same office for the United States. On being elected a senator of the United States, Hayne at once showed himself an active foe to protective legislation, and vigorously combated the tariffs of 1824 and 1828. A bill having been passed in 1832 removing the duty from those imports only which were not in competition with home manufactures, the state of South Carolina passed an ordinance nullifying the bill, on the ground that it was unconstitutional. President Jackson denounced this proceeding, and South Carolina, appointing Hayne governor, was preparing to defend its position by arms, when Congress made the desired change in the tariff, and South Carolina repealed its act. Hayne, on retiring from the governorship in 1834, was elected mayor of Charleston, and continued to take an active interest in public affairs till his death at Asheville, North Carolina, September 24, 1840. See *Life and Speeches of R. Y. Hayne*, 1845.

HAYTER, SIR GEORGE (1789-1871), principal painter in ordinary to the queen, was the son of a popular drawing-master and teacher of perspective who published a well-known introduction to perspective and other works. The son was born in London, and in his early youth went to sea. He afterwards studied in the Royal Academy, became a miniature painter, and was appointed in 1815 miniature-painter to the Princess Charlotte. He passed some years in Italy, more especially in Rome, returned to London towards 1826, resumed portrait painting, now chiefly in oil-colour, executed many likenesses of the royal family, and attained such a reputation for finish and refinement in his work that he received the appointment of principal painter, and teacher of drawing to the princesses. In 1842 he was knighted. He painted various works on a large scale of a public and semi-historical character, but essentially works of portraiture; such as The Trial of Queen Caroline (189 likenesses), The Meeting of the First Reformed Parliament, now in the National Portrait Gallery, Queen Victoria taking the Coronation-oath (accounted his finest production), The Marriage of the Queen, and the Trial of Lord William Russell. The artistic merits of Hayter's works are not, however, such as to preserve to him with posterity an amount of *prestige* corresponding to that which court patronage procured him. He is not to be confounded with a contemporary artist, John Hayter, who produced illustrations for the *Book of Beauty*, &c.

HAYTI.

Plate XIII. HAYTI, variously known as Haiti, Santo Domingo, and named by Columbus Espagnola or Little Spain, (which last name was translated intothe Latin, Hispaniola), is, with the exception of Cuba, the largest island of the West Indies, in the Antilles group.

It lies north between 17° 37' and 20° 0' lat., and west between 68° 20' and 74° 28' long.

The extreme length of the island is 407 miles from Cape Engaño on the east to Cape Tiburon on the west; the breadth of the island is 160 miles from Cape Isabella on the north to Cape Beata on the south.

With the islands of Tortue or Tortuga on the northern coast, Gonaive on the west and Saone, St. Catherine, Beata Alta Vela and other small islands along the south coast, it represents an area of 28,000 miles, which is about the size of Ireland. Cuba lies W.N.W. of Haiti, and Jamaica W.S.W., and between the islands flows the branch of the ocean known as the Windward Passage.

From Cuba the distance is 70 miles and from Jamaica 130 miles. Puerto Rico is sixty miles east, and between flows the Mona Passage. The appearance of Hayti on the map, from east to west, is suggestive of a turtle, owing to the strange formation of the extreme eastern peninsula which resembles the head, and the two western peninsulas which resemble the hind limbs of the creature.

The coast line is variously estimated at from 1,200 to 1,500 miles in extent, and in character is remarkable for the vast number of indentations and projections, which form many bays and natural harbors of refuge where vessels can seek shelter, and anchor safely in the roughest weather. Cape Tiburon is the extremity of the southwest peninsula, which is the largest in extent, being 150 miles long, and varying from 20 to 40 miles wide.

The northwest peninsula ranks second in extent, being 50 miles long and about 40 miles wide.

At the head of the bay formed by these two peninsulas, which, together, make an acute angle, stands the City of Port au Prince.

This bay is called the Gulf of Gonaive, from the Island of Gonaive, situated 27 miles from the city, 36 miles in length, and 8½ miles in breadth. The position of this island across the entrance to Port au Prince, forms two channels, which are equally good for ships of all draughts, and gives a perfectly safe anchorage, 200 miles square, in all weather, between the city and the island; vessels of heavy draught are compelled to lie out 1½ miles from the shore, on account of the coral reefs.

The other principal port in the Gulf of Gonaive is St. Marles, which lies to the north of Port au Prince and has a considerable trade in coffee. Gonaives, a port of less consequence, is formed by a bay four miles across, with a small island in the middle. St. Nicolas Mole, the furthest point on the northwest peninsula, has an outer harbor, leading into an inner one, which is land locked, and affords a splendid anchorage. The principal points on the north coast are Port de Paix, Acul Bay, Cape Haiti, named also Guarico, the Bay of Carocol or Port Royal, and Port Dauphin or Fort Liberté.

On the north coast there are no good harbors between Fort Liberté and Samana, Port Isabella forming no protection from the violence of the wind and sea, in bad weather, and Puerta Plata having a harbor full of shoals and surrounded with coral reefs.

At the extreme northeast of the island, the peninsula of Samana, which is simply a narrow mountain ridge, 35 miles in length, and varying from six to 10 miles in breadth, extending into the sea, forms the bay of Samana.

The bay has an area of 300 square miles, and from east to west 30 miles in length, and from north to south 10 miles in breadth. The bay affords a good and safe anchorage for the largest ships in all weather, having a natural breakwater of coral reefs, stretching across the entrance from the south point to one and a half miles from the northern point, and from the north a number of small islets extend toward the reef for about three-quarters of a mile.

This leaves a somewhat narrow passage, but nevertheless deep and safe, for ships of all draughts to pass from the ocean into the bay.

After leaving the Bay of Samana, there are no ports on the east and south coast, until Santo Domingo is gained, which has a harbor containing two fathoms of water.

The Bay of Ocoa, west of Santo Domingo, has an opening called Calderas Bay, which could be made into a magnificent harbor, if a passage were cut through the reefs which extend across the entrance; furthe west is also the Bay of Neiba. Opening to the southeast is the almost circular bay of Jacmel. On this side are also the Bay of Baienet, the ports of Aquin and St. Louis and the open roadstead of Aux Cayes. Beyond Aux Cayes are the port of Jeremie and the Bay of Baradères which contains a fine harbor; these are the only ports until Port au Prince is reached.

The principal islands around the coast line are, Gonaive, which has already been described, La Tortue or Tortuga, on the north, at one time a rendezvous and stronghold of the pirates, 22 miles in length, and five in breadth; off the southeast coast is La Saône or Adamanay, 15 miles by three and a half, lying off Aux Cayes is Ile de Vache, nine miles by two; in the Bay of Baradères, Great Cagemite, five miles by three; off Cape La Beata, La Beata, five miles by two. There are many small islands off the coast. In the Windward Passage is Navasa, which has been held by a private company from the United States, for the preparation of guano, since 1855.

Hayti is full of mountain ranges, but between the various ranges are many large plains or savannas rich with luxuriant vegetation. The mountain ranges have three divisions, but all three divisions have generally an easterly and westerly trend, there is a northern, a midland and a southern chain. In the north, the Sierra de Monte Cristi runs from Cape Samana on the east to the Sella de Caballo on the west, close to Point Fragata. The highest mountain in this chain is Mount Diego Campo, in the center, 4,000 feet above the level of the sea, the second is Sella de Caballo, 3,900 feet high. The midland chain commences on the east, by Point Macao, and stretches in a westerly direction to 70° 20' long, with an almost regular height of 1,000 feet; it then branches off into two separate chains, one of which runs in a northwest direction to Cape St. Nicholas, while the other bears away southwest to Mount Ocao, and then turns westward to the coast, which it touches by St. Mari. In the western portion of the island, these two chains are united by an irregular and hooked-shaped mountain ridge. The northern branch of this range forms the backbone of the island, and is called the Sierra del Cibao. Through the middle part of this chain, which is the Cibao proper, the average height is 7,000 feet, although in places it is between 8,000 and 9,000 feet. At the east end are the highest peaks, Loma Tina and Pico del Yaqui, being over 9,000 feet in height – and these are the two highest points on the island. The southern range of mountains, which forms the backbone of the southwest portion of the island, commences near the Bay of Neiba, and bears due west to Cape Tiburon. This chain has several names, at the eastern extremity it is called Balriruco, in the central portion La Selle, which name also belongs to the highest peak, nearly 9,000 feet high; in the west end it is called La Hotte. La Vega Real (the Royal Plain) is the most extensive and richest of the large plains or savannas, and lies between the middle of the Cibao and Monte Cristi ranges. It is about 140 miles in length, and fourteen miles in breadth, and extends from Samana Bay to Manganillo Bay. This valley was named La Vega Real by Columbus, but that name is limited now to the eastern half, the western portion is called the Valley of the Santiago, and the whole plain is named the Valley of Cibao. It is irrigated by the north or Gran Yaqui river, the Yuna river and their tributaries. From the river Ozama the plain of Seybo extends for 95 miles in an easterly direction, with a breadth of about 16 miles, and is perfectly irrigated by the rivers Ozama, Soco, Macoris, Quiabon and Yuna. The greater part of the valleys and plains are altogether uncultivated, being partly pasture land or savanna and partly forest, and they are eminently suitable for raising all kinds of stock. The Gran Yaqui river has its source in the Pico de Yaqui and follows a winding course in a northwesterly direction through the Valley of St. Gague, and falls into the Bay of Manganillo. It is navigable only by canoes and small boats. The Neiba or Neiva, sometimes called the South Yaqui, has its source in the Pico del Yaqui and the Entre del Rios, and following a southerly course empties itself into the Bay of Neiba, in the Caribbean sea. The Yuna, remarkable for the swiftness of its current, rises on Loma Tina, and flows through the fertile valley of Vega Real into the Bay of Samana. Small vessels drawing only a few feet of water can proceed up the river to its confluence with Camu, and canoes and small boats can ascend with cargoes as far as Concepcion de la Vega. The Ozama has a very deep bed, and affords a passage for a few miles up from its mouth, for vessels of light draught; it runs south and empties itself into the Caribbean sea. The Artibonite flows into the Bay of Gonaive to the north of St. Marc; it is a shallow stream whose waters are teeming with caymans. There are several other streams of insignificant size, which flow into the great salt salve of Enriquillo or Xaragua, which also bears the French name of Etang Salé (Salt Lake), and is situated on the south shore. This is the largest lake on the island, being 27 miles in length by eight in breadth; the specific gravity of its waters is the same as that of the ocean, from which it is 25 miles distant; it has regular tides, which indicate some subterranean connection with the Caribbean sea. Many varieties of fish and caymans abound in it. Next in size to this is Lago de Fondo, or in the French, Etang Saumâtre (Brackish Lake), which is 16 miles in length by four in breadth. Icotea de Limon is a fresh water lake, with no outlet apparently, five miles in length and two in breadth. Rincon and Maragoane are two smaller lakes of no importance. For the most part the waters of the rivers are too turbid and full of earth to be used for drinking purposes. But some of the mountain streams and the small fresh water lakes afford clear and wholesome water for drinking.

The greater part of the coast line of Hayti is of considerable elevation.

Earthquakes are of common occurrence, but there are no volcanoes in activity at the present time.

No rocks older than those of the second period have yet been found; the centre and heart of the island is formed of limestone, conglomerate and slate, interspersed with syenitic masses.

A large amount of tertiary deposits, bordered by newly formed limestone and gravel are found to the front of the slate and rocks of the Sierra, in the north, and in portions of the south of the island.

The Sierra, of which the central range of mountains consists, which penetrates the whole of the Santo Domingo Republic, and forms the peninsula of Samana, and the smaller one of Porto Plata, is formed of upturned and forcibly compressed rock of changed appearance, which consisted originally of clay shale, sandstone, sandstone conglomerate, and limestone.

In the western portions of the island, these masses are broken and divided by deep dykes and rocky valleys.

There is gold quartz found in the slates, near volcanic masses, and also in the beds of the streams which flow through the metamorphic rocks, if in the vicinity of syenite or granite formations.

The rivers Nigua, Jaina, Nizao and Ocoa, also many of the streams which feed the Yaqui, and descend from the northern side of the Sierra del Cibao, have more or less gold in their sands, but not in any large quantities.

The [illegible] found in the Upper M[illegible] are [illegible] a few [illegible] of [illegible] The [illegible] of the island consist of gold [illegible] iron, [illegible] sulphur, [illegible] Many kinds of mineral springs abound, impregnated with iron and sulphur and other [illegible]. The fossil [illegible] of the Miocene strata [illegible] those of the [illegible] that during an early period of the Miocene [illegible] and [illegible] held [illegible] formation. For particulars of the geology of [illegible] Trans. Amer. Phil. Soc. [illegible] and [illegible] Quart. Journ. Geol. Soc. [illegible] xxxv. 1879, p. [illegible]. There are [illegible] a great variety of animals [illegible]. The largest wild animal is the agouti, a [illegible] and [illegible], the [illegible] the flesh is [illegible] good [illegible]. Wild [illegible] horses [illegible] and dogs roam in [illegible] herds [illegible] the [illegible], they [illegible] imported from Europe [illegible] [illegible] are [illegible] with dogs. There are very few [illegible] of birds, with the exception of water fowl and [illegible] [illegible]. Snakes are numerous, but very few are poisonous, [illegible] being quite harmless. In the low [illegible] [illegible] swarm in myriads, including scorpions, [illegible] and [illegible] tarantulas. [illegible] in the lakes and rivers, which are full of fish of many varieties. The sea around the coast [illegible] abounds in oysters, lobsters, crabs, and all kinds of salt water fish. The soil of Hayti will produce [illegible] of [illegible] vegetation in rich profusion, and in this respect is unsurpassed by any country in the world.

In the lower lands all tropical productions grow to perfection, and [illegible] the mountains are produced the vegetables and fruits of [illegible] latitudes. A vast quantity of productions are [illegible] coffee, tobacco, maize, cocoa, [illegible] cassava, potato [illegible] yam, sweet potato and native [illegible]. From originally imported [illegible] there grow excellently sugar cane, coffee, [illegible] to the [illegible] melons, peas, beans and [illegible] vegetables, cabbage, lucerne, guinea grass, [illegible] almond, apple, [illegible]. The [illegible] and grape vine trail their [illegible] through the vast forests, and from the grapes is produced a [illegible] wine. Many of the forest trees have deteriorated from want of proper attention, and a destructive insect wages [illegible] war upon the roots of the bamboo. The [illegible], which [illegible], has now become a recognized [illegible] of food and in that respect has taken precedence of the [illegible], which was [illegible] used as an article of diet. Hayti [illegible] for furniture, building purposes, and [illegible]. The timber for furniture and building [illegible] mahogany, [illegible], satinwood, rosewood, [illegible], and wax palm. Cinnamon wood, yellow [illegible]. Among the dye woods are fustic, logwood, Brazil wood, [illegible], from which is produced a [illegible] and several others, in addition to [illegible] and the [illegible] fig. Pine forests and oak [illegible] parts of the mountains, and there are also found the [illegible] of palm, the cypress or Bermuda cedar, [illegible] wood.

In Hayti, as in all tropical and sub-tropical countries, there are two seasons, a wet season from May to October, and a dry season from November to April [illegible]. The rains fall most abundantly in May and June, when the rivers which are almost dry for the greater part of the year fill up rapidly, and often overflow their banks and flood the surrounding country. In the months of June, July and August the heat generally increases to 100° and over in the [illegible]; in the high lands a fire is [illegible] in the evening.

In Hayti [illegible] almost every variety of climate, from several [illegible] of the island, the fact of so much of it being [illegible] low level, the position of the island in the very [illegible] of the trade winds, and the quantity of timber, [illegible]. During the months of June, July and August [illegible] hurricanes break over the island, although they are not so frequent as in the Windward islands. The [illegible].

Hayti has suffered much from earthquakes, which have occasionally [illegible] whole cities. Farming has advanced but little in the island and the appliances used are of the most crude description. The [illegible] of produce which were cultivated in the [illegible] of slavery, and which made the island famous for its exports, are [illegible].

[illegible] Yaque, along the banks of the river [illegible] the North Arrondissement and in the south, [illegible]. Copper and iron mines exist in the [illegible] of [illegible]. These mines [illegible] have been worked [illegible] has been abandoned for [illegible] are cut in the interior for [illegible] and [illegible] are also prepared for the same purpose. [illegible] is carried on principally by Americans and [illegible] settled in the towns and [illegible]. The population [illegible] between [illegible] and [illegible] of the Western Republic of Hayti [illegible] of the Republic of Santo Domingo [illegible] Africans in the Republic [illegible] in the eastern Republic. There are [illegible] of Spanish and [illegible] of French origin. There are [illegible] from the United States, English, Germans and [illegible] in the seaport towns. Spanish is [illegible] Dominican Republic, and a sort of mongrel French in the [illegible] Republic.

[illegible] discovered by Columbus, who landed on St. Nicolas Mole [illegible] 1492 [illegible] after leaving Cuba. There were [illegible], who are represented by the Spaniards as [illegible] of a low type of [illegible] and were treated by them [illegible] visited the [illegible] in these countries, which [illegible] the presence of gold brought [illegible] adventurers from [illegible], who oppressed the natives and compelled them to work for them as slaves in their search for the hidden treasure.

Their cruelty and severity finally roused the natives to resistance, and some of them fought bravely, but without success, for their liberty. At the end of 30 years, from the treatment of their cruel masters, and being unused to the hardships of the mines, the aboriginal race had almost disappeared. In 1517 a royal edict was issued, authorizing the importation of 4,000 negroes from Africa, each year, to be used for working the mines and plantations as slaves, the experiment having been tried, ten years previously, of bringing over a few which had proved entirely successful, as they were a stronger race and better able to stand the toil and labor. The first negro slaves were kept on the plantation of Pedro, the son of Christopher Columbus, the governor of the island. In 1711 only 21,000 of the natives remained in the island, and in the present day it is supposed that the race is entirely extinct, with the exception of a few who are reported to be living in the Bahoruco mountains. The Spaniards also decreased in numbers and left for the more recently discovered countries of Mexico and Peru. This magnificent land was then almost deserted. But in 1630 a number of French and English adventurers, who called themselves buccaneers, and were really pirates, settled on the island of Tortuga, which they made into a stronghold from which they sailed on depredatory expeditions. These crossed over to Hayti, and formed a settlement on the northern shore, which was recognized as an independent department in 1714, that part of the island having been ceded to France in 1697 by the treaty of Ryswick. In 1777 a definite boundary line was laid down, extending from the mouth of the Daxabon or Massacre in the north, to the outlet of the Pedernales or Anses à Pitres in the south. The colony prospered exceptionally until the outbreak of the French revolution, 1789. At this time there existed a three-cornered problem in the island, which was destined to solve itself only after terrible bloodshed and pitiless war. The population consisted of three classes, whites, free colored people and slaves. The free colored people were largely men of wealth and means, owning fine estates in the colony, and were also intelligent, educated and refined, but they had no political rights. In 1790, influenced by the revolutionary ideas which were then convulsing France, the mulattoes demanded political recognition, and when this was refused by the whites they took up arms to enforce their claim. They were defeated and their leaders were captured and executed. In 1791, the national convention granted to the mulattoes all the privileges of French citizens, in spite of the remonstrance of the whites. On August 23, 1791, the insurrection of the negro slaves occurred, and then the whites endeavored to conciliate the mulattoes, for the sake of their assistance in the coming struggle. But just at this time the House Government reversed the decree of the national convention, granting to the mulattoes political rights as French citizens, and this settled their decision.

From that moment they united and made common cause with the negroes in the bloody war which followed. For several years the war raged with no apparent advantage to either side, and each party was disgraced by acts of unnecessary cruelty and vengeance. Commissioners with full powers came from France to settle the difficulty, but accomplished nothing. In 1793, the abolition of slavery was formally proclaimed, and the problem was settled by the granting of equal rights to all. In September, 1793, the British sent a force to capture the island, but they effected little on account of the ravages which the climate made on the troops. At this time Toussaint Louverture, the leader of the blacks, came to the assistance of the French Government, and was appointed commander-in-chief of the French army in the colony; by his vigorous measures and capable leadership the English were compelled to retire from the island in 1798. In 1795, Spain ceded the whole island to France, in the treaty of Basle, and it then received the name of Saint Domingue. In 1801, a constitutional form of government was adopted by the country, and Toussaint was elected president for life. At this time Bonaparte, first consul of France, determined to reduce the island to dependence and consign the blacks to slavery. General Leclerc was sent with 25,000 troops to accomplish this purpose, but failed altogether. He therefore invited Toussaint to an interview, and then treacherously seized him and sent him to France, where he died in prison in 1803. His successor Dessalines was a man of considerable power and ability, and he prosecuted the war with such success against the French, that combined with the yellow fever, and the arrival of a British fleet off the coast, the French lost heart, and on November 30, 1803, 8,000 French troops surrendered to the British Admiral. In 1804, St. Domingue proclaimed itself an independent republic, under the aboriginal name of Hayti. Dessalines was elected governor for life, but on October, 8 1804, he broke the constitution, declared himself emperor, and was crowned with great pomp and ceremony. After this unwise step, he became cruel and tyrannical, as well as vainly emulative of the customs of royalty in old countries. Outbreaks and civil wars resulted from his conduct, until he was assassinated in 1806. Several chiefs now strove for the leadership, and while Christophe was fighting for the supremacy in the north, and Petion in the south, the eastern portion of the island permitted the Spaniards to regain a footing, and form a Spanish province under a title of Santo Domingo, a modified form of the French name. The war between Christophe and Petion lasted until 1810, when hostilities ceased, and Christophe proclaimed himself king, with the title of Henry I. In 1820 he committed suicide, after causing an insurrection by his cruelty and tyranny. Petion died in 1818, and so in 1822, General Boyer took supreme control of the whole of the French part of the island, and was elected president. In 1821, the Spanish colony of Santo Domingo proclaimed its independence of the old country, but by its internal dissensions invited an attack from its French neighbor and in 1822 was conquered by General Boyer, who remained as President of the whole island until he was compelled to fly from the country, by a revolution in 1843. In 1844, the people in the east again proclaimed their independence and established the Dominican Republic, which has maintained its freedom and independence until the present day. The Spaniards made one last effort to regain their claim on Santo Domingo in 1861, but failed in the attempt and retired finally in 1865.

In Hayti several presidents followed one another in rapid succession, but were speedily deposed or resigned. In 1846 Soulouque was elected president; he was a full-blooded negro, who in early life had been a slave. He made an unsuccessful attempt to reconquer the eastern Republic, but obtained no advantage. In 1849 he assumed the imperial title, and the following year was crowned as Faustin I., emperor. But the people tired of imperial government, and in 1858 he was deposed, and a Republican government was organized with Fabre Geffrard as president. He became unpopular, and in 1867 an insurrection compelled him to resign. He fled and escaped to Jamaica. The next president was Sylvestre Salnave. The people rose against him in 1868, and although he made a stout resistance for two years, he was finally captured and shot by the insurgents in 1870. **Nissage-Saget was elected to the presidency on** May 20, 1870, and Gen. Michel Domingue on June 14, 1874. He was ousted in 1876, and was succeeded by General Boisrond Canal, who resigned and left the country July 17, 1879. General Salomon was elected for seven years on October 23, 1879. On May 1, 1887, General Salomon was re-elected to the presidency. General Légitime was elected president on August 14, 1888, but his authority was recognized only in the north, and General Hippolyte, the leader of the opposition, was elected provisional president. Civil war ensued, which lasted from the fall of 1888 to September 1889, and **ended in the defeat of Legitime, and the unanimous election of** General Hippolyte to the presidency, on October 17, 1889.

Haytian Republic.—The Republic of Hayti is situated in the western portion of the island, and is separated from the Republic of Santo Domingo by a boundary line extending from the river Massacre on the north to the river Pedernales on the south. It possesses an area of about [illegible] square miles. It is governed with a constitution adopted October, 1889 under President Hippolyte. The government consists of three departments, the legislative, executive and judicial. The legislature has a chamber of communes and a senate. The members of the former are elected for three years, the latter for six years. The executive power is vested in a president elected for [illegible] years by both houses of legislature in joint convention. The president appoints his cabinet composed of [illegible] Ministers of State. The revenue and expenditure for [illegible] is given as [illegible]. The *Budget* estimates for 1887-88 gave expenditure as [illegible] piastres. The foreign debt incurred in Paris in 1825, with other liabilities incurred to France, amounts to [illegible] francs or £[illegible], and no interest has been paid for many years. The total external and internal debt amounted to $[illegible] in 1887. Since October, 1881, the National Bank of Hayti has gone into business with a capital of £[illegible] in [illegible] shares. The nominal strength of the army is [illegible] men, but in time of war all able-bodied men are liable for service. The chief trade of Hayti is carried on with the United States and Great Britain. Coffee, mahogany and logwood are the principal exports, the principal imports are linen and cotton goods. Prior to the civil war of 1888-89 the imports into Hayti were $[illegible] per annum, and the exports **$9,000,000, the bulk of the business** being with the United States. In 1887, British [illegible] to the value of £[illegible] were imported and [illegible] to the value of £[illegible]. The weights and measures in use are French, and so also is the gold and silver coinage. The national bank of Hayti can issue bills which are generally accepted. The piastre or dollar of the Republic is now worth three shillings and four pence. The capital, Port au Prince, in 1887, had a population estimated at about [illegible]. The national religion of Hayti is the Roman Catholic religion.

Dominican Republic.—The Republic of Santo Domingo, which is generally called San Domingo and officially is the República Dominicana, has an area of [illegible] square miles, and an estimated population in 1888 of [illegible]. It consists of five states, Santo Domingo, Santa Cruz de Seibo, Concepcion de la Vega, Santiago de los Caballeros and Azua de Compostela, each having its own legislature and governor, and two maritime districts of Puerto Plata and Samaná. It is governed by a constitution adopted in 1844, but changed, modified and improved in 1865 and again in 1888. The chief executive is a president elected for four years. Gen. Heureaux was elected in 1886 to the presidency. The president appoints his own ministers, and the legislature is composed of [illegible] members. The revenue in 1887 is given as $[illegible], the expenditure as $[illegible]. On January 1, 1888, the internal debt amounted to $[illegible], the foreign debt to [illegible]. There is a small army of [illegible] [illegible] In 1888 [illegible] The capital, [illegible] [illegible] of the republic [illegible] of the [illegible]. The Roman Catholic religion is the national religion of the country.

[illegible] Hayti is published by [illegible] New York. W. W.

HAYWARD, Sir John (c. 1560–1627), one of the earliest writers of English history as distinguished from the old chroniclers, was born about 1560 at or near Felixstow on the coast of Suffolk. According to a statement in his will he "received the means of his education" out of the parish of Felixstow. It is affirmed by the old authorities that he studied at Cambridge and took the degree of doctor in civil law, but his name does not occur in any of the registers. In 1599 he published *The First Part of the Life and Raigne of King Henrie the IIII., extending to the end of the first yeare of his raigne*, which, from its dedication to the earl of Essex, and a passage it contained on hereditary rights, led to the author's imprisonment by Elizabeth. The queen also caused Francis Bacon to search the book for "places in it that might be drawn within case of treason," who reported, "For treason surely I find none, but for felony very many,"—explaining that many of his sentences had been stolen from Cornelius Tacitus. Notwithstanding this jocular exculpation Hayward was continued in prison, in all probability until after the death of the queen. On the accession of James I. he courted that monarch's favour by the publication of two political pamphlets—*On the Right of Succession* (1603), and *A Treatise of Union of England and Scotland* (1604), and in 1610 he was appointed historiographer along with Camden of the college which King James attempted to found at Chelsea. In 1613 he published his *Lives of the Three Norman Kings of England*, which he wrote at the request of Prince Henry. In 1616 he was admitted an advocate of Doctors Commons, and in 1619 he received the honour of knighthood. He died 27th June 1627. Among his manuscripts was found *The Life and Raigne of K. Edward VI.*, first published in 1630, and *Certain Yeres of Queen Elizabeth's Raigne*, the beginning of which was printed in an edition of the *Reign of Edward VI.* published in 1636, but which was first published in a complete form in 1840, for the Camden Society, under the editorship of John Bruce, who prefixed an introduction on the life and writings of the author. Hayward was conscientious and diligent in obtaining information, and, although his reasoning on questions of morality is often childish, his descriptions are generally graphic and vigorous. Notwithstanding his imprisonment by Elizabeth, his portrait of the qualities of her mind and person is flattering rather than detractive.

HAZÁRA, or Huzára, a British district in the lieutenant-governorship of the Panjáb, India, lying between 33° 45' and 35° 2' N. lat., and between 72° 35' 30" and 74° 9' E. long. It forms the north-eastern district of the Pesháwar Division, and is bounded on the N. by the Black Mountains, the Swáti country, Kohistán, and Chilás; on the E. by the native state of Kashmír; **on the S. by** Ráwal Pindi district; and on the W. by the river Indus. The area is 2771 square miles.

The district forms a wedge of territory extending far into the heart of the outer Himálayan range, and consisting of a long narrow valley, shut in on both sides by lofty mountains, whose peaks rise to a height of 17,000 feet above sea level. Towards the centre of the district the vale of [illegible] is enclosed by mountain chains, which [illegible] [illegible] and [illegible] which [illegible] the [illegible]. The district is well watered by the tributaries of the Indus, the [illegible], which flows through the Khágán Valley, the [illegible], [illegible]. Throughout the scenery is picturesque. In the north [illegible] the district partakes of the Himálayan character, [illegible] the central mountains are covered to their summits with pine and other forest trees, while [illegible] spread in green clumps over the nearer [illegible] constantly [illegible] slope.

The enumeration of 1868, which extended over an area of [illegible] square miles, including the tribal territory of Tanáwal, showed a population of 367,218 (males, 194,123; females, 173,095). The Mahometans numbered 34[illegible]; Hindus, 18,503; Sikhs, [illegible]; others, 1570. The gross revenue in 1875-76 was £[illegible]. In the same year the police force numbered 510 men, besides 290 village watchmen; and there were 24 schools with 1042 pupils. The principal crops consist of wheat, barley, oil-seeds, maize, rice, pulses, millets, and cotton. Out of a cultivated area of [illegible] acres, [illegible],380 are artificially irrigated by means of wells and embankments on the rivers and hill torrents. Hazára has not suffered from any calamity since the famine of 1783, which affected it as well as the rest of Upper India. The chief imports are English cloth, salt, indigo; and the exports ghi, mustard oil, barley, wheat, rice, and live stock. In 1875-76 there were 676 miles of unmetalled roads within the district. The average rainfall for the eight years ending 1874 amounted to 47 inches. The station of Abbottabad is the head-quarters of the Panjab frontier force.

History.—The name Hazára probably belonged originally to a Turkí family which entered India with Timur in the 14th century; and subsequently settled in this remote region. During the prosperous period of the Mughal dynasty, the population included a number of mixed tribes, which each began to assert its independence, so that the utmost anarchy prevailed until the time when Hazára attracted the attention of the rising Sikh monarchy. Ranjit Singh first obtained a footing in the district in 1818, and, after eight years of constant aggression, became master of the whole country. During the minority of the young Maharaja Dhulip Singh, the Sikh capital fell into a state of complete disorganization; the people seized the opportunity for recovering their independence, and rose in 1845 in rebellion. They stormed the Sikh forts, laid siege to Haripur, and drove the governor across the borders. In the following year the greater part of the district was included in the territory ceded to Raja Ghulab Singh by the British, at the conclusion of the first Sikh war. On the outbreak of the second Sikh war the troops in garrison revolted, but the Mussulman inhabitants supported Lieutenant Abbott under the Lahore Government, and the insurrection was soon quelled. Since then Hazára has passed under direct British rule, and has enjoyed for more than quarter of a century uninterrupted peace.

HAZARAS. See AFGHANISTAN.

HAZARD, a game played with dice. The player or "caster" calls a "main" (that is, any number from five to nine inclusive). He then throws with two dice. If he "throws in," or "nicks," he wins the sum played for from the banker or "setter." Five is a nick to five, six and twelve are nicks to six, seven and eleven to seven, eight and twelve to eight, and nine to nine. If the caster "throws out" by throwing aces, or deuce, ace (called crabs), he loses. When the main is five or nine the caster throws out with eleven or twelve; when the main is six or eight he throws out with eleven; when the main is seven he throws out with twelve. If the caster neither nicks nor throws out, the number thrown is his "chance," and he keeps on throwing till either the chance comes up, when he wins, or till the main comes up, when he loses. When a chance is thrown, the "odds" for or against the chance are laid by the setter to the amount of the original stake.

Suppose, for example, 7 is the main. If the caster throws 7 or 11 he wins; if he throws aces, crabs, or 12 he loses. If he throws any other number, that is his chance. Say 7 is the main and 4 the chance, the odds against the caster are now 2 to 1 (as will appear from the table below). If the stake were £1, the setter would lay £2 to £1 in addition. The caster goes on throwing till either 7 or 4 appears, when he loses £2 or wins £3.

In laying the odds, the setter gains no advantage, as can easily be shown, examining the various ways in which two dice can be thrown.

		can be thrown by	Ways
2		1 and 1,	1
3		2 — 1, 1 and 2	2
4		2 — 2, 3 — 1, 1 and 3,	3
5		4 — 1, 1 — 4, 3 — 2, 2 and 3,	4
6		3 — 3, 5 — 1, 1 — 5, 4 — 2, 2 and 4,	5
7		6 — 1, 1 — 6, 5 — 2, 2 — 5, 4 — 3, 3 and 4,	6
8		4 — 4, 6 — 2, 2 — 6, 5 — 3, 3 — 5,	5
9		6 — 3, 3 — 6, 5 — 4, 4 — 5,	4
10		5 — 5, 6 — 4, 4 — 6,	3
11		6 — 5, 5 — 6,	2
12		6 — 6,	1

In all 36 ways. The table shows that there are six ways in which 7 can be thrown, three ways in which 4 can be thrown. Hence the odds are 6 to 3, or 2 to 1.

But there is always an advantage in favour of the setter on the stake first played for. The least disadvantageous main for the caster to call is 7.

Take the case in which 7 is the main and £18 (to avoid fractions) the caster's stake, and £36 therefore the sum played for. Then (1) if 7 or 11 is thrown the caster wins. There are eight ways out of 36 in his favour; therefore his expectation on nicking is $\frac{8}{36}$ths of £18 = £8. (2) If the chance is 6, in order to win he must throw 6 before he throws 7. There are five ways of throwing 6, and six ways of throwing 7. His expectation on 6 is therefore $\frac{5}{36}$ths of $\frac{5}{11}$ths of £36 = £2, 5s. 5½d. (3) The expectation on a chance of 8 is the same as on 6, viz., £2, 5s. 5½d. (4 and 5) If the chance is 9 or 5 the expectation is $\frac{4}{36}$ths of $\frac{2}{5}$d of £36 = £1, 12s. (twice). (6 and 7) If the chance is 10 or 4 the expectation is $\frac{3}{36}$ths of $\frac{1}{3}$d of £36 = £1 (twice). The total expectation of the caster is all the separate expectations added together, viz., £17, 14s. 11d. If his expectation were equal to the setter's, it should amount to £18. Therefore the caster's expectation is 5s. 1d. less than it would be if the probabilities of his winning or losing were equal. This makes his disadvantage when 7 is the main equal to 3¼d. and half a farthing in the pound.

The calculations applied to the main of 7 can easily be made use of for any other main, when it will be found that the caster's expectation of loss when 5 or 9 is the main is 3¼d. and half a farthing in the pound, and when 6 or 8 is the main 5½d. and nearly half a farthing in the pound.

HAZARIBÁGH, a British district in the lieutenant-governorship of Bengal, India, lying between 23° 25′ and 24° 48′ N. lat., and between 84° 29′ and 86° 38′ E. long. It is bounded on the N. by the districts of Gayá and Monghyr, on the E. by the Santál Parganás and Mánbhúm districts, on the S. by Lohárdagá, and on the W. by Lohárdagá and Gayá; it forms the north-east portion of the Chutiá Nágpur division, and has an area of 7020 square miles.

The physical formation of Hazáribágh exhibits three distinct features—(1) a high central plateau occupying the western section, the surface of which is undulating and cultivated; (2) a lower and more extensive plateau stretching along the north and eastern portions; to the north, the land is well cultivated, while to the east the country is of a more varied character, the elevation is lower, and the character of a plateau is gradually lost; (3) the central valley of the Dámodar river occupying the entire southern section. Indeed, although the characteristics of the district are rock, hill, and wide-spreading jungle, fine patches of cultivation are met with in all parts, and the scenery is generally pleasing and often picturesque. The district forms a part of the chain of high land which extends across the continent of India, south of the Nerbudda on the west, and south of the Són river on the east. The most important river of Hazáribágh is the Dámodar, with its many tributaries, which drains an area of 2480 square miles. The only other river of any importance is the Barakhar. The jungle gives shelter to wild animals of all sorts. Game birds are plentiful.

The census of 1872 showed a population of 771,875 (males, 397,045; females, 374,830). Belonging to aboriginal tribes there are 57,120; semi-Hinduized aborigines, 216,712; Hindus, 421,622; persons of Hindu origin not recognizing caste, 2664; Mahometans, 72,338; non-Asiatics, 1362; and mixed races, 57. Three municipalities contain more than 5000 inhabitants:—Hazáribágh, 11,050; Jehak, 8999; and Chatrá, 8818. The only place of special interest is Párasnáth Hill, a celebrated place of pilgrimage, which is annually visited by large numbers of Jain worshippers. The revenue in 1870 amounted to £32,841, and the expenditure to £31,367. The regular police force (1872) numbered 557 men of all ranks; municipal force, 65; and rural police, 3834 men; maintained at a total cost of £15,763. There were, in 1873, 86 schools with 2183 pupils. Rice is the staple crop, and the three principal kinds are grown. Among the other crops are wheat, barley, Indian corn, the usual pulses and green crops of Bengal, jute, flax, aloes, sugar-cane, opium, cotton, &c. The trade is concentrated at Chatrá, the great central market. The chief exports are lac, metal cooking utensils, *ghí*, iron, and cattle; and the imports, rice, salt, cattle, and tobacco. There are 400 miles of road. Six coal-fields are known to exist in the district,—the most important being that of Karharbárí, which is capable of supplying 250,000 tons a year for 300 years. In 1877 there were three tea plantations containing mature plants, and one on Párasnáth Hill which promises well. The average mean temperature for 1874 was 74° F.; the average yearly rainfall, 52·4 inches. The climate is very healthy, but rheumatism, fever, and dysentery are not uncommon; cholera is rare.

The history of the district is involved in obscurity until 1755, about which time a certain Mukund Singh was chief of the country. In a few years he was superseded by a Tej Singh, who had gained the assistance of the British. In 1780 Hazaribagh, along with the surrounding territory, passed under direct British rule.

HAZARIBAGH, the chief town and administrative headquarters of the above district, is picturesquely situated on the high central plateau of the district, at an elevation of 2000 feet above sea-level, and in the midst of a group of conical hills, 23° 59′ 21″ N. lat. and 85° 24′ 32″ E. long. The town is little more than a cluster of villages, with intervening cultivation, which have sprung up round the military *bázár*. Hazaribagh has been the military headquarters of the district since 1780, and the seat of civil administration since 1834. The cantonment lies south-east of the town. Population in 1872, 11,050 (6312 males, 4738 females):—Hindus, 7240; Mahometans, 3384; Christians, 52; "others," 374.

HAZEBROUCK, a town of France, capital of an arrondissement of the same name in the department of Nord, is situated on the Bourre, 32 miles W.N.W. of Lille, in a district formerly covered with marshes. It stands on the Lille and Calais Railway, at the junction of the branch from Dunkirk. The town is governed by a sub-prefect, and has a court of primary instance with two juges de paix, besides various offices of excise and inland revenue. There are numerous religious and charitable societies including the Frères des Écoles Chrétiens, Sœurs de Charité, and Dames de la Sainte Union. The convent of Capuchins, built near the town in 1854, is now occupied by a school. Hazebrouck contains some handsome public buildings, as the church of St Nicolas, with a tower 260 feet high, of fine open work, built about 1520, the hôtel de ville (1807–1813), the prison for the department, two theatres, and the communal college. The Augustinian convent, built in the 16th century, with a façade of the 17th century, is now occupied in its several parts by the hospital, a tobacco-warehouse, a market, and college lecture-rooms. A chamber of agriculture meets in the town, where there are also a small public library and a secondary school. The principal manufactures are linen cloth, thread, soap, beer, oil, lime, and salt. There are also tanneries, salt refineries, corn-mills, and dye-works. Trade in country produce, cattle, timber, and hops is also carried on. Population (1876) of the district 9867, of the town 6363.

HAZEL (Anglo-Saxon, *Hæsel*;[1] German, *Hasel*; French, *Noisetier*, *Coudrier*), *Corylus*, Tournef., a genus of shrubs or low trees of the natural order *Cupuliferæ* and sub-order *Coryleæ*. The common hazel, *Corylus Avellana*, L., is distributed throughout Europe, in North Africa, and in Central and Russian Asia, except the north-eastern parts. It is commonly found in hedges and coppices, and as an undergrowth in woods, and reaches a height of about 12 feet; occasionally, as at [illegible] Park, Kent, it may attain to 30 feet. According to Evelyn (*Sylva*, p. 36, 1664), hazels "above all affect cold, barren, dry, and sandy grounds; also mountains, and even rocky grounds produce them; but more plentifully if somewhat moist, dankish, and mossy." In Kent they thrive best in a calcareous soil. The bark of the older stems is of a bright brown, mottled with grey, that of the younger twigs is ash-coloured, and glandular and hairy. The leaves are alternate, from 2 to 4 inches in length, doubly serrate, roundish-cordate, pointed, and slightly pubescent; occasionally they are found with the margins united at the base, or with the stalk so depressed as to form a pitcher-like structure (Masters). In the variety *C. purpurea*, the leaves, as also the pellicle of the kernel and the husk of the nut, are purple, and in *C. heterophylla* they are thickly clothed with hairs. In autumn the rich yellow tint acquired by the leaves of the hazel adds greatly to the beauty of landscapes. The flowers are monœcious, and appear in Great Britain in February and March, before the leaves, and sometimes in October (Loudon). The cylindrical, drooping, and yellow male catkins (see BOTANY, vol. iv. p. 123, fig. 161) are 1 to 2½ inches in length, and occur 2 to 4 in a raceme; when in unusual numbers they may be terminal in position. The female flowers are small, subglobose, and sessile, resembling leaf-buds, and have protruding crimson stigmas; the minute inner bracts, by their enlargement, form the palmately lobed and cut involucre or husk of the nut. The ovary is not visible till nearly midsummer, and is not fully developed before autumn. The nuts have a length of from ½ to ¾ inch, and grow in clusters. Double or treble nuts are the result of the equal development of two or all the three carpels of the original flower, of which ordinarily two become abortive. Fusion of two or more nuts is not uncommon, and Masters gives an instance of the union of as many as five. From the light brown or brown colour of the nuts the terms *hazel* and *hazelly*, i.e., "in hue as hazel nuts" (Shakespeare, *Taming of the Shrew*, ii. 1), derive their significance.[3] The wood of the hazel is whitish red, close in texture, and pliant, and has when dry a weight of 49 lb per cub. foot; it has been used in cabinet-making, and for toys and turned articles. Curiously veined veneers are obtained from the roots; and the root-shoots are largely employed in the making of crates, coal-corves or baskets, hurdles, withs and bands, whip-handles, and other objects. The rods are reputed to be most durable when from the driest ground, and to be especially good where the bottom is chalky. The light charcoal afforded by the hazel serves well for crayons, and is valued by gunpowder manufacturers. An objection to the construction of hedges of hazel is the injury not infrequently done to them by the nut-gatherer, who "with active vigour crushes down the tree" (Thomson's *Seasons*, "Autumn"), and otherwise damages it.

The filbert,[2] among the numerous varieties of *Corylus Avellana*, is extensively cultivated, especially in Kent, for the sake of its nuts, which are readily distinguished from cob-nuts by their ample involucre and greater length. It may be propagated by suckers and layers, by grafting, and (see ARBORICULTURE, ii. 312) by seeding. Suckers afford the strongest and earliest bearing plants. Grafted filberts are less liable than others to be encumbered by suckers at the root. By the Maidstone growers the best plants are considered to be obtained from layers. These become well rooted in about a twelvemonth, and then, after pruning, are bedded out in the nursery for two or three years. The filbert may be economically grown in the borders of plantations, orchards, or copse or garden woods. It thrives best in a light loam with a dry subsoil; rich and, in particular, wet soils are unsuitable, conducing to the formation of too much wood. Plantations of filberts are made in autumn, in well-trenched ground, and a space of about 10 feet by 8 has to be allowed for each tree. Ground good for hops is good also for filberts, according to Whitehead, who recommends old woollen rags as the best manure for the latter ("On the Cultivation of the Filbert," *Trans. Hort. Soc.*, iv. 148). In the third year after planting the trees may require root-pruning; in the fifth or sixth they should bear well. The nuts grow in greatest abundance on the extremities of second year's branches, where light and air have ready access. In 1819, a very productive year, Williamson obtained from 57 trees, mostly not above six years old, and growing on 300 square yards of ground, 2 cwt. of nuts. To obtain a good tree, the practice in Kent is to select a stout upright shoot 3 feet in length; this is cut down to about 18 inches, of which the lower 12 are kept free from outgrowth. The head is pruned to form six or eight strong offsets; and by judicious use of the knife, and by training, preferably on a hoop placed within them, these are caused to grow outwards and upwards to a height of about 6 feet, so as to form a bowl-like shape. Excessive luxuriance of the laterals may be combated by root pruning, or by checking them early in the season, and again later, and by cutting back to a female blossom bud, or else spurring nearly down to the main branch in the following spring. In certain conditions of growth the trees may bear almost exclusively male or female flowers, and those produced in the first blossoming are stated (*Gent. Mag.*, 1788, vol. lviii., pt. 1, p. 495) to be female only. The fertilization of the latter may be secured by suspending amongst them a branch with male bloom.

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[1] [illegible] hazel of olden [illegible]

[2] On the etymology of "filbert," see [illegible] and Queries, 5th ser., [illegible]

[3] For the derivation of the words see Latham's Johnson's *Dictionary*.

Hazel-nuts required for keeping must be gathered only when quite ripe; they may then be preserved in dry sand, or, after drying, by packing with a sprinkling of salt in small casks or new earthenware pots. Four different forms are the Cosford, which are thin-shelled and oblong; the Downton, or large square nut, having a [illegible] husk; the white or Wrotham Park filbert, and the red hazel or filbert, the kernel of which has a red pellicle. The last two, on account of their elongated husk, were by Willdenow distinguished as a species, under the name *Corylus tubulosa*. Like these, apparently, were the nuts of Abella, or Avella, in the Campania (*cf.* Fr. [illegible]), [illegible] to have been originally designated "Pontic," from their introduction into Asia and Greece from Pontus (see *Nat. Hist.*, xv. 24, xxiii. 78). Cob-nuts are short and roundish, and have a thick and strong shell. Hazel-nuts, under the name of Barcelona or Spanish nuts, are largely exported from France and Portugal, and especially Tarragona and other places in Spain. The [illegible] pale-yellow, sweet-tasting, [illegible] oil, which has a specific gravity of 0·92 nearly, [illegible] 19° [illegible], and consists approximately of carbon 77, and hydrogen and oxygen each 11·5 per cent. Hazel nuts formed part of the food of the ancient lake dwellers of Switzerland [illegible] Keller, *Lake Dwellings*, trans. Lee, 2d ed., 1878). By the Romans they were sometimes eaten roasted. Kaltenbach (*Pflanzenfeinde*, pp. 653-58, 1874) enumerates [illegible] which attack the hazel. Among these the beetle *Balaninus nucum*, L., the nut weevil, seen on hazel and oak stems from the end of May till July, is highly destructive to the nuts. The female [illegible] an egg in the unripe nut, on the kernel of which the larva feeds till September, when it bores its way through the shell and buries itself in the earth, to undergo transformation into a chrysalis the ensuing spring. The leaves of the hazel are frequently [illegible] the upper and under side respectively by the larvæ of [illegible], and *L.* [illegible], Sta. The [illegible] to pass over the filbert whilst destroying [illegible], *Ann. and Mag. Nat. Hist.*, ii. 231). Parasitic on the roots of the hazel is found the curious leafless *Lathræa squamaria*, or Toothwort, of the order *Orobanchaceæ*.

The Hebrew word *luz*, translated "hazel" in the authorized version of the English Bible, Gen. xxx. 37, is believed to signify "almond" (see Kitto, *Cycl. of Bibl. Lit.*, ii. 869, and iii. 811, 1864). A belief in the efficacy of divining rods of hazel for the discovery of [illegible] is probably of remote origin (*cf.* Hosea, iv. 12). G. Agricola, in his treatise *Vom Bergwerck* (pp. xxix.-xxxi., Basel, 1557) gives an account, accompanied by a woodcut, of their employment in the search for mineral veins. By certain persons, who [illegible] rods of various materials, rods of hazel, [illegible] for silver lodes, and by the [illegible] to natural signs of mineral veins, they were [illegible] at all. The virtue of the hazel wand [illegible] on its having two forks; these were to be grasped in the fists, with the fingers uppermost, but with moderate [illegible], that the free motion of the opposite end [illegible] object should be interfered with. According to Cornish tradition, the divining or dowsing rod is [illegible] the guardians of the treasures of the earth. [illegible], towards the end of the 17th century, the [illegible] of hazel, or "baguette divinatoire," is [illegible] in the pursuit of criminals. The Jesuit Vanière, who flourished in the early part of the 18th century, in the *Prædium Rusticum* (pp. 12, 13, new ed., Toulouse, 1742) amusingly [illegible] the manner in which he exposed the chicanery of one who pretended by the aid of a hazel divining-rod to point out hidden water [illegible] and gold. The burning of hazel nuts for the [illegible] of the future is alluded to by Gay in *Thursday, or the Spell*, and by Burns in *Hallowe'en*. The hazel is very frequently mentioned by the old French romance writers. The *Corylus rostrata* and *americana* of North America have edible fruits like those of *C. Avellana*. The Witch Hazel is the species *Hamamelis virginica* (see vol. xi. p. [illegible]), of the natural order *Hamamelidaceæ*, the astringent bark of which is used in medicine.

See [illegible], 1838, pp. [illegible] and 552; C. M. [illegible], 1855; Sowerby's *Eng. Bot.*, [illegible] Ray Soc., 1862; J. D. Hooker, *Student's Flora*, [illegible] 2d ed., 1878. (F. H. B.)

HAZEL-HEN. See Grouse.

HAZLETON, a post-borough of Luzerne county, Pennsylvania, U.S., is situated about 80 miles N.N.W. of Philadelphia. Owing to its elevated and healthy situation, its agreeable climate, and the facilities afforded by its railway connexions with other districts, it has become a favourite and fashionable health resort in summer. The manufactures include both iron and timber; and a part of the rolling stock of the Lehigh Valley Railway is made in the town. There are several valuable coal-mines in the vicinity. The population in 1860 was only 1707, in 1870 it was 4317, and since then it has considerably increased.

HAZLITT, William (1778-1830), one of the most eminent of English critics, was born April 10, 1778, at Maidstone, where his father was minister of the Presbyterian congregation. He was educated privately, and afterwards at the Unitarian College at Hackney, where he first began to speculate upon metaphysical subjects. Feeling disinclined to enter the dissenting ministry, he returned to Wem in Shropshire, where his father had in the meantime settled, and there led an idle and desultory life until, about 1802, he determined upon becoming a painter. Metaphysics and art continued his joint passion throughout his life. It was his singular lot to be animated by an equal enthusiasm for two of the most dissimilar fields of human effort, in neither of which was he capable of achieving eminence, and yet, by a combination of the qualities proper to both, to obtain the most distinguished success in another sphere which he only entered by accident. The secret of his distinction as a critic is the union in him of the metaphysician's acuteness with the painter's eye for colour and substance. Nowhere else is abstract thought so picturesquely bodied forth by concrete illustration. He commenced the practice of painting in London, where his elder brother had already acquired some reputation as an artist, and soon found his way into literary and artistic circles, becoming especially intimate with Lamb, Hunt, and Godwin. Previously to this he had (January 1798) been powerfully influenced by Coleridge, who had come to preach in his father's neighbourhood, and of whose conversation and general demeanour he has left a most vivid picture. His professional painting did not prosper, and little remains of it except a few portraits; but in 1805 he published his *Essay on the Principles of Human Action*, which had occupied him at intervals for six or seven years. This work, further defined by the author as an argument in favour of the natural disinterestedness of the human mind, was preferred by him to all his other writings, but never attracted any attention from the public. In 1807 appeared a most useful abridgment of Abraham Tucker's *Light of Nature Pursued*, and a clever but fallacious attempt to invalidate the natural law established in Malthus's *Essay on Population*. In the following year he married Sarah, sister of Dr Stoddart, well known for his connexion with the journalism of the day, a woman of literary tastes and great strength of character, but cold, formal, and utterly uncongenial to him. No man indeed could well be less adapted for domestic life than Hazlitt, whose habits, notwithstanding his exemplary sobriety, were most irregular.

whose temper was fitful and moody, and the intensity of whose passions rendered him for the time insensible to the feelings and rightful claims of those who might stand in the way of their gratification. The dissolution of the ill-assorted union was nevertheless deferred for fourteen years, during which much of his best literary work had been produced. After three or four years, during which he almost disappears from observation, he came forward prominently as a writer in the *Examiner* and as a lecturer at the Surrey Institution, bringing out in rapid succession his *Round Table*, a collection of essays on literature, men, and manners, his *View* of the contemporary English stage, and his lectures on the poets, the English comic writers, and the dramatic literature of the age of Elizabeth. By these works, together with his *Characters of Shakespeare's Plays* (1817), and his *Table Talk* (1821), his reputation as a critic and essayist will mainly be sustained. Next to Coleridge, Hazlitt was perhaps the most powerful exponent of the dawning perception that Shakespeare's art was no less marvellous than his genius; and Hazlitt's criticism did not, like Coleridge's, remain in the condition of a series of brilliant but fitful glimpses of insight, but was elaborated with steady care. His lectures on the Elizabethan dramatists performed a similar service for the earlier, sweeter, and simpler among them, such as Dekker, till then unduly eclipsed by later writers like Massinger, better playwrights but worse poets. Treating of the contemporary drama, he successfully vindicated for Edmund Kean (whom, however, he had at first disparaged) the high place which he has retained as an actor; while his criticisms on the English comic writers and men of letters in general are masterpieces of ingenious and felicitous exposition, though rarely, like Coleridge's, penetrating to the inmost core of the subject. As an essayist Hazlitt is even more effective than as a critic, for this style of composition allows more scope to the striking individuality of his character. Being enabled to select his own subjects, he escapes dependence upon others either for his matter or his illustrations, and presents himself by turns as a metaphysician, a moralist, a humorist, a painter of manners and characteristics, but always, whatever his ostensible theme, deriving the essence of his commentary from his own bosom. This combination of intense subjectivity with strict adherence to his subject is one of Hazlitt's most distinctive and creditable traits. Intellectual truthfulness is a passion with him. He steeps his topic in the hues of his own individuality, but never uses it as a means of self-display. The first reception of these admirable essays was by no means in accordance with their deserts. Hazlitt's political sympathies and antipathies were vehement, and he had taken the unfashionable side. The *Quarterly* attacked him with deliberate malignity, stopped the sale of his writings for a time, and blighted his credit with publishers. He had become estranged from his early friends, the Lake poets, by what he uncharitably but not unnaturally regarded as their political apostasy; as well as by an escapade of his own, obscurely related, but apparently not creditable. His asperities of temper separated him for a time even from Leigh Hunt and Charles Lamb, and on the whole the period of his most brilliant literary success was that when he was most soured and broken. Domestic troubles supervened; his marriage, being little more than nominal, was dissolved in consequence of the infatuated passion he had conceived for a servant girl, a most ordinary person in the eyes of every one else. It is impossible to regard Hazlitt as a responsible agent while he continued subject to this influence. His own record of the transaction, published by himself under the title of *Liber Amoris, or the New Pygmalion* (1823), is a most remarkable psychological curiosity, and one of the most graphic examples extant of the power of genuine passion, not merely to palliate what is wrong, but to dignify what is ridiculous. "His idolatry," says Mrs Jameson, "in its intense earnestness and reality assumes something of the sublimity of an act of faith." The business-like dissolution of his marriage under the law of Scotland is related with amazing naiveté by the family biographer. Rid of his wife and cured of his mistress, he shortly afterwards astonished his friends by marrying a widow. "All I know," says his grandson, "is that Mrs Bridgewater became Mrs Hazlitt." They travelled on the Continent for a year, and then parted never to meet again. Hazlitt's study of the Italian masters during this tour, described in a series of letters contributed to the *Morning Chronicle*, had a deep effect upon him, and perhaps conduced to that intimacy with the cynical old painter Northcote which, shortly after his return, engendered a curious but eminently readable volume of conversations with him. The respective shares of author and artist are not always easy to determine. During the recent agitations of his life he had been writing essays, collected in 1826 under the title of *The Plain Speaker*; others subsequently written were published after his death. They are in no respect inferior to his earlier performances. *The Spirit of the Age* (1825), a series of criticisms on the leading intellectual characters of the day, reveals that he was less qualified to assign their true place to contemporaries than to revise the verdicts of the past, but is in point of style perhaps the most splendid and copious of his compositions. It is eager and animated to impetuosity, with no trace of carelessness or disorder. He now undertook a work which was to have crowned his literary reputation, but which can hardly be said to have even enhanced it—*The Life of Napoleon* (1828-30). The undertaking was at best premature, and was inevitably disfigured by partiality to Napoleon as the representative of the popular cause, excusable and even becoming in a Liberal politician writing in the days of the Holy Alliance, but preposterous now that the true tendencies of French imperialism are recognized. Owing to the failure of his publishers Hazlitt received no recompense for this laborious work. Pecuniary anxieties and disappointments may have contributed to hasten his death, which took place on September 18, 1830. Charles Lamb was with him to the last.

With many serious defects both on the intellectual and the moral side, Hazlitt's character in both had at least the merit of sincerity and consistency. He was a compound of intellect and passion, and the refinement of his critical analysis is associated with vehement eloquence and glowing imagery. He was essentially a critic, a dissector, and, as Bulwer justly remarks, a much better judge of men of thought than of men of action. But he also possessed many gifts in no way essential to the critical character, and transcending the critic's ordinary sphere. These, while giving him rank as an independent writer, frequently perturbed the natural clearness of his critical judgment, and seduced him into the paradoxes with which his works abound. These paradoxes, however, never spring from affectation; they are in general the sallies of a mind so eager and ardent as to overrun its own goal. His style is perfectly natural, and yet admirably calculated for effect. His diction, always rich and masculine, seems to kindle as he proceeds, and when thoroughly animated by his subject, he advances with a succession of energetic, hard-hitting sentences, each carrying his argument a step further, like a champion dealing out blows as he presses upon the enemy. Although, however, his grasp upon his subject is strenuous, his insight into it is rarely profound. He can amply satisfy men of taste and culture, he cannot, like Coleridge or Burke, dissatisfy them with themselves by showing them how much they would have missed without him. He is a stranger to the class of critics that exhibits the beauties of an author, rather than to the class that reveals them. He was somewhat backward in appreciating contemporary merit; he venerated Coleridge's intellect, but his estimate of his poetry is ridiculously low; his review of Shelley's posthumous poems, though distinctly hostile, is [illegible], and he did little to vindicate the fame of Keats. As an essayist and observer of manners his chief merit consists in the extreme felicity of his occasional observations. But all shortcomings are forgotten in the generous warmth and fervour of the writer's self-portraiture, and the [illegible] in which he stands out from the crowd of mankind. The perversity of his personal convictions [illegible] as he wrote [illegible] in a perfect autobiographer. Other men have been said to speak like books, Hazlitt's books speak like men. To read his works in connexion with Leigh Hunt's and Charles Lamb's is to be introduced into one of the most attractive of English literary circles, and this alone will long preserve them from oblivion.

The most copious source of information respecting Hazlitt is the biography by his grandson [illegible] As [illegible] sketch had previously been prefixed by his son to the posthumous essays published in 1836, accompanied by eloquent but [illegible] of his intellectual character by Bulwer and Talfourd. Valuable biographical particulars have been preserved in Barry Cornwall's memoirs of Lamb, and in the reminiscences of Mr P. G. Patmore, Hazlitt's most intimate associate in his later years. A [illegible] list of his writings, with a [illegible] of the most remarkable critical judgments upon them from all quarters, has been tastefully and exhaustively prepared by Mr Alexander Ireland (1868). (R. G.)

HEAD, SIR EDMUND WALKER, BART., (1805–1868), a popular writer on art, was born in 1805 at Wiarton Place, near Maidstone, in Kent. He was educated at Winchester school and Oriel College, Oxford, and taking his degree with first class honours in classics, he became in 1827 fellow of Merton College, and in 1834 university examiner in classics. Two years later he married; and on his father's death in 1838, he succeeded to the baronetcy as eighth baronet. His services as poor-law commissioner, to which post he was appointed in 1841 after three years as assistant commissioner, procured for him in 1847 the office of lieutenant governor of New Brunswick, whence he passed in 1854 to the governor-generalship of Canada, which he retained till 1861. The following year, having returned to England, Head was nominated a civil-service commissioner. In 1857 he was sworn of the Privy Council, and in 1860 was decorated as K.C.B., while in the course of his career he received the degrees of D.C.L. at Oxford and LL.D. at Cambridge. He died in London, January 28, 1868.

Sir Edmund Head wrote the article "Painting," in the *Penny Cyclopaedia*; *A Handbook of the Spanish and French Schools of Painting*, 1848; *Shall and Will, or two chapters on future Auxiliary Verbs*, 1856; and *Ballads and other Poems, original and translated*, 1868. He also edited *A Handbook of Painting of the German, Flemish, Dutch, Spanish, and French Schools*, 1854. His translation from the Icelandic of *Viga Glum's Saga* appeared in 1865.

HEAD, SIR FRANCIS BOND, BART. (1793–1875), soldier, traveller, and author, son of James Roper Head of the Hermitage, Kent, was born there January 1, 1793. He served with the Royal Engineers at the battles of Waterloo and Fleurus, and when he retired from the army he had risen to the rank of major. In 1825 he accepted the charge of an association formed to work the gold and silver mines of Rio de la Plata. In connexion with this enterprise he made several rapid journeys across the Pampas and among the Andes, his *Rough Notes* of which, published in 1826, and written in a clear and spirited style, obtained for him the name of "Galloping Head." In 1835 he was appointed governor of Upper Canada, where he manifested singular energy in dealing with the discontents from which the colony was at that time suffering. He resigned his office in 1837, and in recognition of his services he was in 1838 created a baronet. The narrative of his administration in Upper Canada was published by him in 1839. In 1867 he became a privy councillor. He died at his residence at Croydon, July 20, 1875. Some time previously a pension of £100 per annum was conferred upon him for his "services to literature."

Sir Francis Head was the author of a considerable number of works, chiefly of travel, written in a clever, amusing, and graphic fashion, and displaying both acute observation and genial humour. Besides those already mentioned, his principal works, which have all gone through more than one edition, are *Bubbles from the Brunnens of Nassau*, 1833; *Life of Bruce*, 1844; *The Emigrant*, 1846; *Stokers and Pokers*, 1850; *The Defenceless State of Great Britain*, 1850; *A Faggot of French Sticks*, 1851; *A Fortnight in Ireland*, 1852; *Descriptive Essays*, 1856; *The Horse and his Rider*, 1860; *The Royal Engineer*, 1869.

HEAD, SIR GEORGE (1782–1855), brother of the preceding, was born in 1782. He was educated at the Charterhouse. In 1808 he received an appointment in the commissariat of the British army in the Peninsula, where he was a witness of many exciting scenes and important battles, of which he gave an interesting account in "Memoirs of an Assistant Commissary General" attached to the second volume of his *Home Tour*, published in 1837. In 1814 he was sent to America to take charge of the commissariat in a naval establishment on the Canadian lakes, and he subsequently held appointments at Halifax and Nova Scotia. Some of his Canadian experiences were narrated by him in *Forest Scenery and Incidents in the Wilds of North America*, published in 1829. In 1831 he received the honour of knighthood. He published in 1835 *A Home Tour through the Manufacturing Districts of England*, and in 1837 a sequel to it, entitled *A Home Tour through various parts of the United Kingdom*. Both works are amusing and instructive, but his *Rome, a Tour of Many Days*, published in 1849, is somewhat dull and tedious. He also contributed several articles to the *Quarterly Review*, and translated *Historical Memoirs of Cardinal Pacca*, 1850, and the *Metamorphoses of Apuleius*, 1851. He died in London, May 2, 1855.

HEARNE, SAMUEL (1745–1792), an English explorer, was born at London in 1745. At the age of eleven he entered the Royal Navy as midshipman in the vessel of Lord Hood, but at the conclusion of the war he took service with the Hudson's Bay Company as quartermaster. In 1768 he was appointed to examine portions of the coast of Hudson's Bay with a view to the improvement of the cod-fishing, when he executed his task with such ability that it was resolved to employ him in the discovery of the north west passage, and of certain mines of copper whose existence was asserted by the Indians. His first attempt, upon which he set out on November 6, 1769, was unsuccessful owing to the desertion of the Indians; and his second, entered upon on 23d February 1770, was by the breaking of his quadrant likewise rendered abortive; but in his third expedition, upon which he started in December 1770, he was completely successful, as he not only discovered the existence of copper on the banks of what is now known as Coppermine river, but traced the course of that river till it joined the Arctic Ocean. After an absence of eighteen months and twenty three days he arrived at Fort Churchill, of which he was subsequently promoted to be the governor. He returned to England in 1787, and died there in 1792. An account of his journeys from Prince of Wales Fort to the Northern Ocean was published posthumously in 1795.

HEARNE, THOMAS (1678–1735), an English antiquary, was born in 1678 at Littlefield Green, in the parish of White Waltham, Berkshire, where his father, the parish clerk, in payment of the rental of the vicarage house in which he lived, taught ten boys yearly. Thomas, after receiving the rudiments of education from his father, was sent by the kindness of a gentleman to the free school of Bray, "on purpose to learn the Latin tongue." This gentleman in 1695 took him into his house, and his education was continued at Bray till the Easter of 1696, when he was sent to study at Edmund Hall, Oxford. There his diligence and scholarship attracted the attention of Dr John Mill, the editor of the Greek Testament with various readings, who employed him to compare several MSS. Hearne took the degree of B.A. in 1699, and on account of the reputation he had acquired for his knowledge of books he was in 1701 appointed assistant-keeper of the Bodleian Library. There at his own option he set himself diligently to correct the catalogue, and prepared an appendix which was afterwards incorporated in the new catalogue without acknowledgment. His interest in the antiquarian treasures of the library induced him to refuse many valuable preferments, and in 1712 he was appointed second keeper, with the stipulation made by himself that he should also be janitor, so as to obtain access to the library at any time he pleased. In 1714 or 1715 he was elected architypographus and esquire beadle of civil law in the university, but, an objection being taken to his holding this office along with that of second librarian, he resigned it in the November following. In January 1716 he was compelled, on account of his refusal to take the oaths to the Government, to resign also his appointment of librarian, but he continued to reside principally at Oxford, where he occupied himself chiefly in preparing for publication the works of old English authors. His injudicious and inappropriate insertion of Jacobite sentiments in his prefaces awakened, however, the hostility of the university magnates, and subjected him to several prosecutions. He died 10th June 1735. Though Hearne was somewhat undiscriminate in his antiquarian taste, and rambling and desultory in his style of composition, his persevering diligence and minute accuracy enabled him to do valuable service in bibliography.

His publications were nearly all printed by subscription at Oxford. [illegible] III; [illegible] Most of these have been [illegible] of Edmund Hall, [illegible] Oxford, 1857; 2d ed., London, 1869.

[illegible] Life of T. H[illegible]

HEART, DISEASES OF THE, form a large proportion of the most fatal disorders that afflict mankind, in youth as well as in advanced life. For the structure and functions of the organ the reader is referred to ANATOMY and PHYSIOLOGY.

In the early eras of medicine, the absence of correct anatomical, physiological, and pathological knowledge prevented diseases of the heart from being recognized with any certainty during life, and almost entirely precluded them from being brought within the reach of medical treatment. No sooner did Harvey (1628) publish his discovery of the circulation of the blood, and its dependence on the heart as its central organ, than derangements of the circulation began to be recognized as signs of disease of that central organ. The earliest indications of this important step in the diagnosis of these diseases are to be found in the instructive records contained in the writings of the great pathologists of the beginning of the 18th century, of whom the chief in this respect are Lancisi, Morgagni, Senac, and Meckel. There is, however, a limit to the information obtainable in this way; and, though its range has been largely increased in our day by the invention of such instruments as the sphygmograph and cardiograph, &c., it was very easily reached in those early times, when men had only their unaided senses to depend upon, and but little experience to guide them. We need not wonder, then, that after the first great step was taken there was but little further progress made, and medicine had to wait till the beginning of another century, when Corvisart (1806) first made practical use of Auenbrugger's (1761) invention of percussion to determine the size of the heart, enlargement of that organ bulking largely in those days as a substantive disease. Corvisart was also in the habit of listening to the sounds made by the heart, and he may therefore be regarded as the first practical exponent of our modern methods of physical exploration, though scarcely as their founder. For as Auenbrugger invented percussion, so Laennec (1819) was undoubtedly the first to make a scientific application of mediate auscultation to the diagnosis of diseases of the chest, and it is to him we trace all the benefits derived from this method of inquiry, though it is to Bouillaud (1824) that we are chiefly indebted for its extension to the diagnosis of diseases of the heart; while it is to the clinical experience, and above all to the practical experiments, of James Hope (1832) that we owe much of that precision we have now attained in our diagnosis of those diseases from abnormalities in the sounds produced during the cardiac movements; just as we have learned from M. Forget (1851) the doctrine of retro-dilatation, which rightly interpreted is capable of greatly informing us as to the origin and progress of heart disease, and from William Stokes (1854) some instructive views on defective heart power as a cause of certain symptoms simulating disease of the brain, which have proved most valuable and suggestive in the diagnosis of diseases of the heart as well as in their treatment.

The half dozen works just alluded to by no means exhaust the literature of this subject during the past ages, but each of them marks an era, and by their means we may readily trace the progress of cardiac diagnosis during the 150 years intervening between Lancisi and Stokes; but during the twenty odd years that have since elapsed the literature of the subject has become so unusually copious and exhaustive that it would occupy too much space merely to enumerate the authors' names. Fortunately this further development need not concern us here.

As in former so in recent times the progress made in the diagnosis of diseases of the heart has been entirely based on physics and on physiology, and the heart is an organ so situated and so connected as to render it singularly amenable to these methods of investigation. Resting on the diaphragm, and projected against the anterior chest wall, the heart is partly within reach, and is otherwise so completely surrounded on three sides by resonant organs (the lungs) that any change in its position or in its size is readily made out by palpation and percussion, while by listening over the cardiac area—auscultation—we can ascertain whether the valves of the heart remain intact, have an unusual strain thrown upon them, or have been rendered incompetent by disease.

As the four openings of the heart lie so close together that a superficial area of half a square inch includes a part of each, it is only by taking advantage of certain well known laws regulating the conduction of sound that we are able to differentiate the sounds produced at each of these openings respectively, and to assign to each a definite position on the chest-wall, where it is heard at its maximum intensity. Physiology, on the other hand, teaches us that each individual cardiac pulsation, the time of which is marked for us by that impulse against the chest-wall of which we are all more or less conscious, consists of alternate acts of contraction and dilatation affecting the four cavities of the heart. Some of these acts precede this impulse, some accompany it, and others follow it, and the relation of any sound produced within the heart to these physiological acts is termed its rhythm.

The functional perfection of the heart is thus easily determined by ascertaining that it is of a normal size, that its impulse is neither too strong nor too weak, and that its sounds are normal when listened to, each in its own position of maximum intensity. When these conditions are present, any abnormal cardiac phenomena, such as palpitation, irregular action, &c., are to be regarded as entirely due to abnormal innervation, and not to any actual disease of the heart. On the other hand functional imperfection is readily detected by the occurrence of any abnormality in the phenomena already referred to, especially if accompanied by a blowing sound instead of the usual valve sound in any of the normal auscultatory areas. And an intelligent appreciation of these facts, together with a correlation of the physical with the physiological phenomena, that is, a correct determination of the rhythm of the sounds heard, enables us to ascertain with certainty, not only the valve implicated, but also the mode in which the lesion has affected or is likely to affect the heart and through it the circulation. Having found the heart to be functionally imperfect, we have two alternatives presented to us—either the valves are incurably deformed from previous disease, or they are merely functionally imperfect from over-distention of the cardiac cavities, a state of matters which may arise from various causes, and which is always susceptible of great relief and very often of perfect cure.

The great function of the heart is to keep up such a pressure within the arterial section of the vascular canals as will suffice for the maintenance of the circulation and of all the organic functions of the body dependent upon it. The tendency, however, of all the extrinsic forces connected with the circulation is to equalize the blood pressure throughout the vascular system, and so to bring the circulation to a stand-still; and indeed it is in this way that death at last occurs; whether it happen suddenly or slowly the cause is still the same—cessation of the circulation brought about by equalization of the blood pressure throughout the whole of the vascular system, or, as it may be otherwise put, from decline of the arterial (aortic) blood pressure.

Valvular lesions of the heart, however produced, tend, as may be readily understood, to neutralize the cardiac function and to lower the arterial blood pressure, either by permitting an unnatural escape of the blood backward (regurgitation) or by obstructing its onward flow (obstruction). And this action is further intensified by the interference with the cardiac nutrition which necessarily results, first of all directly, from the heart being flushed with blood at a low pressure, and secondly indirectly, from the imperfect performance of all those functions, such as digestion, &c., upon which the formation of healthy blood depends, arising from the same cause.

Valvular disease thus gives the heart more work to do, while it takes from it the power of doing it, putting the organ in a vicious circle. In this way curable disease if neglected may readily lapse into incurability, while to incurable disease there can be but one ending, though, apart from such accidents as embolism or asystole from violent emotion or exertion, that is neither so sudden nor so speedy as is commonly supposed, and indeed usually occurs from gradual asthenia, often accompanied by dropsy, and preceded by a life of more or less active exertion, averaging in many cases not less than twenty years from the primary onset of the disease. During this comparatively long period the disease may have been entirely mute; that is, the valve lesion has progressed so slowly from its trifling commencement that the residual accumulation in the cavity primarily affected has gone on *guttatim*, and has spread itself backwards over the other sections of the circulation in the same gradual manner, the resulting dilatation being so immediately followed by compensating hypertrophy that the sufferer has never been aware of any derangement of his functions. A time comes at last, however, when, from a failure of nutrition due to physical causes, the increase in the heart's bulk ceases to be muscular, it becomes fibrous; then indeed the disease is no longer mute, serious rupture of the compensation sets in, and all that art can do is to make the inevitable declension as gradual as possible. Up to this period any accidental rupture of the compensation, which readily enough occurs from over-exertion, imperfect nutrition from any cause, or from any feverish attack, is as a rule perfectly amenable to appropriate treatment, though the restored compensation is always less stable than it had been previously.

Ruptured compensation is often attended by very alarming symptoms, such as great general dropsy and extreme irregularity of the heart's action, but the true measure of the patient's danger lies less in these symptoms than in the condition of the cardiac muscle, and in the circumstances which threaten asystole, that is, arrest of the heart's action.

If in early times the diagnosis of diseases of the heart was a matter of great difficulty, this seemed of less importance as their treatment was so hopeless. "A mésure qu'on pénètre," says Senac, "dans les maladies du cœur, la médicine parait plus stérile; que peut-on espérer des médicaments, par exemple, dans les dilatations du cœur?" But modern science, which has rendered the heart so accessible from all sides that there is nowadays probably no organ of the body whose diseases can be so readily detected or so accurately discriminated, has not only pointed out the true source of danger in these diseases, but has also put into our hands a remedy by which some are cured who were formerly thought incurable, while many incurables have their downward progress so successfully arrested that they feel themselves to be practically cured. And yet DIGITALIS (*q.v.*) was all but unknown 100 years ago, while so little was known of its real action—*ratio medendi*—that within the last thirty years a living author wrote that the use of digitalis as a diuretic in heart disease was quite "indefensible," as "the failing heart is absolutely incapable of sustaining the depressing influence of the drug." Nowadays we know digitalis to be the only drug that can be relied on for increasing the power of the heart's contractions, and it also slows them,—the result being that the blood pressure is increased throughout the whole arterial system, and that, time being given for the heart itself to be flushed by blood at an increased pressure, its nutrition is improved. The heart not only acts more powerfully under the immediate influence of the drug, but it becomes more able to act, so that by and by the drug may be left off; though indeed, should the muscular degeneration determinately threaten a rapid progression, tonic doses of the drug may be safely given daily for many years continuously, in spite of all our forefathers' croaking as to the dangers of accumulation. But however marvellous the effects of tonic doses of digitalis may be, the virtues of the drug in larger doses are even more wonderful in appropriate cases, for by means of large doses the skilled physician has it in his power permanently to contract many dilated hearts, and so to cure what seemed an incurable disease not only to Senac but even to many of his more modern successors.

There are many other drugs employed in the treatment of diseases of the heart, but there is no other deserving of special mention. Other medicines are employed to relieve pain, aid digestion, dispel flatulence, unload the bowels, improve the blood, or simply as general tonics, and may be catalogued as morphia, chloroform, belladonna, pepsine, asafœtida, aloes, rhubarb, iron, &c.

ANGINA PECTORIS (*q.v.*) is a painful disease of the heart which has been already described. *Palpitation* is an extremely rapid and sometimes forcible action of the heart. *Irregular* and *Intermittent Action* are sufficiently described by their names; irregular action may be tumultuous or so peculiar as to deserve the name of a veritable *delirium cordis*; intermission consists in the dropping of a beat every second, third, or fourth time, or seldomer. Sometimes the intermission only applies to the pulse, the heart acting regularly, and is caused by that particular systole not being forcible enough to propel the blood to the periphery; occasionally we have two beats of the pulse and then an intermission, constituting what has been termed a *pulsus bigeminus*, or the rhythm of the intermission may be even more varied. All these forms of perverted action of the heart may accompany valvular lesions, or they may occur in hearts whose valves are sound; the walls of such hearts are, however, almost invariably more or less feeble, imperfectly nourished, and the blood often poor and watery. They are rarely indicative of any real danger, though sufficiently troublesome and alarming to the sufferer; they arise from abnormal innervation, and are part of the penalties we pay for our present state of organization. We could enjoy nothing if we could not also suffer; and the blush of sensitiveness, the quickened pulse of affection, are paid for by the throb of anxiety, and the fatal inhibition of the heart's action due to overwhelming emotion. Most of these cases, however, own a much more ignoble origin: a flatulent distention of the stomach, a crapulous dyspepsia, the abuse of alcohol and tobacco, &c., are frequent sources of nervous heart trouble, so frequent that in some parts where young men most do congregate the tobacco-heart especially is quite a proverbial ailment. Overwork, worry, or excess of any kind is sufficient to bring on heart trouble of this character, as we can readily understand when we reflect that the heart does about one-fifth of the whole mechanical work of the body—a work equivalent to raising its own weight over 13,000 feet an hour; that it takes its rest only in short snatches as it were, its action as a whole being continuous; and that it must necessarily be the earliest sufferer from any improvidence as regards nutrition,—mental emotion being in this respect quite as potential a cause of constitutional bankruptcy as the most violent muscular exertion. Fortunately, to a skilled physician there is no difficulty of determining the true nature of these cases, and they are all more or less amenable to appropriate treatment. *Syncope*, or fainting, is an affection somewhat similar to those just described; it essentially consists in an emotional inhibition of the cardiac systole, so that the blood pressure within the brain falls below that necessary for the maintenance of consciousness; as the heart's action fortunately does not in these cases entirely cease, the best plan is to favour the flow of blood to the head by maintaining the sufferer with a lowered and slightly depending head until the effects of the momentary inhibition have passed off. The inflammatory affections of the heart, *Carditis*, *Endocarditis*, and *Pericarditis* are most important and serious affections, but their history and treatment are more suited for a work on practice of physic, in any of which full information regarding them may be found. They are mainly rheumatic and gouty in character, and they are to be regarded as varieties of these diseases: the mere fact of their affecting the heart is of but little consequence as to their immediate result, however important it may by and by become from the valvular lesions to which they so often give rise. There are but few exceptions to this rule, and amongst them are those rare cases in which acute endarteritis blocks the coronary vessels and gives rise to fatal angina. *Fatty Degeneration* of the heart, which bulks so largely in the popular mind as a cause of sudden death, is an almost hypothetical lesion of most infrequent occurrence, probably never found apart from disease of the coronary arteries, impossible of diagnosis, and very rarely of itself proving suddenly fatal. (G. W. B.)

HEAT.

SENSE OF HEAT.

The distinction between hot bodies and cold ones is familiar to all, and is associated in our minds with the difference of the sensations which we experience in touching various substances, according as they are hot or cold. The intensity of these sensations is susceptible of degrees, so that we may estimate one body to be hotter or cooler than another by the touch. The words hot, warm, cool, cold, are associated in our minds with a series of sensations which we suppose to indicate a corresponding series of states of an object with respect to heat.

The temperature of a body, therefore, is a quantity which indicates how hot or how cold the body is.

When we say that the temperature of one body is higher or lower than that of another, we mean that the first body is hotter or cooler than the second, but we also imply that we refer the state of both bodies to a certain scale of temperatures. By the use, therefore, of the word temperature we fix in our minds the conviction that it is possible, not only to feel, but to measure how hot a body is.

We find the cooling of a hot body and the heating of a cold body happening simultaneously as parts of the same phenomenon, and we describe this phenomenon as the passage of heat from the hot body to the cold one. Heat, then, is something which may be transferred from one body to another, so as to diminish the quantity of heat in the first and increase that in the second by the same amount.

Heat, therefore, may pass out of one body into another just as water may be poured from one vessel into another, and it may be retained in a body for any time just as water may be kept in a vessel. We have therefore a right to speak of heat as of a *measurable quantity*, and to treat it mathematically like other measurable quantities so long as it continues to exist as heat. We shall find, however, that we have no right to treat heat as a *substance*, for it may be transformed into something which is not heat, and is certainly not a substance at all, namely, mechanical work.

We have nothing to do with the word heat as an abstract term signifying the property of hot things, and when we might say a certain heat, as the heat of new milk, we shall always use the more scientific word temperature, and speak of the temperature of new milk.

We shall never use the word heat to denote the sensation of heat. In fact it is never so used in ordinary language which has no names for sensations unless when the sensation itself is of more importance to us than its physical cause, as in the case of pain, etc. The only name we have for this sensation is the "sensation of heat."

THERMOMETRY, OR THE THEORY OF TEMPERATURE.

Definition of Temperature.—The temperature of a body is its thermal state considered with reference to power of communicating heat to other bodies.

Definition of Higher and Lower Temperature.—If when two bodies are placed in thermal communication, one of the bodies loses heat, and the other gains heat, that body which gives out heat is said to have a higher temperature than that which receives heat from it.

[illegible]—If, when two bodies are placed in thermal communication, neither of them loses or gains heat, the two bodies are said to have equal temperatures or the same temperature. The two bodies are then said to be in thermal equilibrium.

Law of Equal Temperatures.—Bodies whose temperatures are equal to that of the same body have themselves equal temperatures. This law is not a truism, but expresses the fact that if a piece of iron when plunged into a vessel of water is in thermal equilibrium with the water, and if the same piece of iron, without altering its temperature, is transferred to a vessel of oil, and is found to be also in thermal equilibrium with the oil, then if the oil and water were put into the same vessel they would themselves be in thermal equilibrium, and the same would be true of any other three substances.

(SEE THERMOMETER.)

As we often find temperatures stated according to a different scale from that which we adopt ourselves, it is necessary to know the principles on which these scales are formed.

The Centigrade scale was introduced by Celsius, Professor of Astronomy in the University of Upsala. In it the freezing point is marked 0° and called zero, and the boiling point is marked 100°.

The obvious simplicity of this mode of dividing the space between the points of reference into 100 equal parts and remember that 0° Centigrade is 32° Fahrenheit, and that five degrees Centigrade are equal to nine of Fahrenheit.

The third thermometric scale is that of Réaumer. In this scale the freezing point is marked 0° and the boiling point 80°. I am not aware of any advantage of this scale. It is used to some extent on the continent of Europe for medical and domestic purposes. Four degrees of Réaumur correspond to five Centigrade and to nine of Fahrenheit.

Calling each of these a degree, and reckoning all temperatures in degrees from the freezing point, caused it to be very generally adopted, along with the French decimal system of measurement, by scientific men, especially on the continent of Europe.

The other two scales are called by the names of those who introduced them.

Fahrenheit, of Dantzig, about 1714 first constructed thermometers comparable with each other. In Fahrenheit's scale the freezing point is marked 32°, and the boiling point 212°, the space between being divided into 180 equal parts, and the graduation extended above and below the points of reference. A point 32° degrees below the freezing point is called zero, or 0°, and temperatures below this are indicated by the number of degrees below zero.

It is found that after a thermometer has been filled and sealed the capacity of the bulb diminishes slightly, and that this change is comparatively rapid at first, and only gradually becomes insensible as the bulb approaches its ultimate condition. It causes the freezing point to rise in the tube to 0°·3 or 0°·5, and if, after the displacement of the zero, the mercury be again boiled, the zero returns to its old place and gradually rises again.

This change of the zero point was discovered by M. Flaugergues.—*Ann. de Chimie et de Physique*, xxi p. 333 (1822). It may be considered complete in from four to six months. Dr. Joule, however, finds that the rise of the freezing point of a delicate thermometer has been going on for twenty-six years, though the changes are now exceedingly minute.—*Phil. Soc. Manchester*, Feb. 22, 1870.

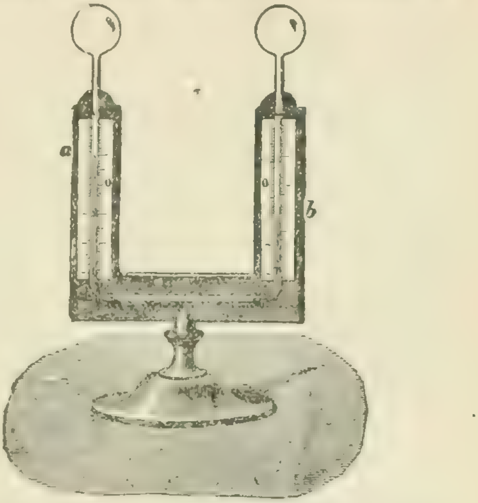
Change of Zero point.

THE AIR THERMOMETER.

Sec. 3.—The original thermometer invented by Galileo was an air thermometer. It consisted of a glass bulb with a long neck. The air in the bulb was heated, and then the neck was plunged into a colored liquid. As the air in the bulb cooled, the liquid rose in the neck, and the higher the liquid the lower the temperature of the air in the bulb. The air thermometer cannot of itself tell us anything about temperature. We must consult the barometer at the same time, in order to correct the reading of the air thermometer. Hence the air thermometer, to be of any scientific value, must be used along with the barometer, and its readings are of no use till after a process of calculation has been gone through. This puts it at a great disadvantage compared with the mercurial thermometer as a means of ascertaining temperature.

The *Differential Thermometer* of Leslie and Rumford is really a couple of air thermometers working against one another. In its simplest form it consists merely of a tube with a ball blown at each end. These balls contain air and the contents of the two are kept separate by a column of sulphuric acid, whose motions indicate differences of pressure, and therefore of temperature, in the two bulbs. This instrument is obviously unaffected by changes of barometric pressure; it can be made very sensitive, and it is therefore of great use. Leslie made all his experiments on radiation of heat with this instrument; and, by varying the materials of which the balls (or one of them) were made, he converted it into a hygrometer, a photometer, an æthrioscope, etc.

Differential Thermometer of Leslie and Rumford



It is exceedingly convenient, especially in dealing with questions relating to gases, to reckon temperature not from the freezing point or from Fahrenheit's zero, but from the bottom of the tube of the air thermometer.

This point is then called the absolute zero of the air thermometer, and temperatures reckoned from it are called absolute temperatures. It is probable that the dilatation of a perfect gas is a little less than 1.3665. If we suppose it 1.366, then absolute zero will be —460° on Fahrenheit's scale, or —273°¼ Centigrade.

Absolute Zero.

If we add 460° to the ordinary reading on Fahrenheit's scale, we shall obtain the absolute temperature in Fahrenheit's degrees.

If we add 273¼ to the Centigrade reading, we shall obtain the absolute temperature in Centigrade degrees.

One of the most important applications of the conception of absolute temperature is to simplify the expression of the two laws discovered respectively by Boyle and by Charles. The laws may be combined into the statement that *the product of the volume and pressure of any gas is proportional to the absolute temperature.*

For instance, if we have to measure quantities of a gas by their volumes under various conditions as to temperature and pressure, we can reduce these volumes to what they would be at same standard temperature and pressure.

Thus if V, P, T be the actual volume, pressure, and absolute temperature, and V_0 the volume at the standard pressure P_0, and the standard temperature T_0, then

$$\frac{VP}{T} = \frac{V_0 P_0}{T_0}$$

$$V_0 = V\frac{P\,T_0}{P_0\,T}$$

If we have only to compare the relative quantities of the gas in different measurements in the same series of experiments, we may suppose P_0 and T_0 both unity, and use the quantity $\frac{VP}{T}$ without multiplying it by $\frac{T_0}{P_0}$, which is a constant quantity. (For a full account of the methods of measuring gases, Bunsen's *Gasometry*, translated by Roscoe.)

The great scientific importance of the scale of temperature as determined by means of the air or gas thermometer arises from the fact, established by the experiments of Joule and Thomson, that the scale of temperature derived from the expansion of the more permanent gases is almost exactly the same as that founded upon purely thermodynamic considerations, which are independent of the peculiar properties of the thermometric body. This agreement has been experimentally verified only within a range of temperature between 0° C and 100° C. If, however, we accept the molecular theory of gases, the volume of a perfect gas ought to be exactly proportional to the absolute temperature on the thermodynamic scale, and it is probable that as the temperature rises the properties of real gases approximate to those of the theoretically perfect gas.

THERMO ELECTRIC CURRENT.

SEC. 4.—Electric currents excited by differences of temperature in different parts of a metallic circuit are called thermo-electric currents. An arrangement by which the electromotive forces arising from a number of junctions may be added together is called a thermopile and is used in experiments on the heating effect of radiation, because it is more sensitive to changes of temperature caused by small quantities of heat than any other instrument.

Professor Tait (*Proceedings of the Royal Society of Edinburgh*, 1870-71) has found that if t_1 and t_2 denote the temperature of the hot and cold junction of two metals the electromotive force of the circuit formed by these two metals is

$$A(t_1 - t_2)\left\{T - \tfrac{1}{2}(t_1 + t_2)\right\}.$$

where A is a constant depending on the nature of the metals and T is a temperature also depending on the metals, such that when one junction is as much hotter than T as the other is colder, no current is produced. T may be called the neutral temperature for the two metals. For copper and iron it is about 284° C.

Mr Siemens has found that the resistance of the metals may be expressed by a formula of the form

$$R = \alpha\sqrt{T} + \beta T + \gamma$$

where R is the resistance, T the absolute temperature, and α β γ coefficients. Of these α is the largest and the resistance depending on it increases the square root of the absolute temperature, so that the resistance increases more slowly as the temperature rises. The second term, βT, is proportional to the temperature and may be atributed to the expansion of the substance. The third term is constant.

CALORIMETRY.

SEC 5.—Having explained the principles of Thermometry, or the method of ascertaining temperatures, we are able to understand what we may call Calorimetry, or the method of measuring quantities of heat.

When heat is applied to a body it produces effects of various kinds. In most cases it raises the temperature of the body; it generally alters its volume or its pressure, and in certain cases it changes the state of the body from solid to liquid or from liquid to gaseous.

Any effect of heat may be used as a means of measuring quantities of heat by applying the principle that when two equal portions of the same substance in the same state are acted on by heat in the same way so as to produce the same effect, then the quantities of heat are equal.

We begin by choosing a standard body, and defining the standard effect of heat upon it. Thus we may choose a pound of ice at the freezing point as the standard body, and we may define as the unit of heat that quantity of heat which must be applied to this pound of ice to convert it into a pound of water still at the freezing point. This is an example of a certain change of state being used to define what is meant by a quantity of heat. This unit of heat was brought into actual use in the experiments of Lavoisier and Laplace. Unit of Heat.

In this system a quantity of heat is measured by the number of pounds (or of grammes) of ice at the freezing point which that quantity of heat would convert into water at the freezing point.

We might also employ a different system of measurement by defining a quantity of heat as measured by the number of pounds of water at the boiling point which it would convert into steam at the same temperature.

This method is frequently used in determining the amount of heat generated by the combustion of fuel.

Neither of these methods requires the use of the thermometer.

Another method, depending on the use of the thermometer, is to define as the unit of heat that quantity of heat which if applied to unit of mass (one pound or one gramme) of water at some standard temperature (that of greatest density, 39° F. or 4° C., or occasionally some temperature more convenient to laboratory work, such as 62° F. or 15° C.) will raise that water one degree (Fahrenheit or Centigrade) in temperature.

According to this method a quantity of heat is measured by the quantity of water at a standard temperature which that quantity of heat would raise one degree.

Measure of Quantity of Heat.

All that is assumed in these methods of measuring heat is that if it takes a certain quantity of heat to produce a certain effect on one pound of water in a certain state, then to produce the same effect on another similar pound of water will require as much heat, so that twice the quantity of heat is required for two pounds, three times for three pounds, and so on.

We have no right to assume that because a unit of heat raises a pound of water at 39° F. one degree, therefore two units of heat will raise the same pound two degrees, for the quantity of heat required to raise the water from 40° to 41°, may be different from that which raised it from 39° to 40°. Indeed, it has been found by experiment that more heat is required to raise a pound of water one degree at high temperature than at low ones.

In some of the earlier experiments of Black on the heat required to melt ice and to boil water, the heat was applied by means of a flame, and as the supply of heat was assumed to be uniform, the quantities of heat supplied were inferred to be proportional to the time during which the supply continued. A method of this kind is obviously very imperfect, and in order to make it at all accurate would need numerous precautions and auxiliary investigations with respect to the laws of the production of heat by the flame and its application to the body which is heated. Another method, also depending on the observation of time, is more worthy of confidence. We shall describe it under the name of the Method of Cooling.

ICE CALORIMETERS.

[illegible]

Sec 6.—Wilcke, a Swede, was the first who employed the melting of snow to measure the heat given off by bodies in cooling. The principal difficulty in this method is to ensure that all the heat given off by the body is employed in melting the ice, and that no other heat reaches the ice so as to melt it, or escapes from the water so as to freeze it. This condition was first fulfilled by the calorimeter of Laplace and Lavoisier, of which the description is given in the Memoirs of the French Academy of Sciences for 1780. The instrument itself is preserved in the Conservatoire des Arts et Metiers at Paris.

This apparatus, which afterward received the name of Calorimeter, consists of three vessels, one within another.

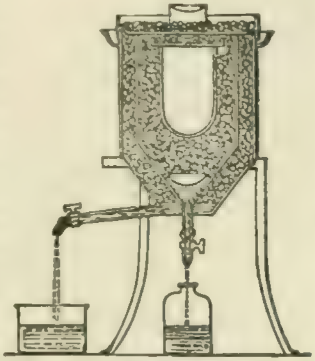


Fig. 1.

The first or innermost vessel, which we may call the receiver, is intended to hold the body from which the heat to be measured escapes. It is made of thin sheet copper, so that the heat may readily pass into the second vessel. The second vessel or calorimeter proper, entirely surrounds the first. The lower part of the space between the two vessels is filled with broken ice at the freezing (or melting) point, and the first vessel is then covered by means of a lid, which is itself a vessel full of broken ice. When the ice melts in this vessel, whether in the lower part or in the cover of the first vessel, the water trickles down and passes through a drainer, which prevents any ice from escaping, and so runs out into a bottle set to catch it. The third vessel, which we may call the ice jacket, entirely surrounds the second, and is furnished, like the second, with an upper lid to cover the second. Both the vessel and the lid are full of broken ice at the freezing point, but the water formed by the melting of this ice is carried off to a vessel distinct from that which contains the water from the calorimeter proper.

Bunsen (*Pogg. Ann.* Sept. 1870 and *Phil. Mag.* 1871) independently devised a calorimeter founded on the same principle, but in the use of which the sources of error are avoided and the physical constants determined with a degree of precision seldom before attained in researches of this kind.

[illegible]

Bunsen's calorimeter, as described by the author, is a small instrument. The body which is to give off the heat which is to be measured is heated in a test-tube placed in a current of steam of known temperature. It is then dropped, as quickly as may be, into the test-tube of the calorimeter, which contains water at 0° C. The body sinks to the bottom and gives off heat to the water. The heated water does not rise in the tube, for the effect of heat on water between 0° C. and 4° C. is to increase its density. It therefore remains stationary at the bottom of the tube, and its heat cannot escape by convection either upwards through the water, or through the sides of the tube, which, being thin, afford a better channel. The tube is surrounded by ice at 0° C. in the calorimeter, C, so that as soon as any part of the water in the tube is raised to a higher temperature, conduction takes place through the sides and part of the ice is melted. This will soon bring every thing within the tube again reduced to 0° C., and the whole quantity of ice melted by heat from *within* is an accurate measure of the heat which the heated body gives out as it cools to 0° C.

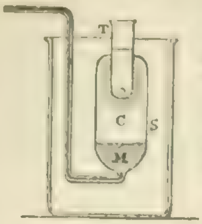


Fig. 2.

METHOD OF MIXTURE.

Sec. 7. The second calorimetric method is usually called the Method of Mixture. This name is given to all the processes in which the quantity of heat which escapes from one body is estimated by the increase of temperature it produces in another body into which it escapes. The most perfect method of ensuring that all the heat which escapes from the one body passes into the other is to mix them, but in many cases to which the method is now applied this cannot be done. For the processes of the method of mixture, see Maxwell on *Heat.*

DEFINITION OF THE CAPACITY OF A BODY.

Sec. 8.—The capacity of a body for heat is the number of units of heat required to raise that body one degree of temperature.

We may speak of the capacity for heat of a particular thing, such as a copper vessel, in which case the capacity depends on the weight as well as on the kind of matter. The capacity of a particular thing is often expressed by stating the quantity of water which has the same capacity.

We may also speak of the capacity for heat of a substance, such as copper, in which case we refer to unit of mass of the substance.

DEFINITION OF SPECIFIC HEAT.

Sec. 9. The specific heat of a body is the ratio of the quantity of heat required to raise that body one degree to the quantity required to raise an equal weight of water one degree.

The specific heat therefore is a ratio of two quantities of the same kind, and is expressed by the same number, whatever be the units employed by the observer, and whatever thermometric scale he adopts. Specific Heat.

To measure the heat given out to water we may put some cold water in a vessel, say about three quarters of a pound. Weigh the vessel and water carefully, and observe the temperature of the water; then, while the steam flows freely from the nozzle, condense steam in the water for a short time, and remove the nozzle, observe the temperature and weigh the water in its vessel again, taking note of the time of the experiment.

Let us suppose the original weight..........	5,000 grains
Weight after the condensation of steam.....	5,100 grains
Hence the weight of steam condensed is....	100 grains
Temperature of water at first	55° F.
Temperature at the end of experiment......	77° F.
Rise of temperature	22°

Let us now make a second experiment, as like the first as we can, only differing from it by the use of hot water instead of steam to produce the rise of temperature.

It is impossible in practice to insure that everything shall be exactly the same, but after a few trials we may select a method which will nearly, if not quite, fulfill the conditions.

Thus it is easy to bring the vessel and cold water to the same weight as before, namely, 5,000 grains; but we shall suppose the temperature now to be 56° F. instead of 55°. We now pour in water at 176° F. gradually, so as to make this experiment last about as long as the first, and we find that the temperature is now 76°, and the weight 6,000 grains. Hence, 1,000 grains of water cooling 100° raise the vessel and its contents 20°.

Assuming that the specific heat of water is the same at all temperatures, which is nearly, though by no means exactly, true, the quantity of heat given out by the water in the second experiment is equal to what would raise 100,000 grains of water one degree.

In the experiment with the steam the temperatures were nearly though not exactly equal but the rise of the temperature was greater in the proportion of 22 to 20. Hence we may conclude that the quantity of heat which produced this heating effect in the experiment with steam was greater than in the experiment with water in the same proportion. This makes the heat given out by the steam equal to that which would raise 110,000 grains of water one degree.

The fact that steam at the boiling point gives out a large quantity of heat when it is condensed into water which is still at the same temperature, and the converse fact that in order to convert water at the boiling temperature into steam of the same temperature a large quantity of heat must be communicated to it, was first clearly established by Black in 1757.

He expressed it by saying that the latent heat of steam is 965° F., and this form of expression is still in use, and we should take it to mean neither more nor less than what we have just stated. Latent Heat [illegible]

ON LINES OF EQUAL TEMPERATURE, ISOTHERMAL LINES ON THE INDICATOR DIAGRAM.

Sec. 10. Given the pressure and the volume, to find the temperature.

Lay off O V on the line of volumes to represent the given volume, and O P on the line of pressures to represent the given pressure, then draw F P horizontal and L P vertical, to determine the point P. If the point P falls on one of the lines of equal temperature, the number attached to that line indicates the temperature. If the point P falls between two of the lines we must estimate its distance from the two nearest lines, and then as the sum of these distances is to the distance from the lower line of temperature, so is the difference of the temperature of the two lines to the excess of the true temperature above that of the lower line.

2. Given the volume and temperature to find the pressure.

Lay off O L to represent the volume and draw L P vertical, and let L P be the point where it meets the line of the given temperature. Then L P represents the required pressure.

3. Given the pressure and temperature, to find the volume.

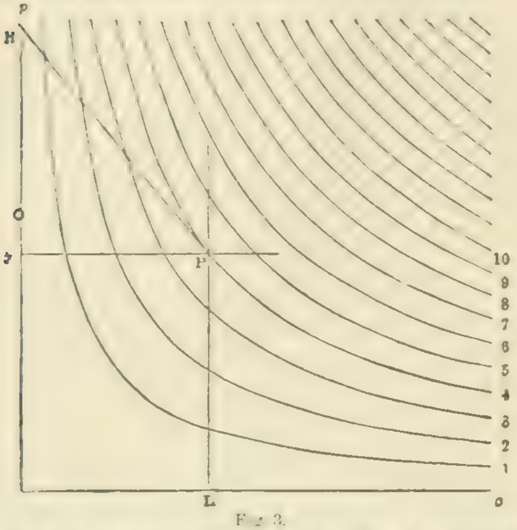


Fig. 3.

Lay off O F to represent the pressure and draw F P horizontal till it meets the line of the given temperature in P, then F P represents the required volume.

ON THE FORM OF THE ISOTHERMAL CURVES IN DIFFERENT CASES.

Sec. 11.—*The Gaseous State.* If the substance is in the gaseous state, then it is easy to draw the isothermal curves by taking account of the laws of Boyle and Charles.

Boyle's Law

By Boyle's law the product of the volume and the pressure is always the same for the same temperature. Hence, in the figure, the area of the rectangle O L P F will be the same provided P be a point in the same isothermal curve.

The curve which has this property is known in geometry by the name of rectangular hyperbola, the lines O L and O F being the asymptotes [illegible]. The asymptotes are lines such that a point [illegible] the curves in either direction [illegible] it. The isothermal lines [illegible] that a gas follows Boyle's law and [illegible] the same.

[illegible]

It is manifest that the relation between the pressure and the volume of any substance must be such that no pressure, however great, can reduce the volume to nothing. Hence the isothermal lines cannot be straight lines, for a straight line, however slightly inclined to the line of no volumes O F and however distant from it, must cut that line somewhere. The limited range of pressures which we are able to produce does not in some cases cause sufficient change of volume to indicate the curvature of the isothermal lines. We may suppose that for the small portion we are able to observe they are nearly straight lines.

The expansion due to an increase of temperature is also much smaller in the case of liquids than in the case of gases.

If, therefore, we were to draw the indicator diagram of a liquid on the same scale as that of a gas, the isothermal lines would consist of a number of lines very close together, nearly vertical, but very slightly inclined toward the line O F.

If, however, we retain the scale of pressures and greatly magnify the scale of volumes, the isothermal lines will be more inclined to the vertical and wider apart, but still very nearly straight lines. Liquids, however, which are near the critical point described at the end of this chapter are more compressible than even a gas.

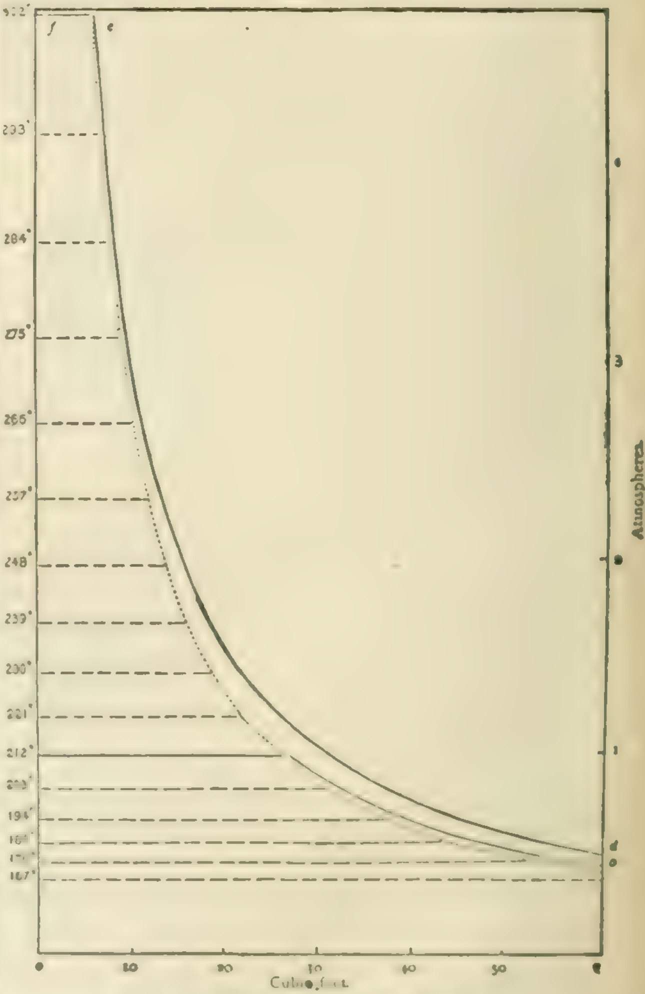
Scale of Pressures and of Volumes.

The Solid State.—In solid bodies the compressibility and the expansion by heat are in general smaller than liquids. Their indicator diagrams will therefore have the same general characteristics as those of liquid.

INDICATOR DIAGRAM OF A SUBSTANCE PART OF WHICH IS LIQUID AND PART VAPOR.

Sec. 13.—Let us suppose that a pound of water is placed in a vessel and brought to a given temperature, say 212° F., and that by

Fig. 15



Isothermals for Steam and Water.

means of a piston the capacity of the vessel is made larger or smaller, the temperature remaining the same. If we suppose the vessel to be [illegible] cubic feet and to be maintained at 212° F., then the whole of the water will be converted into steam, which will fill the vessel and will exert on it a pressure of about 575 pounds' weight on the square foot. If we now press down the piston, and so reduce the capacity of the vessel to diminish the pressure will increase nearly in the same proportion as the volume diminishes, so that the product of the numbers representing the pressure and volume will be nearly constant. When, however, the volume is considerably diminished, this product begins to diminish, that is to say, the pressure does not increase so fast as it ought to do by Boyle's law if the steam were a perfect gas. In the diagram, fig. 4, the relations between the pressure and the volume of steam at 212° are indicated by the curve *a b*. The pressure in atmospheres is marked on the right hand of the diagram, and the volume of one pound in cubic feet at the bottom.

When the volume is diminished to 26.36 cubic feet the pressure is 2,116 lbs., so that the product of the volume and pressure, instead of 57,500, is now reduced to 55,770. This departure from the law of Boyle, though not very large, is quite decided. The pressure and volume of the steam in this state are indicated by the point *b* in the diagram.

If we now diminish the volume and still maintain the same temperature, the pressure will no longer increase, but part of the steam will be converted into water, and as the volume continues to diminish, more and more of the steam will be condensed into the liquid form, while the pressure remains exactly the same, namely, 2,116 pounds' weight on the square foot, or one atmosphere. This is indicated by the horizontal line *b c* in the diagram.

This pressure will continue the same till all the steam is condensed into water at 212°, the volume of which will be 0.016 of a cubic foot, a quantity too small to be represented clearly in the diagram.

As soon, as the volume, therefore, is reduced to this value there will be no more steam to condense, and any further reduction of volume is resisted by the elasticity of water, which, as we have seen, is very large compared with that of a gas.

Isothermal line for water.

We are now able to trace the isothermal line for water corresponding to the temperature 212°. When v is very great the curve is nearly of the form of an hyperbola for which v p = 57,500. As v diminishes the curve falls slightly below the hyberbola, so that when v = 26.36, v p = 55,770. Here, however, the line suddenly and completely alters its character, and becomes the horizontal straight line *b c*, for which p = 2,116, and this straight line extends from v = 26.36 to v = 0.016, when another equally sudden change takes place, and the line, from being exactly horizontal, becomes nearly but not quite vertical, nearly in the direction *c p*, for the pressure must be increased beyond the limits of our experimental methods long before any very considerable change is made in the volume of the water.

The isothermal line in a case of this kind consists of three parts. In the first part, *a b*, it resembles the isothermal lines of a perfect gas, but as the volume diminishes the pressure begins to be somewhat less than it should be by Boyle's law. This, however, is only when the line approaches the second part of its course, *b c*, in which it is accurately horizontal. This part corresponds to a state in which the substance exists partly in the liquid and partly in the gaseous state, and it extends from the volume of the gas to the volume of the liquid at the same temperature and pressure. The third part of the isothermal line is that corresponding to the liquid state of the substance, and it may be considered as a line which on the scale of our diagrams would be very nearly vertical, and so near to the line *c p* that it cannot be distinguished from it.

In the diagram, fig. 4, the isothermal line of water for the temperature 212° F., the ordinary boiling point is represented by *a b c p*, and that for 302° F. by *d e f p*.

At the temperature of 302° F. the pressure at which condensation takes place is much greater, being 9,966 pounds' weight on the square foot; and the volume to which the steam is reduced before condensation begins is much smaller, being 6.153 cubic feet. This is indicated by the point *e*. At this point the product v p is 61,321, which is considerably less than 65,260, its value when the volume is very great.

Isothermals of Carbonic Acid.

At this point condensation begins and goes on till the whole steam is condensed into water at 302° F., the volume of which is 0.0175 cubic feet. This volume is somewhat greater than the volume of the same water at 212° F.

ISOTHERMALS OF CARBONIC ACID.

SEC. 14.—Dr. Andrews has examined carbonic acid under varied conditions of temperature and pressure, in order to ascertain the relations of the liquid and gaseous states and has arrived at the conclusion that the gaseous and liquid states are only widely separated forms of the same condition of matter, and may be made to pass one into the other without any interruption of breach of continuity.[1]

Carbonic acid is a substance which at ordinary temperatures and pressures is known as a gas. The measurements of Regnault and others show that as the pressure increases the volume diminishes faster than that of a gas which obeys the law of Boyle, and that as the temperature rises the expansion is greater than that assigned by the law of Charles.

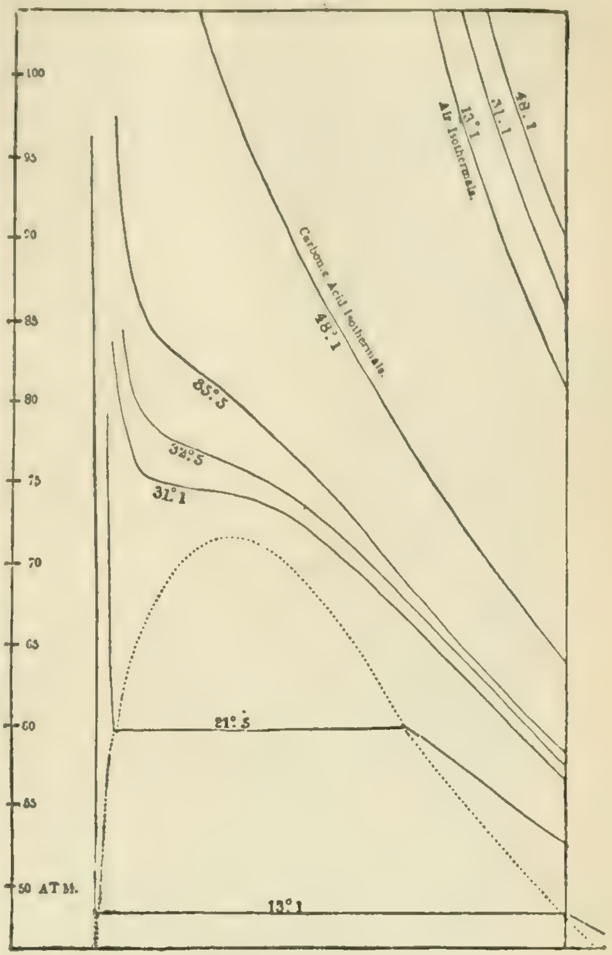
The isothermal lines of the diagram of carbonic acid at ordinary temperatures and pressures are therefore somewhat flatter and also somewhat wider apart than those of the more perfect gases.

The diagram for carbonic acid is taken from Dr. Andrews' paper with the exception of the dotted line showing the region within which the substance can exist as a liquid in presence of its vapor. The base line of the diagram corresponds, not to zero pressure, but to a pressure of 47 atmospheres.

The lowest of the isothermal lines is that of 13°.1 C. or 55°.6 F.

This line shows that at a pressure of about 47 atmospheres condensation occurs. The substance is seen to become separated into two distinct portions, the upper portion being in the state of vapor or gas, and the lower in the state of liquid. The upper surface of the liquid can be distinctly seen, and where this surface is close to the sides of the glass containing the substance it is seen to be curved, as the surface of water is in small tubes.

FIG. 5.



Isothermals of Carbonic Acid.

As the volume is diminished, more of the substance is liquified, till at last the whole is compressed into the liquid form.

Liquid carbonic acid, as was first observed by Thilorier, dilates as the temperature rises to a greater degree than even a gas, and, as Dr. Andrews has shown, it yields to pressure much more than any ordinary liquid. From Dr. Andrews' experiments it also appears that its compressibility diminishes as the pressure increases. These results are apparent even in the diagram. It is, therefore, far more compressible than any ordinary liquid, and it appears from the experiments of Andrews that its compressibility diminishes as the volume is reduced.

It appears therefore, that the behavior of liquid carbonic acid under the action of heat and pressure is very different from that of ordinary liquids, and in some respects approaches to that of a gas.

SEC. 15.—*Critical Temperature.* The critical temperatures of most ordinary liquids are much higher than that of carbonic acid, and their pressure in the critical state is very great, so that experiments on the critical state of ordinary liquids are difficult and dangerous. M. Cagnard de la Tour estimated the temperature and pressure of the critical state to be:

	Temperature Fahr.	Pressure (Atmospheres).
Ether	369°.5	37.5
Alcohol	497°.5	119.0
Bisulphide of Carbon	504°.5	66.5
Water	773°.0	——

In the case of water the critical temperature was so high that the water began to dissolve the glass tube which contained it.

The critical temperature of what are called the permanent gases is probably exceedingly low, so that we cannot by any known method produce a degree of cold sufficient, even when applied along with enormous pressure, to condense them into the liquid state.

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[1] Phil. Trans. 1869, p. 575.

Critical temperature of permanent gases.

It has been suggested by Professor James Thomson (Proceedings of the Royal Society, 1871, No. 130) that the isothermal curves for temperatures below the critical temperature are only apparently, and not really, discontinuous, and that their true form is somewhat similar in its general features to the curve A B C D E F G H K.

The peculiarity of this curve is, that between the pressures indicated by the horizontal line B F and D H, any horizontal line, such as C E G, cuts the curve in three different points. The literal interpretation of this geometrical circumstance would be that the fluid at this pressure, and at the temperature of the isothermal line, is capable of existing in three different states. One of these, indicated by C, evidently corresponds to the liquid state. Another, indicated by G, corresponds to the gaseous state. At the intermediate point E the slope of the curve indicates that the volume and the pressure increase and diminish together. No substance having this property can exist in stable equilibrium, for the very smallest disturbance would make it rush into the liquid or the gaseous state. We may, therefore, confine our attention to the points C and G.

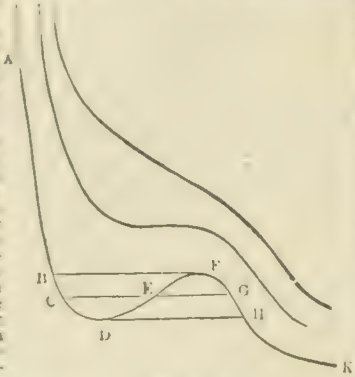


Fig. 5.

Retardation of boiling and condensation.

Sec. 16.—*Retardation of Boiling and Condensation.*—According to the theory of exchanges, when the liquid is in contact with its vapor the rate of evaporation depends on the temperature of the liquid, and the rate of condensation on the density of the vapor. Hence for every temperature there is a determinate vapor density, and therefore a determinate pressure, represented by the horizontal line C G, at which the evaporation exactly balances the condensation. At the pressure indicated by the horizontal line the liquid will be in equilibrium with its vapor. At all greater pressures the vapor, if in contact with the liquid, will be condensed, and at all smaller pressures the liquid, if in contact with its vapor, will evaporate. Hence the isothermal line as deduced from experiments of the ordinary kind will consist of the curve A B C, the straight line C G, and the curve G K.

But it has been pointed out by Prof. J. Thomson that by suitable contrivances we may detect the existence of other parts of the isothermal curve. We know that the portion of the curve corresponding to the liquid state extends beyond the point C, for if the liquid is carefully freed from air and other impurities, and is not in contact with anything but the sides of a vessel to which it closely adheres, the pressure may be reduced considerably below that indicated by the point C, till at last, at some point between C and D, the phenomenon of *boiling with bumping* commences.

Let us next consider the substance wholly in the state of vapor, as indicated by the point K, and let it be kept at the same temperature and gradually compressed till it is in the state indicated by the point G. If there are any drops of the liquid in the vessel, or if the vessel is capable of being wetted by the liquid, condensation will now begin. But if there are no facilities for condensation, the pressure may be increased and the volume diminished till the state of the vapor is that which is represented by the point F. At this point condensation must take place if it has not begun before. (See CAPILLARITY.)

The existence of this variability in the circumstances of condensation, though exceedingly probable, is not as yet established by experiment, like that of the variability in the circumstances of the evaporation. Prof. J. Thomson suggests that by measuring the condensation produced by the rapid [illegible] of vapor in a vessel provided with a steam jacket, the existence of this part of the isothermal curve might be established.

The state of the substance, however, represented by the portion of the isothermal curve D E F, can never be realized in a homogeneous mass, for the substance is then in a state of unstable equilibrium, since the pressure increases with the volume. We cannot, therefore, expect any experimental evidence of the existence of this part of the curve, unless, as Prof. J. Thomson suggests, this state of things may exist in some parts of the thin superficial stratum of transition from a liquid to its own gas, in which the phenomena of capillarity take place.

ON THE PROPERTIES OF A SUBSTANCE WHEN HEAT IS PREVENTED FROM ENTERING OR LEAVING IT.

Sec. 17.—*Adiabatic Curves.*—Hitherto we have considered the properties of a substance [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] which the changes which take place are effected without any passage of heat either into the substance from without or out of the substance into other bodies.

For the sake of associating the statement of scientific facts with mental images, which are easily formed, and which preserve the statements in a form always ready for use, we shall suppose that the substance is contained in a cylinder fitted with a piston, and that both the cylinder and the piston are absolutely impermeable to heat, so that not only is heat prevented from getting out or in by passing completely through the cylinder or piston, but no heat can pass between the inclosed substance and the matter of the cylinder or piston itself.

No substance impermeable to heat.

No substance in nature is absolutely impermeable to heat, so that the image we have formed can never be fully realized, but it is always possible to ascertain in each particular case that heat has not entered or left the substance, though the methods by which this is done and the arrangements by which the condition is fulfilled are complicated. In the present discussion it would only distract our attention from the most important facts to describe the details of physical experiments. We therefore reserve any description of actual experimental methods till we can explain them in connection with the principles on which they are founded. In explaining these principles we make use of the most suitable illustrations without assuming that they are physically possible.

We therefore suppose the substance placed in a cylinder, and its volume and pressure regulated and measured by a piston, and we suppose that during the changes of volume and pressure of the substance no heat either enters it or leaves it.

In order to represent the relation between the volume and the pressure, we suppose a curve traced on the indicator diagram during the motion of the piston, exactly as in the case of the isothermal lines formerly described. The only difference is that whereas in the case of the isothermal lines the substance was maintained always at one and the same temperature, in the present case no heat is allowed to enter or leave the substance, which, as we shall see, is a condition of quite a different kind.

The line drawn on the indicator diagram in the latter case has been named by Professor Rankine an Adiabatic Line, because it is defined by the condition that heat is not allowed to pass through (διαβαίνειν) the vessel which contains the substance.

Since the properties of the substance under this condition are completely defined by its adiabatic lines, it will assist us in understanding these properties if we associate them with the corresponding features of the adiabatic lines.

As the volume diminishes the pressure increases.

The first thing to be observed is that as the volume diminishes the pressure invariably increases. In fact, if under any circumstances the pressure were to diminish as the volume diminishes the substance would be in an unstable state, and would either collapse or explode till it attained a condition in which the pressure increased as the volume diminished.

Hence the adiabatic lines slope downward from left to right in the indicator diagram as we have drawn it.

If the pressure be continually increased up to the greatest pressure which we can produce, the volume continually diminishes, but always slower and slower, so that we cannot tell whether there is or is not a limiting volume, such that no pressure, however great, can compress the substance to a smaller volume.

We cannot, in fact, trace the lines upward beyond a certain distance, and therefore we cannot assert anything of the upper part of their course except that they cannot recede from the line of pressures, because in that case the volume would increase on account of an increase of pressure.

If, on the other hand, we suppose the piston to be drawn out so as to allow the volume to increase, the pressure will diminish.

If the substance is in the gaseous form, or assumes that form during the process, the substance will continue to exert pressure on the piston even though the volume is [illegible] increased, and we have no experimental reason to believe that the pressure would be reduced to nothing, however much the volume were increased. For gaseous bodies, therefore, the lines extend indefinitely in the direction of the line of volumes continually approaching but never reaching it.

With respect to substances which are not originally in the gaseous form, some of them, when the pressure is sufficiently diminished, are known to assume that form, and it is [illegible] [illegible] that we have no evidence that any substance, however solid and however cold, if entirely free from external pressure, would not sooner or later become dissipated through space by a kind of evaporation.

The [illegible] by which such metals as iron and copper may be rec[illegible] [illegible] [illegible] [illegible] [illegible] very [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of does not affect our [illegible] [illegible].

Be this as it may, there are many substances the pressure of which seems to cease entirely when the volume has [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

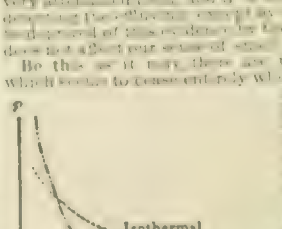


Fig. 6.

Relation of Adiabatic Lines to Isothermal Lines.

The next thing to be observed about the adiabatic lines is that where they meet the isothermal lines they [illegible] [illegible] [illegible] to the [illegible] line than the isothermal lines.

In order [illegible] [illegible] the volume of a substance by a given [illegible] greater increase of pressure when the substance is prevented from [illegible] heat than when it is [illegible] at a [illegible] temperature.

[illegible] that when the state [illegible]

[illegible]

[illegible] the substance, and [illegible] the cylinder, but [illegible] which [illegible] the cylinder.

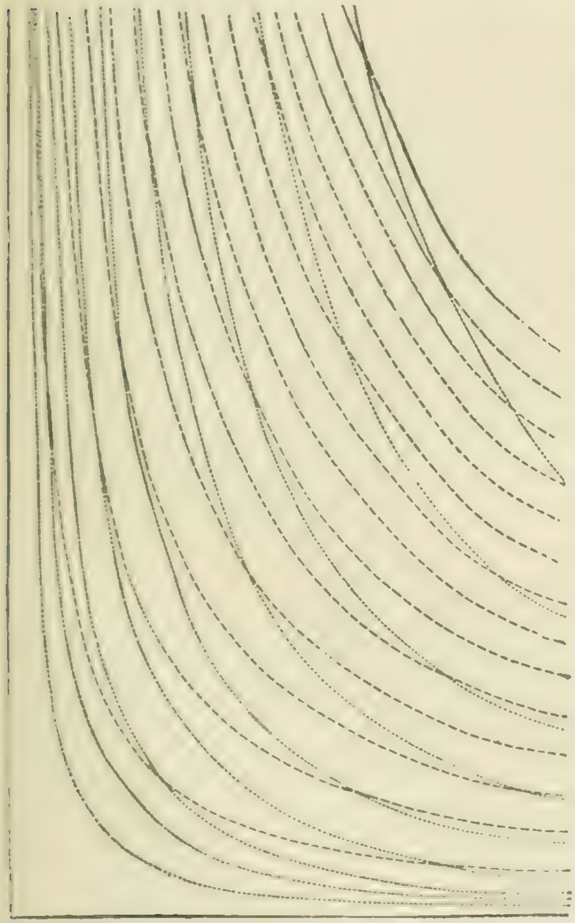
If we now suppose the walls of the cylinder to be the perfect [illegible] of heat, everything remains the same except that the heat is not able to pass [illegible] out of the cylinder.

If [illegible] gives rise to [illegible] of heat [illegible] the second case, when this [illegible] will be required to produce a given [illegible] on account of the greater constraint of the system [illegible].

[illegible] the effect which the compression of a [illegible] are when heat is prevented from entering [illegible].

We have seen that in every case the pressure increases more than it does when the temperature remains constant, or if the increase of pressure be supposed given the diminution of volume is less when [illegible] heat is confined. Hence the volume after the pressure is applied is greater when the heat is confined than when the temperature is constant.

Fig. 7.



Thermal Lines for Air.

Isothermals — — — — — —

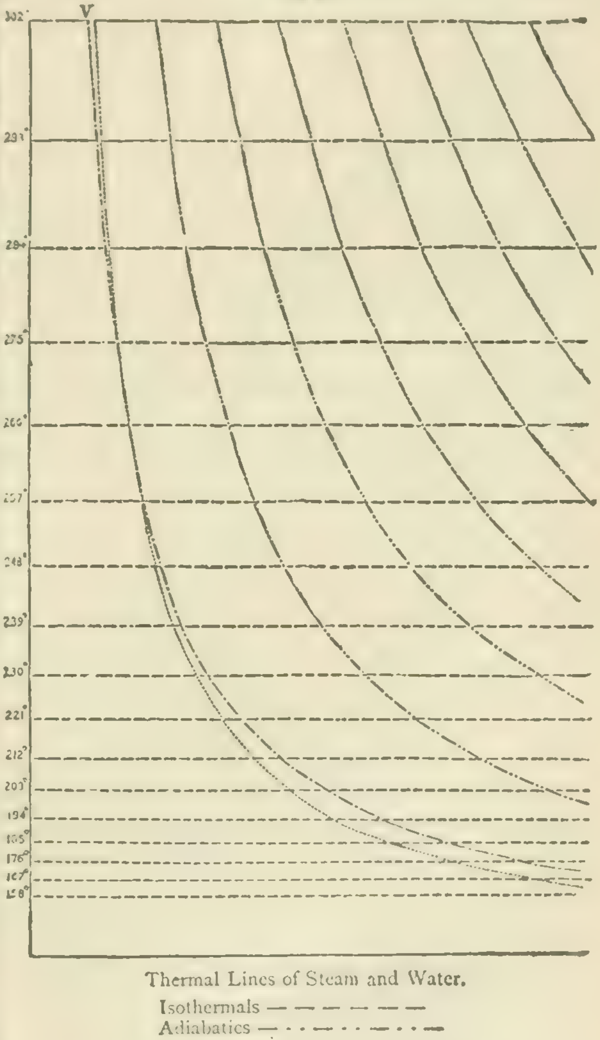
Adiabatics - - - - - - - - - - - -

Relation of Expansion of Substances to Temperature.

But the greater number of substances expand when their temperature is raised, so that for the same pressure a greater volume corresponds to a higher temperature. In these substances, therefore, compression produces a rise of temperature if heat is not allowed to escape, but if the walls of the cylinder permit the passage of heat [illegible] the temperature [illegible] heat will flow out [illegible] the compression [illegible] the pressure [illegible] the substance [illegible]. The isothermal and adiabatic lines of air are given in Fig. 7, [illegible] adiabatic lines are more inclined [illegible] than the isothermal lines.

There are, however, certain substances which contract instead of expanding when their temperature is raised. When pressure is applied to these substances the compression produced is, as in the former case, less when heat is prevented from passing than when the temperature is maintained constant. The volume after the application of pressure is therefore, as before, greater than when the temperature is constant; but since in these substances an increase of volume indicates a fall of temperature it follows that instead of being heated, they are cooled by compression, and that, if the walls of the cylinder permit the passage of heat, heat will flow in from without to restore the equilibrium of temperature.

Fig. 8.



Thermal Lines of Steam and Water.

Isothermals — — — — — —

Adiabatics — · · — · · —

Steam Line V V

During a change of state, when at a given pressure, the volume alters considerably without change of temperature, as successive portions of the substance pass from the one state to the other, the isothermal lines are, as we have already remarked, horizontal. The adiabatic lines, however, are inclined downwards from left to right. Any increase of pressure will cause a portion of the sub-

[illegible] one of the two states in which its volume is [illegible] to pass into that [illegible]. In so doing it will give out heat if, as in the case of a liquid and its vapour, the substance gives out heat in passing into the denser state, but if, as in the case of ice and water, the ice requires heat to melt it into the denser form of water, then an increase of pressure will cause some of the ice to melt, and the mixture will become colder.

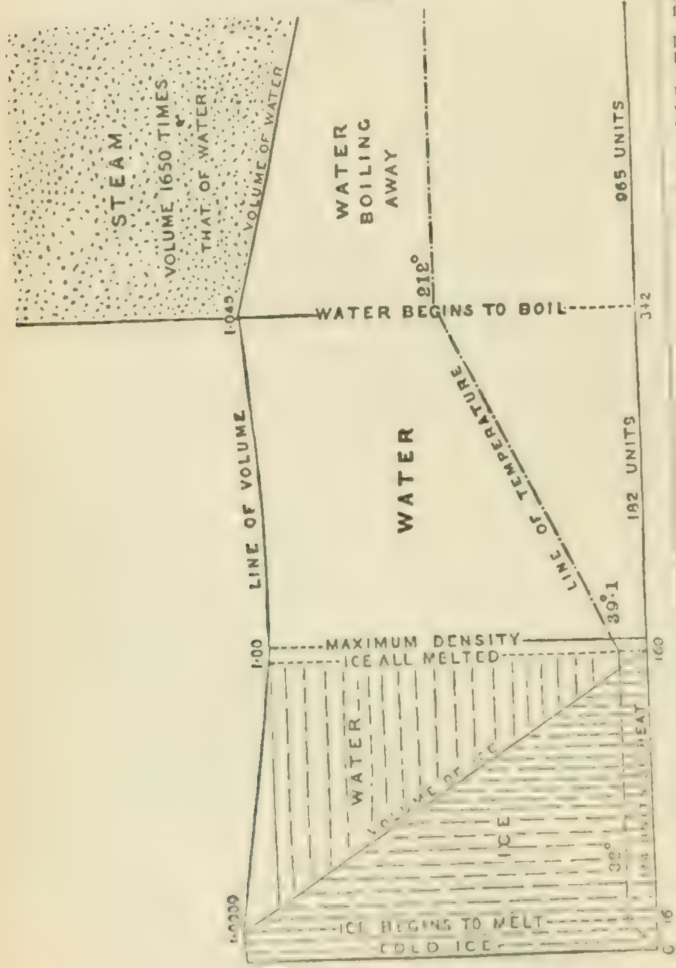
The isothermal and adiabatic lines for steam in presence of water are given in Fig. 8. The isothermal lines are here horizontal.

The steam line [illegible] which indicates the volume of one pound of saturated steam, is also drawn in the diagram. Its [illegible] to [illegible] than that of the [illegible] lines. Hence, [illegible] when no heat is allowed to escape, and increase of pressure causes some of the water to become steam, and a diminution of pressure causes some of the steam to be condensed into water. This was first shown by Clausius and Rankine.

By means of diagrams of the isothermal and adiabatic lines the thermal properties of a substance can be completely defined, as we [illegible] chapters. As a [illegible] method this [illegible] of representing the properties of the substance is by far the [illegible] in order to interpret the diagrams, some knowledge of [illegible]. As an aid to the student in [illegible] the properties of a substance, the following mode of [illegible] the changes of volume and temperature at a constant pressure [illegible] useful, though it is quite destitute of those [illegible] which render the indicator diagrams so valuable in the [illegible] of physical phenomena.

[illegible] represents the effect of the application of heat to a pound of ice at 0° F. The quantity of heat applied to the ice is [illegible] by the distance measured along the base line marked "units of heat." The volume of the substance is indicated by the [illegible]

Fig. 9.



[illegible]

The ice now begins to melt, the temperature remains constant at 32° F., but the volume of ice diminishes and the volume of water increases, as is represented by the line marked "volume of ice." The latent heat of ice is 144° F., so that the process of melting goes on till 144 units of heat have been applied to the substance, and the whole is converted into water at 32° F.

Volume and heat of water at 32° F.

The volume of the water at 32° F. is, according to M. Despretz, 1·00012. Its specific heat is at this temperature is very little greater than unity; it is exactly unity at [illegible], and as the temperature rises the specific heat increases, so that to heat the water from 32° F. to 212° F. requires 182 units instead of 180. The volume of the water diminishes as the temperature rises from 32° F. to 39°·1 F., where it is exactly 1. It then expands, slowly at first, but more rapidly as the temperature rises, till at 212° F. the volume of water is 1·0435.

If we continue to apply heat to the water, the pressure being still that of the atmosphere, the water begins to boil. For every unit of heat, one nine hundred and sixty fifth part of the pound of water is boiled away and is converted into steam, the volume of which is about 1700 times that of the water from which it was formed. The diagram might be extended on a larger sheet of paper to represent the whole process of boiling the water away. This process would require 965 units of heat, so that the whole length of the base line from 0 would be 11·07 inches. At this point the water would be all boiled away, and the steam would occupy a volume of 1700 times that of the water. The vertical line on the diagram which would represent the volume of the steam would be [illegible] inches, or more than 236 feet long. The temperature would be still 212° F. If we continue to apply heat to the steam still at the atmospheric pressure, its temperature will rise in a [illegible] uniform manner at the rate of [illegible] degrees for every unit of heat, the specific heat of steam being 0·486.

The volume of the superheated steam also increases in a regular manner, being proportional to its absolute temperature reckoned from −460° F.

SEC. 18.—*Efficiency of a Heat Engine.*—Let us consider the relation between the heat supplied to an engine and the work done by it.

If the temperature of the source of heat is T, and if H is the quantity of heat supplied to the engine at that temperature, then the work done by this heat depends entirely on the temperature of the refrigerator. Let [illegible] be the temperature of the refrigerator, then the work done by H is represented by the area A B B′ A′, or, since all the areas between the isothermals and the adiabatics are equal, let [illegible] be the area of one of the quadrilaterals, then the work done by H will be H (T − T′). The quantity [illegible] depends only on the temperature T. It is called Carnot's function of the temperature. This, therefore, is a complete determination of the work done when the temperature of the source of heat is T. It depends only on Carnot's principle, and is true whether we admit the first law of thermodynamics or not.

Carnot's function of the temperature.

If the temperature of the source is not T, but T′, we must consider what quantity of heat is represented by the expansion A′ B′ along the isothermal [illegible]. Call this quantity of heat H′; the work done by an engine working between the temperatures T′ and T is

$$W = H C (T' - T).$$

Now Carnot supposed that H′ = H, which would make the efficiency of the engine simply $\frac{W}{H} = C (T' - T)$, where C is Carnot's function, considered as constant on this supposition. But according to the dynamical theory of heat, we get by the first law of thermodynamics

$$H' - H = A B B' A',$$

the heat being measured as mechanical work, or

$$H' - H = H C (T' - T).$$

On this theory, therefore, the efficiency of the engine working between T and T′ is

$$\frac{W}{H'} = \frac{H C (T' - T)}{H + H C (T' - T)}$$

$$= \frac{T' - T}{\frac{1}{C} + T' - T}.$$

It is plain that the work which a given quantity of heat H can perform [illegible] greater than the [illegible] [illegible]

[illegible]

[illegible] which is never very great when the temperature is measured by the air thermometer. We may now express the efficiency of a [illegible] in terms of the absolute temperatures of the source and the refrigerator. [illegible] the quantity of work [illegible] is the quantity of heat [illegible] both estimated in dynamical measure,

$$\frac{W}{H}=\frac{S-T}{S}.$$

The quantity of heat which is given out to the refrigerator at temperature T is $h = H - W = H\frac{T}{S}$,

$$\frac{H}{S}=\frac{h}{T} \quad \text{or} \quad \frac{H}{h}=\frac{S}{T},$$

that is, in a reversible engine the ratio of the heat received to the heat [illegible] is that of the numbers expressing on an absolute scale the temperatures of the source and the refrigerator.

[illegible] method which is certain to give consistent results, [illegible] is that which is founded on Carnot's [illegible] and the most convenient form in which this method [illegible] is that which defines the absolute temperature [illegible] of Carnot's function. We shall see afterwards how a comparison can be made between the absolute temperature [illegible] thermodynamic scale, and the temperature as indicated by [illegible] of a particular kind of gas.

[illegible]—We have next to consider the series of adiabatic lines as [illegible] a series of degrees of another property of the body [illegible] is a [illegible] quantity such that when there is no [illegible] of heat this quantity remains constant, but when heat enters or leaves the body the quantity increases or diminishes. [illegible] the name given by Clausius to this quantity and [illegible] the entropy of the body. Rankine, in whose investigations this quantity also plays an important part, calls it the thermodynamic function. This term, however, is not so appropriate as the [illegible] has been assigned to any one of several important [illegible] in the most [illegible].

Entropy of a body.

We must regard the entropy of a body, like its volume, pressure, and temperature, as a distinct physical property of the body depending on its actual state.

The [illegible] of entropy is that of the body when entirely deprived of heat. [illegible] bring the body into this condition [illegible] reckon entropy from a standard state defined by a standard temperature and pressure.

The entropy of the body in any other condition is then measured thus. Let the body expand or contract without communication of heat till it reaches the standard temperature, the value of which, [illegible] is T. Then let the body be kept at the standard temperature and brought to the standard pressure, and let H be the number of units of heat given out during this process. Then the entropy of the body in its original state is $\frac{H}{T}$.

We shall use the symbol φ to denote the entropy.

If [illegible] to arrive at the standard state, requires to [illegible] the original entropy must be reckoned negative with respect to the standard state.

When heat enters a body at the temperature θ and causes the entropy to increase from ϕ_1 to ϕ_2, the amount of heat which enters the body is $\theta(\phi_2 - \phi_1)$.

The entropy of a body in a given state is proportional to the mass of the body, so that the entropy of two pounds of water is double that of one pound in the same state.

We often, however, speak of the entropy of a substance, by which we mean the entropy of unit of mass of that substance in the given state.

The entropy of a system of bodies in different states is the sum of the entropies of each of the bodies.

When a quantity H of heat passes from a body at temperature θ_1, to a body at temperature θ_2, the entropy of the first body is diminished by $\frac{H}{\theta_1}$, while that of the second is increased by $\frac{H}{\theta_2}$, so that the entropy of the system increases by $H\frac{\theta_1 - \theta_2}{\theta_1\theta_2}$.

Now it is the condition of the transfer of heat that it passes from the hotter to the colder body, and therefore θ_1 must be greater than θ_2.

Any transference of heat, therefore, from one body of the system to another increases the entropy of the system.

[illegible]

[illegible] that the entropy of the system [illegible].

[illegible] during any very small change of [illegible] $\theta(\phi_2 - \phi_1)$, where θ is the mean temperature of the body during the process, and ϕ_1 and ϕ_2 represent the entropy at the beginning and the end of the process.

[illegible] ϕ_1 and ϕ_2 to be continued [illegible] temperatures down to the temperature [illegible] between the two isentropic lines between [illegible] θ [illegible] ϕ_1).

[illegible] correctly for [illegible] of the thermodynamic [illegible] between the isentropic lines [illegible] isothermal θ and zero would be $\theta(\phi_2 - \phi_1)$, and this area [illegible] the heat which enters the body during the process.

[illegible] to construct the properties of a body [illegible] to draw on a diagram the true forms of the [illegible] temperature [illegible] we have constructed the thermodynamic diagram for that part of the field which is known by observation, to draw lines in the unknown part of the field by means of which we may still represent quantities of heat by areas.

If the known part of the field is bounded by the isothermal T, and if we draw from the extremities of the known parts of the isentropic lines a series of lines of any form which do not intersect each other, and if we draw another line ZZ so that the space included between these two and two of the isentropics ϕ_1 and ϕ_2 shall be equal to $T(\phi_2 - \phi_1)$, we may in calculating quantities of heat treat the line ZZ as the fictitious isothermal of absolute zero, and the series of lines as a fictitious isentropic series.

For the area between the two isentropic lines from temperature θ to temperature T is $(\theta - T)(\phi_2 - \phi_1)$. This area within the known part of the field down to the fictitious isothermal of absolute zero is $T(\phi_2 - \phi_1)$. The whole area therefore $= \theta(\phi_2 - \phi_1)$, and it therefore represents the quantity of heat absorbed in passing at the temperature θ from the line ϕ_1 to the line ϕ_2.

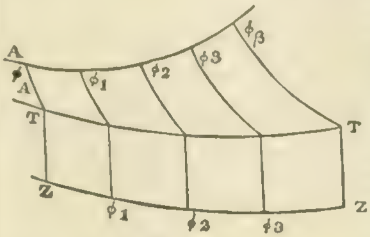


Fig. 10.

Heat of the Path.

The whole heat absorbed by a body in passing from a state A to a state B through an definite series of intermediate steps represented by the path AB, may be called the heat of the path AB. By dividing AB into a sufficient number of small parts, and considering the area representing the heat absorbed during the passage of the body over each of these divisions, we find that the sum of these areas is the area included by the path AB, the isentropics through A and B including their fictitious parts, and the fictitious isothermal of absolute zero.

THERMODYNAMICS

ON THE RELATIONS BETWEEN THE PHYSICAL PROPERTIES OF A SUBSTANCE

SECTION 21.—Let T_1T_1 and T_2T_2 represent two isothermal lines corresponding to two consecutive degrees of temperature. Let $\phi_1\phi_1$ and $\phi_2\phi_2$ represent two consecutive adiabatic lines. Let ABCD be the quadrilateral which lies between both these pairs of lines. If the lines are drawn close enough to each other, we may treat this quadrilateral as a parallelogram.

The area of this parallelogram is, as we have already shown, equal to unity.

Draw horizontal lines through A and D to meet the line BC produced in K and Q, then, since the parallelograms ABCD and AKQD stand on the same base and are between the same parallels, they are equal. Now draw the vertical lines A*k* and KP to meet QD, produced if necessary. Then the rectangle AKP*k* is equal to the parallelogram AKQD, because they stand on the same base AK, and are between the same parallels AK and *k*Q. Hence the rectangle AKP*k* is also equal to the original parallelogram ABCD.

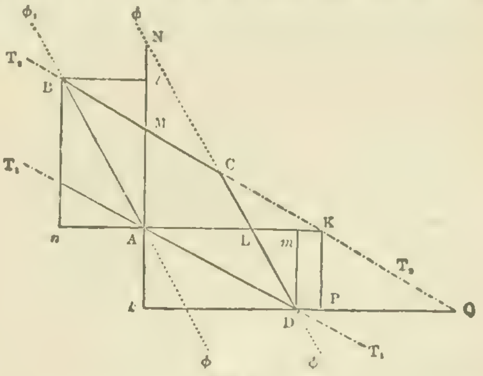


Fig. 11.

If, therefore, we draw AK from A horizontally to meet the isothermal T_2, and A*k* vertically to meet a horizontal line through D, we shall have the following relation:

$$AK \cdot Ak = ABCD$$

In the same way, if the horizontal line through A cuts the adiabatic line ϕ_2 in L and the verticals through D and B in *m* and *n*, and if the vertical line through A cuts the isothermal line T_2 in M, the adiabatic line ϕ_2 in N, and the horizontal line through B in *l*, we shall get the following four values of the area of ABCD, including that which we have already investigated:

$$ABCD = AK \cdot Ak = AL \cdot Al = AM \cdot Am = AN \cdot An.$$

We have next to interpret the physical meaning of the four pairs of lines which enter into these products.

We must remember that the volume of the substance is measured horizontally to the right, and its pressure vertically upwards;

[illegible] represents one degree [illegible] and that the interval between [illegible] quantity of heat whose [illegible]

[illegible] for a rise of tempera- [illegible] by a A K [illegible]

[illegible] constant, the quantity of heat which is [illegible]

$\frac{T}{A\,l}$ [illegible] $\frac{T}{A\,N}$ [illegible] $T \cdot A\,K.$

Hence [illegible]

[illegible] *First Thermody-* [illegible] If the pressure of [illegible] of [illegible] for one degree of tempera- [illegible]

[illegible] If the temperature is maintained constant [illegible] [illegible] heat when the pressure is increased [illegible] A K represents [illegible] equal to T is communicated to the substance.

A *l* represents the increase of pressure required to raise the substance one degree of temperature when no heat is allowed to [illegible]

Second Thermodynamical Relation.—The quantity $\frac{T}{A\,L}$ represents [illegible]

[illegible] in order to [illegible]

[illegible] of pressure corresponding to a [illegible]

[illegible] $\frac{T}{A\,M}$. [illegible]

Since A M [illegible] A K = 1 [illegible]

[illegible] $\frac{T}{A\,M}$ = [illegible] A M [illegible]

Third Thermodynamical Relation. [illegible]

[illegible]

Fourth Thermodynamical Relation. [illegible]

[illegible]

Here [illegible]

SEE THERMODYNAMICAL.

Measuring Specific Heat. SEC. 23.—*On the Two Modes of Measuring Specific Heat.*—The quantity of heat required to raise [illegible] one degree of temperature [illegible] unit.

[illegible] To [illegible] thermometric [illegible] of work.

[illegible] the mode in [illegible] the specific heat of a substance [illegible] vary during the [illegible] pressure and volume of [illegible] rise of temperature.

There are therefore [illegible] of modes of defining the specific heat. [illegible] The first method is to suppose the volume [illegible] The specific heat under this [illegible] is called the specific heat at constant volume. We shall denote it by K_v.

Let A M N represent the different states of the substance when [illegible] of pressure due [illegible] A N [illegible] Hence to [illegible] the quantity of heat K_v which [illegible] in order to raise its temperature one degree, and so increase the pressure by A M. [illegible]

$$A\,N \cdot A\,M = T \cdot K_v$$

or

$$K_v = T \cdot \frac{A\,M}{A\,N}$$

The second method of defining specific heat is to suppose the pressure constant. The specific heat under constant pressure is denoted by K_p.

Let A L K represent the different states of the substance at constant pressure. A K represents the increase of volume due to a rise of one degree of temperature, and A L represents the increase of volume due to a quantity of heat [illegible] equal to T. Now the quantity K_p of heat raises the substance one degree, and therefore increases the volume by A K.

Hence

$$A\,L \cdot A\,K = T \cdot K_p$$

or

$$K_p = T\,\frac{A\,K}{A\,L}.$$

(A third mode of defining specific heat is sometimes adopted in the case of saturated steam. [illegible] as the temperature rises. [illegible] from the experiments of M. Regnault, as shown in the diagram, Fig. 8, that [illegible] a result pointed out [illegible] and Rankine.)

Measuring Elasticity. SEC. 24.—*On the Two Modes of Measuring Elasticity.*—The elasticity of a substance [illegible] the compression [illegible] to the original volume.

But we require to know [illegible] [illegible] constant [illegible] and [illegible] when there is [illegible] the temperature [illegible] [illegible] by E_θ.

[illegible] and pressure is [illegible] [illegible]

$$E_\theta = V\,\frac{A\,l}{A\,k} = V\,\frac{A\,M}{A\,K}$$

[illegible] by E_ϕ.

In [illegible] and pressure is [illegible] [illegible] when [illegible]

$$E_\phi = V\,\frac{A\,l}{A\,L} = V\,\frac{A\,N}{A\,L}$$

[illegible]

$$\frac{K_p}{K_v} = \frac{A\,K}{A\,L} \cdot \frac{A\,N}{A\,M} = \frac{E_\phi}{E_\theta}$$

[illegible]

[illegible] E_ϕ [illegible] E_θ [illegible]

[illegible]

$$E_\phi - E_\theta = [illegible]$$

[illegible] A K [illegible] find

$$[illegible]$$

[illegible]

$$[illegible]$$

[illegible] the principles of Thermodynamics.

[illegible]

[illegible]

$$[illegible]$$

LATENT HEAT.

Latent Heat.

[illegible]—Latent heat is the quantity of heat which must be communicated to a body in a given state in order to convert it into another state without changing its temperature.

We have seen that when heat is applied to a body it may act by changing its state or by raising its temperature, and in certain cases it may act by changing the state without raising the temperature.

The principal cases in which heat is thus employed are—

1. The conversion of solids into liquids. This is called melting or fusion. In the reverse process of freezing or solidification heat must be allowed to escape from the body to an equal amount.

2. The conversion of liquids (or solids) into the gaseous state. This is called evaporation, and its reverse condensation.

3. When a gas expands, in order to maintain the temperature constant, heat must be communicated to it, and this, when properly defined, may be called the latent heat of expansion.

4. There are many chemical changes during which heat is generated or absorbed.

In all these cases the quantity of heat which enters or leaves the body may be measured, and in order to express the result of this measurement in a convenient form we may call it the latent heat required for a given change in the substance.

The most important class of cases is that in which the substance is in two different states at the same temperature and pressure, as when part of it is solid and part liquid, or part liquid and part gaseous.

Substance in the First State and Second State.

[illegible] the volume occupied by the substance must be considered as made up of two parts, v_1 being that of the substance in the first state, and v_2 that of the substance in the second state. The quantity of heat necessary to convert unit of mass of the substance from the first state to the second without altering its temperature is called the Latent Heat of the substance, and is denoted by L.

During this process the volume changes from v_1 to v_2 at the constant pressure p.

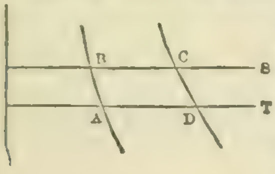


Fig. 12.

Let P S be an isothermal line, which in this case is horizontal, and let it correspond to the pressure P and the temperature S.

Let Q T be another isothermal line corresponding to the pressure Q and the temperature T.

Let B A and C D be adiabatic lines cutting the isothermals in A B C D.

Then the substance, in expanding at the temperature S from the volume P B to the volume P C will absorb a quantity of heat equal to $L \frac{BC}{v_2 - v_1}$, where L is the latent heat at temperature S.

When the substance is compressed from Q D to Q A at temperature T it will give out a quantity of heat equal to

$$L' \frac{AD}{v_2' - v_1'}$$

where the accented quantities refer to the temperature T.

The quantity of work done by an engine when the indicating point describes the figure A B C D on the diagram is represented by the area of this figure, and if the temperatures S and T are so near that we may neglect the curvature of the lines A B and C D, the area is

$$\tfrac{1}{2}(BC + AD)\,PQ$$

If the difference of pressures P Q is very small, BC = AD nearly, so that we may write the area thus:

$$BC\,(P - Q)$$

But we may calculate the work in another way. It is equal to the heat received at the higher temperature multiplied by the ratio of the difference of the temperatures to the higher temperature. This is

$$L \frac{BC}{v_2 - v_1} \frac{S - T}{S}.$$

Equating the two values of the work, we find the latent heat

$$L = (v_2 - v_1)\,S\,\frac{P - Q}{S - T},$$

where it is to be remembered that in calculating the fraction $\frac{P - Q}{S - T}$ the difference of the pressures P and Q and the difference of the temperatures S and T are to be supposed very small. In fact, this fraction is that which in the language of the differential calculus would be denoted by $\frac{dp}{d\theta}$.

SEC. 26.—*The Freezing Point Altered by Pressure.*—The temperature of melting ice was always supposed to be absolutely constant till it was pointed out by Professor James Thomson[1] that it follows from Carnot's principle that the melting point must be lowered when the pressure increases, for if v_2 is the volume of a pound of ice, and v_1 that of a pound of water both being at 32° F., we know that the volume of the ice is greater than that of the water. Hence if S is the melting point at pressure P, and T the melting point at pressure Q, we find

$$\frac{S - T}{P - Q} = (v_2 - v_1)\frac{S}{L}.$$

If we make P = 2116, the pressure of one atmosphere, and S = 32° F., then the melting temperature at pressure Q is

$$T = 32^\circ F. - (v_2 - v_1)(Q - 2116)\frac{S}{L}.$$

Now the volume of a pound of ice at 32° F. is 0·0174 cubic feet = v_2, and that of a pound of water at the same temperature is 0·016 cubic feet = v_1. S, the absolute temperature, corresponding to 32° F., is 493·2. L, the latent heat required to convert a pound of ice into a pound of water, = 142 thermal units = 142 × 772 foot-pounds. Hence T, the temperature of melting, corresponding to a pressure of Q pounds weight per square foot, is

$$T = 32^\circ - 0{\cdot}0000063\,(Q - 2116).$$

If the pressure be that of n atmospheres, each atmosphere being 2,116 pounds weight per square foot,

$$t = 32^\circ - 0{\cdot}0133\,(n - 1).$$

SEC. 27.—*On the Application of the Principles of Thermodynamics to Gases.*—The physical properties of bodies in the gaseous state are more simple than when they are in any other state. The relations of the volume, pressure and temperature are then more or less accurately represented by the laws of Boyle and Charles, which we shall speak of, for brevity, as the 'gaseous laws.' We may express them in the following form:

Let v denote the volume of unit of mass, p the pressure, t the temperature measured by an air thermometer and reckoned from the absolute zero of that instrument, then the quantity $\frac{vp}{t}$ remains constant for the same gas.

We here use the symbol t to denote the absolute temperature as measured by the air thermometer, reserving the symbol θ to denote the temperature according to the absolute thermodynamic scale.

We have no right to assume without proof that these two quantities are the same, although we shall be able to show by experiment that the one is nearly equal to the other.

It is probable that when the volume and the temperature are sufficiently great all gasses fulfill with great accuracy the gaseous laws, but when, by compression and cooling, the gas is brought near to its point of condensation into the liquid form, the quantity $\frac{vp}{t}$ becomes less than it is for the perfectly gaseous state, and the substance, though still apparently gaseous, no longer fulfils with accuracy the gaseous laws.

Let p_1 be the original pressure of the air compressed in a vessel whose volume is V; let its temperature be T, equal to that of the atmosphere.

Part of the air is then allowed to escape, till the pressure within the vessel is P, equal to that of the atmosphere; let the temperature of the air remaining within the vessel be t. Now let the aperture be closed, and let the temperature of the air within become again T, equal to that of the atmosphere, and let its pressure be then p_2.

Absolute Temperature of the Air.

To determine t, the absolute temperature of the air when cooled, we have, since the volume of the enclosed air is constant, the proportion

$$P : p_2 :: t : T,$$

or

$$t = \frac{PT}{p_2}.$$

This gives the cooling effect of expansion from the pressure p_1 to the pressure P. To determine the corresponding change of volume we must calculate the volume originally occupied by the air which remains in the vessel.

At the end of the experiment it occupies a volume V, at the pressure p_2, and a temperature T. At the beginning of the experiment its pressure was p_1 and its temperature T: hence the volume which it then occupied was $V\frac{p_2}{p_1} = v$, and a sudden increase of volume in the ratio of p_2 to p_1, corresponds to a diminution of pressure from p_1 to P. Since p_2 is greater than P, the ratio of the pressures is greater than the ratio of the volumes.

Elasticity of the Air.

The elasticity of the air under the condition of no thermal communication is the value of the quantity

$$\frac{V + v}{2}\cdot\frac{p_1 - P}{V - v} \text{ or } \tfrac{1}{2}(p_1 + p_2)\frac{p_1 - P}{p_1 - p_2}$$

when the expansion is very small, or when p_1 is very little greater than P.

But we know that the elasticity at constant temperature is numerically equal to the pressure. Hence we find for the value of γ, the ratio of the two elasticities,

$$\gamma = \frac{p_1 - P}{p_1 - p_2}$$

or, more exactly,

$$\gamma = \frac{\log p_1 - \log P}{\log p_1 - \log p_2}.$$

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[1] Transactions of the Royal Society of Edinburgh, vol. xvi. p. 575, January 2, 1849

SEC. 28.—*Ratio of Elasticities.* The ratio of elasticities of air, as deduced from experiments on the velocity of sound, is

$$\gamma = 1{\cdot}408.$$

This is also, as we have shown, the ratio of the specific heat at constant pressure to the specific heat at constant volume.

These relations were pointed out by Laplace long before the recent development of thermodynamics.

We now proceed, following Rankine, to apply the thermodynamic equation:

$$E_\theta (K_p - K_v) = T V (A M)^2.$$

In the case of a fluid fulfilling the gaseous laws, and also such that the absolute zero of its thermometric scale coincides with the absolute zero of the thermodynamic scale, we have

$$A M = \frac{p}{\theta},$$

and

$$E_\theta = p.$$

Hence

$$K_p - K_v = \frac{p v}{\theta} = R,$$

a constant quantity.

Now at the freezing temperature, which is 492·6 on Fahrenheit's scale from the absolute zero, $p v = 26{,}214$ foot-pounds by Regnault's experiments on air, so that R is 53·21 foot-pounds per degree of Fahrenheit.

This is the work done by one pound of air in expanding under constant pressure while the temperature is raised one degree Fahrenheit.

Now K_v is the mechanical equivalent of the heat required to raise one pound of air one degree Fahrenheit without any change of volume, and K_p is the mechanical equivalent of the heat required to produce the same change of temperature when the gas expands under constant pressure, so that $K_p - K_v$ represents the additional heat required for the expansion. The equation, therefore, shows that this additional heat is mechanically equivalent to the work done by the air during its expansion. This, it must be remembered, is not a self-evident truth, because the air is in a different condition at the end of the operation from that in which it was at the beginning. It is a consequence of the fact discovered experimentally by Joule, that no change of temperature occurs when air expands without doing external work.

We have now calculated, in dynamical measure, the difference between the two specific heats of air.

We also know the ratio of K_p to K_v to be 1·408. Hence

$$K_v = \frac{53{\cdot}21}{0{\cdot}408} = 130{\cdot}4 \text{ foot pounds per degree Fahrenheit.}$$

and $K_p = K_v + 53{\cdot}21 = 183{\cdot}6$ foot pounds per degree Fahrenheit.

Difference Between the two Specific Heats of Air

Now the specific heat of water at its maximum density is Joule's equivalent of heat, for one pound it is 772 foot pounds per degree Fahrenheit.

Hence, if c_p is the specific heat of air at constant pressure referred to that of water as unity,

$$c_p = \frac{K_p}{J} = 0{\cdot}2378.$$

This calculation was published by Rankine in 1850.

The value of the specific heat of air determined directly from experiment by M. Regnault and published in 1853, is

$$c_p = 0{\cdot}2379.$$

SEC. 29.—*On the Intrinsic Energy of a System of Bodies.* The energy of a body is its capacity for doing work, and is measured by the amount of work which it can be made to do. The intrinsic energy of a body is the work which it can do in virtue of its actual condition, without any supply of energy from without.

Let us compare the energy of a substance in two different states. Let the two states be indicated in the diagram by the points A and B, and let the intermediate states through which it passes be indicated by the line, straight or curved, which is drawn from A to B.

The work of the path, or the work which the body does while passing from the state A to the state B along the path A B, is represented, as we have shown, by the area included between the path A B, the line of equal volume B *b*, the line of zero pressure, *b a*, and the line of equal volume *a* A, and this is to be reckoned positive when this area is described in the direction of the hands of a watch.

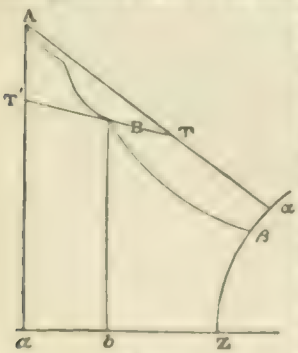

Fig. 13.

The heat of the path, or the heat absorbed by the body during its passage along A B, is represented by the area included between the path A B, the isentropic B β, the fictitious line of zero temperature β α and the isentropic α A.

This area is to be reckoned positive when it lies on the right of A B. In the figure, in which it lies on the left hand of A B, it must be reckoned negative, or, in other words, it represents heat given out by the body.

The sum of the work done and of heat given out by the body, both in dynamical measure, is the whole energy given out by the body during its passage from the state A to the state B. It is represented by the whole area *a* A α β B *b a*, and this area, therefore, represents the diminution of the energy of the body, which is evidently independent of the form of the path between A and B. Now this area is the difference between the areas A α Z *a* A and B β Z *b* B, which are bounded by the line of zero pressure, the fictitious line of zero temperature, and the lines of equal volume and of equal entropy.

If we suppose the fictitious line of zero temperature joined to the line of zero pressure by a line of any form β Z, we may consider the area bounded by these lines and by the lines of equal volume and of equal entropy through A as representing that part of the energy of the body in the state A the variations of which we are dealing with, for if the body passes into the state B, by doing work and giving out heat, the energy given out is represented by the excess of the area A α Z *a* A above B β Z *b* B, and this, therefore, represents the excess of the energy in the state A above that of the state B.

Hence, in discussing the variations of the energy, we may consider them represented by the variations of the area A α Z *a* A, or, what is the same thing, we may suppose the energy to be represented by this area together with an unknown constant.

Available Energy.

SEC. 30.—*Available Energy.*—The sum of the work done by the body and the dynamical equivalent of the heat which it gives out during its passage from the state A to the state B is, as we have seen, the same whatever be the path by which the body passes from the state A to the state B. If, however, we suppose that the body is surrounded by a medium, the temperature of which is maintained constant, so that the body can give out heat only when its temperature is higher than that of the medium, and can take in heat only when its temperature is lower than that of the medium, then these conditions will confine the path within certain limits.

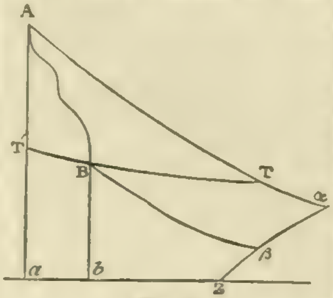

Fig. 13.

Draw the isothermal T T, representing the constant temperature of the surrounding medium. Then since the temperature of the body at A and at all points above the line T T′ is higher than that of the medium, the body cannot receive heat from the medium. Hence its entropy cannot increase, and the path cannot rise above the adiabatic or isentropic A α, drawn through A.

Again, when the body gives out heat to the medium, its temperature must be higher than that of the medium. Hence the path must be above the isothermal T T′.

The path formed by the isentropic A T and the isothermal T B is therefore the limiting form of the path, and is that wherein the work done by the body is a maximum, and the heat given out by it a minimum.

If we denote the energy of the body in the state A by ϵ, and its entropy by ϕ, and the energy and entropy of the body at the temperature and pressure of the surrounding medium (represented by B) by ϵ_0 and ϕ_0, then the total energy given out as work and heat during the passage from the state A to the state B is $\epsilon - \epsilon_0$.

The amount of heat which the body gives out during the process cannot be less than that corresponding to the path A T B, which is

$$(\phi - \phi_0) T$$

where T is the absolute temperature of the surrounding medium.

The amount of work done by the body during the process cannot, therefore, be greater than

$$\epsilon - \epsilon_0 - (\phi - \phi_0) T.$$

This, therefore, is the part of the energy which is available for mechanical purposes under the circumstances in which the body is placed, namely, when surrounded by a medium at temperature T and pressure P.

It appears, therefore, that the greater the original entropy, the smaller is the available energy of the body.

If the system under consideration consists of a number of bodies at different pressures and temperatures, contained within a vessel from which neither matter nor heat can escape, then the amount of energy converted into work will be greatest when the system is reduced to thermal and mechanical equilibrium by the following process.

1st. Let each of the bodies be brought to the same temperature by expansion or compression without communication of heat.

2nd. The bodies being now at the same temperature, let those which exert the greatest pressure be allowed to expand, and let them compress those which exert less pressure, till the pressures of all the bodies in the vessel are equal, the process being conducted so slowly that the temperatures of all the bodies remain sensibly equal to each other throughout the process.

The final state of the system is determined by the following conditions:

Let n be the number of bodies forming the system.

Let m_1 . . . m_n be the masses of these bodies.

v_1 . . . v_n the volume of unit of mass of each.

ϕ_1 . . . ϕ_n the entropy of unit of mass of each.

ϵ_1 . . . ϵ_n the energy of unit of mass of each.

p_1 . . . p_n the pressure of each.

θ_1 . . . θ_n the temperature of each.

The volume of the whole is

$$m_1 v_1 + \ldots + m_n v_n = \Sigma(mv),$$

and since the system is contained in a vessel of volume V

$$\Sigma(mv) = V$$

during the whole process.

The entropy of the whole is

$$m_1 \phi_1 + \ldots + m_n \phi_n = \Sigma(m\phi) = \Phi.$$

When there is no communication of heat except between bodies of equal temperature, Φ remains constant. When there is communication of heat between bodies of different temperature, Φ increases.

In the final state of the system

$$p_1 = p_2 \ldots = p_n = P$$
$$\theta_1 = \theta_2 \ldots = \theta_n = \Theta$$

There are, therefore, n − 1 conditions with respect to pressure, and n − 1 conditions with respect to temperature, together with one condition with respect to volume and one with respect to entropy, or in all 2n conditions connected with the n bodies, and since the state of each body is a function of two variables, the conditions are necessary and sufficient to determine the final state of each of these bodies.

The work done against resistances external to the system may be determined by comparing the total energy at the beginning of the process with the final energy; for, since no heat is allowed to escape, any diminution of energy must arise from work being done.

The intrinsic energy is

$$\Sigma(me) = E.$$

If E be the original and E′ the final value of this quantity, the energy available to produce mechanical work is

$$E - E'.$$

If, during any part of the process by which the system reaches its final state of thermal and mechanical equilibrium, there takes place a communication of a quantity H of heat from a body at temperature θ_1 to a body at temperature θ_2, the increase of the total entropy of the system arising from the communication is

$$H\left(\frac{1}{\theta_2} - \frac{1}{\theta_1}\right),$$

and the final entropy, instead of being equal to the original entropy Φ, becomes

$$\Phi' = \Phi + H\left(\frac{1}{\theta_2} - \frac{1}{\theta_1}\right).$$

Increase of the Final Entropy. This increase of the final entropy involves a corresponding increase of the final temperature and the final energy.

If the rise of the final temperature is small, then, since the volume is constant, the increase of the final energy is

$$\Theta(\Phi' - \Phi) = H\Theta\left(\frac{1}{\theta_2} - \frac{1}{\theta_1}\right),$$

and the available energy is therefore diminished by this quantity on account of the passage of the quantity H of heat from a body at temperature θ_1 to a body at temperature θ_2.

Dissipation of Energy. Processes of this kind, by which, while the total energy remains the same, the available energy is diminished, are instances of what Sir W. Thomson has called the Dissipation of Energy. The doctrine of the dissipation of energy is closely connected with that of the growth of entropy, but is by no means identical with it.

The increment of the total entropy of a system arising from the communication of a given amount of heat, H, from a body at one given temperature, θ_1, to another given temperature, θ_2, is, as we have seen,

$$H\left(\frac{1}{\theta_2} - \frac{1}{\theta_1}\right),$$

a quantity completely determined by the state of the system when the communication of heat takes place.

The energy dissipated or rendered unavailable as a source of mechanical work is

$$H\Theta\left(\frac{1}{\theta_2} - \frac{1}{\theta_1}\right),$$

into which a new factor, Θ, enters, and this factor denotes the final temperature of the system when it has reached the state of thermal and mechanical equilibrium. Θ, therefore, since it depends on the final state of the system, can only be calculated when we know not only the relations between the thermodynamic variables for all the bodies, but the volume which they occupy in their final state.

The calculation of the amount of energy dissipated during any process is therefore much more difficult than that of the increase of the total entropy.

If the system is allowed to reach its final state of thermal and mechanical equilibrium in such a manner that no external work is done and no heat is allowed to leave or enter the system, the condition is that the final energy is equal to the original energy.

Combining this with the other conditions, that the volume is unchanged and that the final state with respect to pressure and temperature is common to all the bodies, we may determine the final value of the temperature, pressure and total entropy.

The total entropy will now have the maximum value consistent with the original state of the system. The dissipation of the available energy will be complete.

SEC. 31.—*Mechanical and Thermal Analogies.*—In studying thermodynamics we may find considerable assistance from a comparison between the thermal and the mechanical phenomena.

We have to do with energy in two forms, work and heat. When energy is being transferred from one body to another, we can always tell whether the first body is doing mechanical work on the second or communicating heat to it. Work is done by motion against resistance. Heat is communicated from a hotter to a colder body.

But as soon as the energy has entered the second body, we can no longer distinguish by any legitimate process whether it is in the form of work or of heat. In fact, we may remove it from the body under either of these forms.

If a fluid at a pressure p increases in volume from v to v', it performs work against external resistance, the amount of which work is

$$p(v' - v) = W.$$

If a body at temperature θ increases in entropy from ϕ to ϕ', an amount of heat must have entered it represented by

$$\theta(\phi' - \phi) = H.$$

If both these processes take place, and if the energy of the body is thereby changed from E to E′, then

$$E' - E = H - W = \theta(\phi' - \phi) - p(v' - v).$$

Here, then, we have two sets of quantities, one relating to work, the other to heat.

$$\begin{matrix} W & v & p \\ H & \phi & \theta \end{matrix}$$

Of these quantities Work and Heat are simply two forms of Energy.

SEC. 32.—*Representation of the Properties of a Substance by Means of a Surface.* Professor J. Willard Gibbs, of Yale College, U. S., to whom we are indebted for a careful examination of the different methods of representing thermodynamic relations by plane diagrams, has introduced an exceedingly valuable method of studying the properties of a substance by means a surface.

Transactions of the Academy of Sciences of Connecticut, vol. ii. For the full discussion of the subject see Maxwell's *Theory of Heat*. We can give here only a summary of the results obtained.

Volume, Entropy and Energy of the Body. According to his method, the volume, entropy, and energy of the body in a given state are represented by the three rectangular coordinates of a point in the surface, and this point on the surface is said to correspond to the given state of the body.

SEC. 33.—*Thermal Lines on the Thermodynamic Surface.*

Thermodynamic Surface.

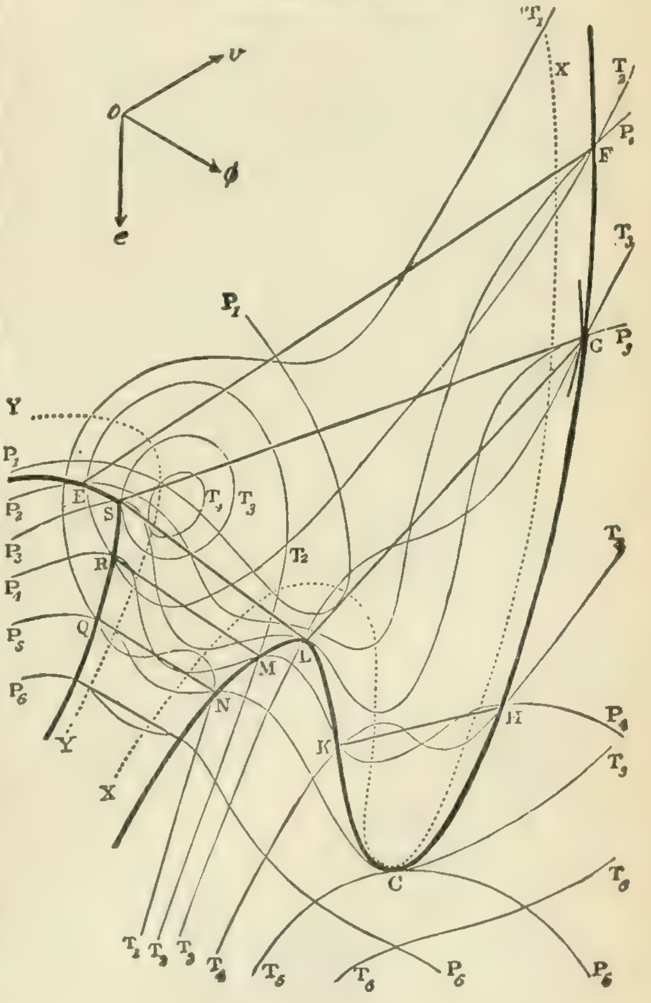

Fig. 15.

o Origin.
o v Axis of volume.
o ϕ Axis of entropy.
o ϵ Axis of energy.
P . . . . P Isopiestics or lines of equal pressure.

Of these P_1 represents [illegible] pressure, or in other words, a [illegible]

T . . . . T Isothermals or lines of equal temperature.

These lines [illegible] branches [illegible]

F G H [illegible] To the right of this line the substance is gaseous and above [illegible] state. [illegible]

G K L M N [illegible] the substance is liquid and [illegible] to the right of G K it may evaporate, to the left of L M N it may solidify.

Q R S E [illegible] left of this line the substance is solid and [illegible] To the right of S R E it may melt and above S E H [illegible]

[illegible] point of the liquid and gaseous states.

B [illegible] of states.

[illegible] point.

[illegible] branches of [illegible] the node-couple curve.

[illegible] the branches of the node-couple curve.

[illegible] Between [illegible] the substance is stable, but only if [illegible]

The [illegible] represents that state of uniform pressure and temperature at which the substance can be partly solid, partly liquid, and partly gaseous.

The [illegible] represent states of uniform pressure and temperature in which [illegible]

S G and F E between solid and gaseous.
G L and K H between liquid and gaseous.
S L R M, and Q N between solid and liquid.

The surface of dissipated energy consists of the plane triangle S L G and the three developable surfaces of which the generating lines are [illegible] The surface lies above the primitive thermodynamic surface and touches it along the node-couple curve.

FREE EXPANSION.

SEC. 34. *The [illegible] in which no External Work is done during a Change of Pressure.*—Let a fluid be forced through a small hole, or a number of narrow tubes, or a porous plug, and let the work [illegible] the pressure [illegible] [illegible] when the fluid after passing [illegible] plug has [illegible] its velocity is very small. [illegible] suppose that no heat enters or leaves the fluid, and [illegible] the energy of which is [illegible] the temperature of the fluid, escapes from the apparatus.

We also suppose that [illegible] that is, that the same quantity of the fluid enters and issues from the apparatus every second.

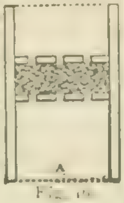

Fig. 16.

During the passage of unit of mass through the apparatus, if P and V are its pressure and volume at the section A before reaching the plug, and p v the same at the section B after passing through it, the work done on it [illegible] the fluid through the section A is P V, and the work done by the fluid in passing through the section B is $p\,v$, so that the amount of work communicated to the fluid in passing through the plug is P V $-$ $p\,v$.

Hence, if E is the energy of unit of mass of fluid [illegible] and e the energy of unit of mass [illegible] B

$$e = E + PV - pv,$$

or

$$E + PV = e + pv \quad . \quad . \quad . \quad (1)$$

That is [illegible] and the product of the volume and the pressure [illegible] after passing through the [illegible]

Now [illegible] in the diagram by the [illegible] A [illegible] P V is represented by the rectangle A P O a. Hence the [illegible] A p O a [illegible] [illegible] the [illegible] B [illegible] b.

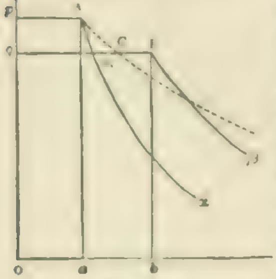

Fig. 17.

Relation of [illegible] energy to the Product of Volume.

We [illegible] [illegible] [illegible] a pressure [illegible] p [illegible]

[illegible]

of this process differ from those of the actual passage from A to B, in whatever manner this is really effected.

In passing from A to C, at the constant temperature θ, the pressure diminishes from P to p. The heat absorbed during the process is, by the first thermodynamic relation,

$$(P - p)\,V\,\theta\,\alpha,$$

where α is the dilatation of unit of volume at constant pressure per degree of temperature.

In passing from C to B the substance expands at constant pressure, and its temperature rises [illegible] θ [illegible] τ.

The heat required to produce this rise of temperature is

$$K_p\,\tau,$$

where K_p denotes the specific heat of the substance at constant pressure.

The whole heat absorbed by the substance during the passage from A to B is therefore

$$(P - p)\,V\,\theta\,\alpha + K_p\,\tau,$$

and this is the value of the area between A B and the two adiabatic lines A α, B β.

Now this is equal to the area A p q B or (P $-$ p) V.

Hence we have the equation

$$K_p\,\tau = (P - p)\,V\,(1 - \theta\,\alpha) \quad . \quad . \quad . \quad (2)$$

where K_p denotes the specific heat of unit of mass at constant pressure, expressed in dynamical measure;

τ, the rise of temperature after passing through the plug;

P $-$ p the *small* difference of pressure on the two sides of the plug.

V, the volume of unit of mass (when P $-$ p is so great as to cause considerable alteration of volume, this quantity must be treated differently);

θ, the temperature on the absolute dynamical scale;

α, the dilatation of unit of volume at constant pressure per degree of temperature.

There are two cases in which observations of the rise (or fall) of temperature may be applied to determine quantities of great importance in the science of heat.

The Dynamical Equivalent of Heat

SEC. 35.—*To Determine the Dynamical Equivalent of Heat.*—The first case is that in which the substance is a liquid, such as water or mercury, the volume of which is but slightly affected either by pressure or by temperature. In this case V will vary so little that the effect of its variation may be taken into account as a correction required only in calculations of great accuracy. The dilatation α is also very small, so much so that the product $\theta\,\alpha$, though not to be absolutely neglected, may be found with sufficient accuracy without a very accurate knowledge of the absolute value of θ.

If we suppose the pressure to be due to a depth of fluid equal to H on one side of the plug and h on the other, then

$$(P - p) = (H - h)\,\rho\,g,$$

where ρ is the density, and g is the numerical measure of the force of gravity. Now

$$V\,\rho = 1,$$

so that equation (2) becomes

$$K_p\,\tau = g\,(H - h)\,(1 - \theta\,\alpha),$$

an equation from which we can determine K_p when we know τ the rise of temperature, and H $-$ h the difference of level of the liquid, α its coefficient of dilatation by heat, and (with a moderate degree of exactness) θ the absolute temperature in terms of the degrees of the same thermometer which is used to determine τ.

The quantity K_p is the specific heat at constant pressure, that is, the quantity of heat which will raise unit of mass of the substance one degree of the thermometer. It is expressed here in dynamical measure, or foot-poundals.

Specific Heat in Gravitation [illegible]

If the specific heat is to be expressed in gravitation measure, as in foot-pounds, we must divide by g, the intensity of gravity. If the specific heat is to be expressed in terms of the specific heat of a standard substance, as for instance water at its maximum density, we must divide by [illegible] the specific heat of [illegible]

We have already shown how by [illegible] to compare the specific heat of any substance with that of water. If the specific heat expressed in this way is denoted by c_p, while K_p is the same quantity expressed in dynamical measure, then the dynamical equivalent of thermal unit is

$$J = \frac{K_p}{c_p}.$$

The quantity J is called Joule's Mechanical Equivalent of Heat, because Joule was the first to determine its value by an accurate method. It may be defined as the specific heat, in dynamical measure, of water at its maximum density.

Joule's Mechanical Equivalent of Heat

It is equal to 772 foot-pounds at Manchester per pound of water. If we alter the standard of [illegible] [illegible]

[illegible]

[illegible] determining the value of J by [illegible]

SEC. 36.—*To [illegible] Temperatures [illegible] the Thermodynamic Scale.*—The most [illegible] of [illegible] the temperature θ on the thermodynamic [illegible] which corresponds [illegible] is therefore [illegible]

[illegible]

RADIATION

Sec. [illegible].—When a body is [illegible] high temperature it be- [illegible]

[illegible] in straight lines [illegible] propagated by [illegible]. Where the heat [illegible] of the medium in what- [illegible]

Radiant Heat.

[illegible] heat passes is not heated if [illegible] transparent me- [illegible] luminous. But if [illegible] causes the medium to be- [illegible] through it, it will also cause it to [illegible] part of the heat when traversed by radiant heat.

A [illegible] is completely defined when we know—

1. The wave [illegible] between two places in which the [illegible]
2. [illegible] extent of the disturbance.
3. The plane in which the disturbance lies.
4. The phase of the wave at a particular point.
5. The [illegible] through the medium.

Wave-lengths.

When the wave-length is greater than 812 millionths of a milli- [illegible] eye, though the effect [illegible] may be very great. When the wave-length is [illegible] the ray is visible as a red light, and a [illegible] is observed. But when the wave-length [illegible] the ray which is seen as a brilliant [illegible] less heating effect than the dark or the red rays, [illegible] thermal effects with rays of smaller wave-lengths, even when concentrated.

[illegible] photographic effect of the radiation [illegible] in the red rays, and [illegible] powerful the smaller the wave-length [illegible] which have a feeble [illegible] thermal effect, the photographic effect [illegible] beyond the visible spectrum, for [illegible] observed. This shows [illegible] is in any way [illegible] when different kinds of [illegible]. It is probable that when the radiation [illegible] its energy doing work [illegible] rather by a [illegible] vibration of [illegible] from the position of almost [illegible] from [illegible] thrown by previous [illegible] them to rush together [illegible] so as to form [illegible] compounds. In cases of this kind the effect is no more a [illegible] than the effect of a fall of a tree is [illegible] of the wind which uprooted it.

Prevost's Theory of Exchanges.

Sec. [illegible].—*Prevost's Theory of Exchanges.* When a system of bodies at different temperatures is left to itself the transfer of heat which takes place always has the effect of rendering the temperatures of the different bodies more nearly equal, and this character of the transfer of heat, that it passes from hotter to colder bodies, is the same whether it is by radiation or by conduction that the transfer takes place.

From experiments made we conclude with Prevost that a hot body is always emitting radiations, even when no colder body is there to [illegible] why there is no change of tempera- [illegible] ture [illegible] other [illegible]

[illegible] to the [illegible] at that temperature as the amount of radia- [illegible] whole [illegible]

[illegible] will emit [illegible]

Formula of Dulong and Petit.

[illegible] Dulong and Petit succeeded in [illegible] the facts observed by them [illegible]

$$r = m a^{\theta}$$

where r is the total loss of heat by radiation from unit of [illegible] the surface of the substance at the temperature θ, m [illegible] on the substance and the [illegible] quantity which, when θ [illegible] scale, is 1.0077.

If the body is placed in a [illegible] devoid of air, whose walls are at the temperature t, then the heat radiated from the walls to the body and absorbed by it will be

$$r' = m a^{t}$$

so that the actual loss of heat will be

$$r - r' = m a^{\theta} - m a^{t}$$

The constancy of the amount of radiation between the same surfaces at the same temperatures affords a very convenient method of comparing quantities of heat.

Sec. [illegible] *Energy, of the Constitution of Bodies.* —*Kinetic Energy.* Energy is known to us in two forms. One of these is known as Kinetic Energy, the energy of motion. A body in motion has kinetic energy, which it must communicate to some other body during the process of bringing it to rest. This is the fundamental form of energy. When we have acquired the notion of matter in motion, and know what is meant by the energy of that motion, we are unable to conceive that any possible addition to our knowledge could explain the energy of motion, or give us a more perfect knowledge of it than we have already.

There is another form of energy which a body may have, which depends, not on its own state, but on its position with respect to other bodies. This is called Potential Energy. The leaden weight of a clock, when it was wound up, has potential energy, which it loses as it descends. It is spent in driving the clock. This energy depends, not on the piece of lead considered in itself, but on the position of the lead with respect to another body—the earth—which attracts it.

In every transformation of potential energy, motion of some kind is involved.

Heat is Motion.

Heat is Motion.—Now we know that whenever one body of a system is hotter than another, heat is transferred from the hotter to the colder body, either by conduction or by radiation.

Hence, whether we consider the radiation of heat as effected by the projection of material caloric, or by the undulations of an intervening medium, the outer surface of a hot body must be in a state of motion, provided any cold body is in its neighborhood to receive the radiation which it emits.

Whatever theory we adopt about the kind of motion which constitutes radiation, it is manifest that radiation consists of motion of some kind, either the projection of the particles of a substance called caloric across the intervening space, or a wave-like motion propagated through a medium filling that space. In either case, during the interval between the time when the heat leaves the hot body and the time when it reaches the cold body, its energy exists in the intervening space in the form of the motion of matter.

The Molecular Theory of Matter.

The doctrine that visible bodies consist of a determinate number of molecules is called *the molecular theory of matter*. The opposite doctrine is that, however small the parts may be into which we divide a body, each part retains all the properties of the substance. This is the theory of the infinite divisibility of bodies. We do not assert that there is an absolute limit to the divisibility of matter: what we assert is, that after we have divided a body into a certain finite number of constituent parts called molecules, then any further division of these molecules will deprive them of the properties which give rise to the phenomena observed in the substance.

The molecules of all bodies are in a state of continual agitation. The hotter a body is, the more violently are its molecules agitated. In solid bodies, the molecules, though in continual motion, never gets beyond a certain very small distance from its original position in the body. The path which it describes is confined within a very small region of space.

In fluids, on the other hand, there is no such restriction to the excursions of a molecule. It is true that the molecule generally can travel but a very small distance before its path is disturbed by an encounter with some other molecule, but after this encounter there is nothing which determines the molecule rather to return towards the place from whence it came than to push its way into new regions. Hence in fluids the path of a molecule is not confined within a limited region, as in the case of solids, but may penetrate into any part of the space occupied by the fluid.

Sec. 40.—*Internal Kinetic Energy of a Molecule.*—If a molecule were a mere material point, endowed with inertia and with attractive and repulsive forces, the only kinetic energy it could possess would be that of translation as a whole. But if it be a body having parts and magnitude, these parts may have motions of rotation or of vibration relative to each other, independent of the motion of the center of gravity of the molecule. We must therefore admit that part of the kinetic energy of a molecule may depend on the relative motions of its parts. We call this the Internal energy to distinguish it from the energy due to the translation of the molecule as a whole. The ratio of the internal energy to the energy of agitation may be different in different gases.

Sec. 41.—*Kinetic Theory of Gases.*—A gaseous body is supposed to consist of a great number of molecules moving with great velocity. During the greater part of their course these molecules are not acted on by any sensible force, and therefore move in straight lines with uniform velocity. When two molecules come within a certain distance of each other a mutual action takes place between them, which may be compared to the collision of two billiard balls.

We may call this mutual action an Encounter between two molecules, and we shall call the course of a molecule between one encounter and another the Free Path of the molecule. In ordinary gases the free motion of a molecule takes up much more time than that occupied by an encounter. As the density of the gas increases, the free path diminishes, and in liquids no part of the course of a molecule can be spoken of as its free path.

It appears that of the molecules composing the system some are moving very slowly, a very few are moving with enormous velocities, and the greater number with intermediate velocities. To compare one such system with another the best method is to take the mean of the squares of all the velocities. This quantity is called the Mean Square of the velocity. The square root of this quantity is called the Velocity of Mean Square.

Sec. 42.—*Distribution of Kinetic Energy Between Two Different Sets of Molecules.*—If two sets of molecules whose mass is different are in motion in the same vessel, they will by their encounters exchange energy with each other till the average kinetic energy of a single molecule of either set is the same. This follows from the same investigation which determines the law of distribution of velocities in a single set of molecules.

Hence if the mass of a molecule of one kind is M_1, and that of a molecule of the other kind is M_2, and if their average velocities of agitation are V_1 and V_2, then

$$M_1 V_1^2 = M_2 V_2^2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The quantity $\frac{1}{2} M V^2$ is called the average kinetic energy of agitation of a single molecule.

Sec. 43.—*Definition of the Velocity of Gas.*—If we determine the motion of the center of gravity of all the molecules within a very small region surrounding a point in a gas, then the velocity of the gas within that region is defined as the velocity of the center of gravity of all the molecules within that region.

Motion of a Gas.

This is what is meant by the motion of a gas in common language. Besides this motion, there are two other kinds of motion considered in the kinetic theory of gases. The first is the motion of agitation of the molecules. This is the hitherto invisible motion of the molecule considered as a whole. Its course consists of broken portions called free paths, interrupted by the encounters between different molecules.

The second is the internal motion of each molecule, consisting partly of rotation and partly of vibrations among the component parts of the molecule.

Sec. 44.—*Theory of the Pressure of a Gas.*—Let us consider two portions of a gas separated by a plane surface which moves with the same velocity as the gas.

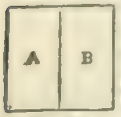

Fig. 17a.

Each molecule in crossing the plane from the region A to the region B enters the second region in precisely the same state as it leaves the first. It, therefore, carries over into the region B, not only its mass, but its momentum and its kinetic energy. Hence, if we consider the quantity of momentum in a given direction existing at any instant in the portion in the region B, this quantity will be altered whenever a molecule crosses the boundary, carrying its momentum along with it.

Now let us consider all the [illegible] whose velocity differs by less than a certain small quantity, c, from a given velocity [illegible] the components of which are u in the direction perpendicular to the plane from A towards B, and v and w in two other directions parallel to the plane. Let there be N molecules of this kind in every unit of volume, and let the mass of each of these be M.

The number of these molecules which will cross unit of area of the plane from A to B in unit of time is

$$N u,$$

the momentum of each of these molecules resolved in the direction A B is M u.

Hence the momentum in this direction communicated to the region B in unit of time is

$$M N u^2.$$

Since this momentum of the gas in B does not produce motion of the gas, [illegible] the amount of this pressure for every unit of area must be M N u².

[illegible] in order to produce a pressure equal to M N u², [illegible] of the region A.

Hence, [illegible] group of molecules whose [illegible] In every such group that which determines the pressure in the direction A B on the surface separating A from B is a quantity of the form $M N u^2$, where N is the number of molecules in the group, and u is the velocity of each molecule resolved in the direction A B. The other components of the velocity do not influence the pressure in this direction.

To find the whole pressure, we must find the sum of all such expressions as $M N u^2$ for all the groups of molecules in the system. We may write this result $p = M N \overline{u^2}$, where N now signifies the total number of molecules in unit of volume, and $\overline{u^2}$ denotes the mean value of u^2 for all these molecules. Now if V^2 is the square of the velocity without regard to direction,

$$V^2 = u^2 + v^2 + w^2,$$

where u, v, w are the components in three directions at right angles. Hence if $\overline{u^2}$, $\overline{v^2}$ and $\overline{w^2}$ denote the mean square of these components, and $\overline{V^2}$ the mean square of the resultant,

$$\overline{V^2} = \overline{u^2} + \overline{v^2} + \overline{w^2}.$$

When, as in every gas at rest the pressure is equal in all directions $\overline{u^2} = \overline{v^2} = \overline{w^2}$ and therefore, $\overline{V^2} = 3\,\overline{u^2}$.

Hence the pressure of a gas is

$$p = \tfrac{1}{3} M N \overline{V^2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

where M is the mass of each molecule, N is the number of molecules in unit of volume, and $\overline{V^2}$ is the mean square of the velocity.

In this expression there are two quantities which have never been directly measured—the mass of a single molecule, and the number of molecules in unit of volume. But we have here to do with the product of these quantities, which is evidently the mass of the substance in unit of volume, or, in other words, its density. Hence we may write the expression

$$p = \tfrac{1}{3} \rho \overline{V^2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

where ρ is the density of the gas.

It is easy from this expression to determine, as was first done by Joule, the mean square of the velocity of the molecules of a gas, for

$$\overline{V^2} = 3 \frac{p}{\rho} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

where p is the pressure, and ρ the density, which must, of course, be expressed in terms of the same fundamental units.

For instance, under the atmospheric pressure of 2116.4 pounds weight on the square foot, and at the temperature of melting ice, the density of hydrogen is 0.00[illegible] pounds in a cubic foot. Hence $\frac{p}{\rho} = 378816$ in gravitation units, and if the intensity of gravity where this relation was observed was 32.2, we have

$$\overline{V^2} = 3[illegible]396,$$

or, taking the square root of this quantity,

$$\overline{V} = [illegible] \text{ feet per second.}$$

This is the velocity of mean square for the molecules of hydrogen at 32° F. at the atmospheric pressure.

Law of Boyle.

Sec. 45.—*Law of Boyle.*—Two bodies are said to be of the same temperature when there is no more tendency for heat to pass from the first to the second than in the reverse direction. In the kinetic theory of heat, as we have seen, this thermal equilibrium is established when there is a certain relation between the velocities of agitation of the molecules of the two bodies. Hence the temperature of a gas must depend on the velocity of agitation of its molecules, and this velocity must be the same at the same temperature, whatever be the density.

In the expression $p = \frac{1}{3} \rho \overline{V^2}$, the quantity $\overline{V^2}$, depends only on the temperature as long as the gas remains the same. Hence when the density ρ varies, the pressure p must vary in the same proportion. This is Boyle's law, which is now raised from the rank of an experimental fact to that of a deduction from the kinetic theory of gases.

If v denotes the volume of unit of mass, we may write this expression,

$$p v = \tfrac{1}{3} \overline{V^2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

Now $p v$ is proportional to the absolute temperature, as measured by a thermometer of the particular gas under consideration. Hence $\overline{V^2}$, the mean square of the velocity of agitation, is proportional to the absolute temperature measured in this way.

Sec. 46.—*Law of Gay-Lussac.*—Let us next consider two different gases in thermal equilibrium. We have already stated that if M_1, M_2 are the masses of individual molecules of these gases, and V_1, V_2 their respective velocities of agitation, it is necessary for thermal equilibrium that $M_1 \overline{V_1^2} = M_2 \overline{V_2^2}$ by equation (1).

If the pressures of these gases are p_1 and p_2, and the number of molecules in unit of volume N_1 and N_2, then by equation (2),

$$p_1 = \tfrac{1}{3} M_1 N_1 \overline{V_1^2} \text{ and } p_2 = \tfrac{1}{3} M_2 N_2 \overline{V_2^2}.$$

If the pressure of the two gases are equal,

$$M_1 N_1 \overline{V_1^2} = M_2 N_2 \overline{V_2^2}.$$

If their temperatures are equal,

$$M_1 \overline{V_1^2} = M_2 \overline{V_2^2}.$$

Dividing the terms of the first of these equations by those of the second, we find

$$N_1 = N_2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (6)$$

or when two gases are at the same pressure and temperature, the number of molecules in unit of volume is the same in both gases.

If we put $\rho_1 = M_1 N_1$ and $\rho_2 = M_2 N_2$ for the densities of the two gases, then since $N_1 = N_2$ we get

$$\rho_1 : \rho_2 :: M_1 : M_2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7)$$

or the densities of two gases at the same temperature and pressure are proportional to the masses of their individual molecules.

These two equivalent propositions are the expression of a very important law established by Gay Lussac that the densities of gases are proportional to their molecular weights.

The proportions by weight in which different substances combine to form chemical compounds depend, according to Dalton's atomic theory, on the weights of their molecules, and it is one of the most important researches of chemistry to determine the proportions of the weights of the molecules from the proportions in which they enter into combination. Gay Lussac discovered that in the case of gases the volumes of the combining quantities of different gases are in a simple ratio to each other. This law of volumes has now been raised from the rank of an empirical fact to that of a deduction from theory, and we may now assert, as a dynamical proposition, that the weights of the molecules of gases (that is, those small portions which do not part company during their motion) are proportional to the densities of these gases at standard temperature and pressure.

Law of Charles.

Law of Charles.—We must next consider the effect of changes of temperature on different gases. Since at all temperatures, when there is thermal equilibrium,

$$M_1\overline{V_1^2} = M_2\overline{V_2^2};$$

and since the absolute temperature, as measured by a gas thermometer, is proportional to $\overline{V_1^2}$ when the gas is of the first kind, and to $\overline{V_2^2}$ when the gas is of the second kind; it follows, since $\overline{V_1^2}$ is always proportional to $\overline{V_2^2}$, that the absolute temperatures, as measured by these two thermometers, are proportional, and if they agree at any one temperature (as the freezing point), they agree throughout. This is the law of the equal dilatation of gases discovered by Charles.

Kinetic Energy of a Molecule.—The mean kinetic energy of agitation of a molecule is the product of its mass by half the mean square of its velocity, or

$$\tfrac{1}{2} M \overline{V^2}.$$

This is the energy due to the motion of the molecule as a whole, but its parts may be in a state of relative motion. If we assume, with Clausius, that the energy due to this internal motion of the parts of the molecule tends towards a value having a constant ratio to the energy of agitation, the whole energy will be proportional to the energy of agitation, and may be written,

$$\tfrac{1}{2} \beta M \overline{V^2},$$

where β is a factor always greater than unity, and probably equal to 1·634 for air and several of the more perfect gases. For steam it may be as much as 2·19, but this is very uncertain.

To find the kinetic energy of the substance contained in unit of volume we have only to multiply by the number of molecules, and we obtain

$$T = \tfrac{1}{2} \beta M N \overline{V^2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

Comparing this with the equation (2) which determines the pressure, we get

$$T_V = \tfrac{3}{2} \beta p \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (9)$$

or the energy in unit of volume is numerically equal to the pressure on unit of area multiplied by $\tfrac{3}{2}\beta$.

The energy in unit of mass is found by multiplying this by *v*, the volume of unit of mass:

$$T_m = \tfrac{3}{2} \beta p v \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (10)$$

SPECIFIC HEAT AT CONSTANT VOLUME.

Since the product *pv* is proportional to the absolute temperature, the energy is proportional to the temperature.

The specific heat is measured dynamically by the increase of energy corresponding to a rise of one degree of temperature. Hence

$$K_V = \tfrac{3}{2} \beta \frac{pv}{\theta} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (11)$$

To express the specific heat in ordinary thermal units, we must divide this by J, the specific heat of water (Joule's equivalent). It follows from this expression that for any one gas the specific heat of unit of mass at constant volume is the same for all pressures and temperatures, because $\frac{pv}{\theta}$ remains constant. For different gases the specific heat at constant volume is inversely proportional to the specific gravity, and directly proportional to β.

Since β is nearly the same for several gases, the specific heat of these gases is inversely proportional to their specific gravity referred to air, or, since the specific gravity is proportional to their molecular weight, the specific heat multiplied by the molecular weight is the same for all these gases. This is the law of Dulong and Petit. It would be accurate for all gases if the value of β were the same in every case.

It has been shown at p. 183 that the difference of the two specific heats is $\frac{pv}{\theta}$. Hence their ratio, γ, is

$$\gamma = \frac{2}{3\beta} + 1 \qquad \text{and} \qquad \beta = \tfrac{2}{3}\,\frac{1}{\gamma - 1}.$$

If V is the velocity of sound in a gas, we have, as at p. 228,

$$V^2 = \gamma p v \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (12)$$

The mean square of the velocity of agitation is

$$\overline{v^2} = 3 p v \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (13)$$

Hence $V = \sqrt{\frac{\gamma}{3}}\,\sqrt{\overline{v^2}}$, or for γ = 1·408 as in air and several other gases,

$$V = \cdot 6858\,\sqrt{\overline{v^2}} \text{ or } \sqrt{\overline{v^2}} = 1\cdot 458\,V \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (14)$$

These are the relations between the velocity of sound and the velocity of mean square of agitation in any gas for which γ = 1·408.

MOLECULAR THEORY OF EVAPORATION AND CONDENSATION.

Molecular theory of evaporation and condensation

The mathematical difficulties arising in the investigation of the motions of the molecules are so great that it is not to be wondered at that most of the numerical results are confined to the phenomena of gases. The general character, however, of the explanation of many other phenomena by the molecular theory has been pointed out by Clausius and others.

We have seen that in the case of a gas some of the molecules have a much greater velocity than others, so that it is only to the average velocity of all the molecules that we can ascribe a definite value. It is probable that this is also true of the motions of the molecules of a liquid, so that, though the average velocity may be much smaller than in the vapor of that liquid, some of the molecules in the liquid may have velocities equal to or greater than the average velocity in the vapor. If any of the molecules at the surface of the liquid have such velocities, and if they are moving from the liquid, they will escape from those forces which retain the other molecules as constituents of the liquid, and will fly about as vapor in the space outside the liquid. This is the molecular theory of evaporation. At the same time a molecule of the vapor striking the liquid may become entangled among the molecules of the liquid, and may thus become part of the liquid. This is the molecular explanation of condensation. The number of molecules which pass from the liquid to the vapor depends on the temperature of the liquid. The number of molecules which pass from the vapor to the liquid depends upon the density of the vapor as well as its temperature. If the temperature of the vapor is the same as that of the liquid, evaporation will take place as long as more molecules are evaporated than condensed; but when the density of the vapour has increased to such a value that as many molecules are condensed as evaporated, then the vapor has attained its maximum density. It is then said to be saturated, and it is commonly supposed that evaporation ceases. According to the molecular theory, however, evaporation is still going on as fast as ever; only, condensation is also going on at an equal rate, since the proportions of liquid and of gas remain unchanged.

Movable equilibrium

A similar explanation applies to cases in which the vapor or gas is absorbed by a liquid of a different kind, as when oxygen or carbonic acid is absorbed by water or alcohol. In such cases a "movable equilibrium" is attained when the liquid has absorbed a quantity of the gas whose volume at the density of the unabsorbed gas is a certain multiple or fraction of the volume of the liquid; or, in other words, the density of the gas in the liquid and outside the liquid stand in a certain numerical ratio to each other. This subject is treated very fully in Bunsen's "Gasometry."

The amount of vapour of a liquid diffused into a gas of a different kind is generally independent of the nature of the gas, except when the gas acts chemically on the vapour.

Dr. Andrews has shown ("Proc. R.S." 1875) that by mixing nitrogen with carbonic acid, the critical temperature is lowered, and that Dalton's law of the density of mixed vapors only holds at low pressures and at temperatures greatly above their critical points.

MOLECULAR THEORY OF ELECTROLYSIS.

Molecular theory of electrolysis

A very interesting part of molecular science which has not been thoroughly worked out, but which hardly belongs to an article on Heat, is the theory of electrolysis. Here an electromotive force acting on a liquid electrolyte causes the molecules of one of its components to be urged in one direction, while those of the other component are urged in the opposite direction. Now these components are joined together in pairs by chemical forces of great power, so that we might expect that no electrolytic effect could take place unless the electromotive force were so strong as to be able to tear these couples asunder. But, according to Clausius, in the dance of molecules which is always going on, some of the linked pair of molecules acquire such velocity that when they have an encounter with a pair also in violent motion the molecules composing one or both of the pairs are torn asunder, and wander about seeking new partners. If the temperature is so high that the general agitation is so violent that more pairs of molecules are torn asunder than can pair again in an equal time, we have the phenomenon of Dissociation, studied by M. Ste-Claire Deville. If, on the other hand, the separated molecules can always find partners before they are ejected from the system, the composition of the system remains apparently the same.

Now Professor Clausius considers that it is during these temporary separations that the electromotive force comes into play as a directing power, causing the molecules of one component to move on the whole one way, and those of the other the opposite way. Thus the component molecules are always changing partners, even when no electromotive force is in action, and the only effect of this force is to give direction those movements which are already going on.

Professor Weidemann, who has also taken this view of electrolysis, compares the phenomenon with that of diffusion, and shows that the electric conductivity of an electrolyte may be considered as depending on the coefficient of diffusion of the components through each other.

MOLECULAR THEORY OF RADIATION.

Molecular theory of radiation.

The phenomena already described are explained on the molecular theory by the motion of agitation of the molecules, a motion which is exceedingly irregular, the intervals between successive encounters and the velocities of a molecule during successive free paths not being subject to any law which we can express. The internal motion of a single molecule is of a very different kind. If the parts of the molecule are capable of relative motion without being altogether torn asunder, this relative motion will be some kind of vibration. The small vibrations of a connected system may be resolved into a number of simple vibrations, the law of each of which is similar to that of a pendulum. It is probable that in gases the molecules may execute many of such vibrations in the interval between excessive encounters. At each encounter the molecule is roughly shaken. During its free path it vibrates according to its own laws, the amplitudes of the different simple vibrations being determined by the nature of the collision, but their periods depending only on the constitution of the molecule itself. If the molecule is capable of communicating these vibrations to the medium in which radiations are propagated, it will send forth radiations of certain definite kinds, and if these belong to the luminous part of the spectrum, they will be visible as light of definite refrangibility. This, then, is the explanation, on the molecular theory, of the bright lines observed in the spectra of incandescent gases. They represent the disturbance communicated to the luminiferous medium by molecules vibrating in a regular and periodic manner during their free paths. If the free path is long, the molecule, by communicating its vibrations to the ether, will cease to vibrate till it encounters some other molecule.

By raising the temperature we increase the velocity of the motion of agitation and the force of each encounter. The higher the temperature the greater will be the amplitude of the internal vibrations of all kinds, and the more likelihood will there be that vibrations of short period will be excited, as well as those fundamental vibrations which are most easily produced. By increasing the density we diminish the length of the free path of each molecule, and thus allow less time for the vibrations excited at each encounter to subside, and, since each fresh encounter disturbs the regularity of the series of vibrations, the radiation will no longer be capable of complete resolution into a series of vibrations of regular periods, but will be analyzed into a spectrum showing the bright bands due to the regular vibrations, along with a greater or less amount of diffused light, forming a continuous spectrum due to the irregular motion introduced at each encounter.

Hence when a gas is rare the bright lines of its spectrum are narrow and distinct, and the spaces between them are dark. As the density of the gas increases the bright lines become broader and the spaces between them more luminous.

When the gas is so far condensed that it assumes the liquid or solid form, then, as the molecules have no free path, they have no regular vibrations, and no bright lines are commonly observed in incandescent liquids or solids. Mr Huggins, however, has observed bright lines in the spectrum of incandescent erbia and lime, which appear to be due to the solid matter, and not its vapor.

LIMITATION OF THE SECOND LAW OF THERMODYNAMICS.

One of the best established facts in thermodynamics is that it is impossible in a system enclosed in an envelope which permits neither change of volume nor passage of heat, and in which both the temperature and the pressure are everywhere the same, to produce any inequality of temperature or of pressure without the expenditure of work. This is the second law of thermodynamics, and it is undoubtedly true as long as we can deal with bodies only in mass, and have no power of perceiving or handling the separate molecules of which they are made up.

But if we conceive a being whose faculties are so sharpened that he can follow every molecule in its course, such a being, whose attributes are still as essentially finite as our own, would be able to do what is at present impossible to us. For we have seen that the molecules in a vessel full of air at uniform temperature are moving with velocities by no means uniform, though the mean velocity of any great number of them, arbitrarily selected, is almost exactly uniform. Now let us suppose that such a vessel is divided into portions, A and B, by a division in which there is a small hole, and that a being, who can see the individual molecules, opens and closes this hole, so as to allow only the swifter molecules to pass from A to B, and only the slower ones from B to A. He will thus, without expenditure of work, raise the temperature of B and lower that of A, in contradiction to the second law of thermodynamics.

This is only one of the instances in which conclusions which we have drawn from our experience of bodies consisting of an immense number of molecules, may be found not to be applicable to the more delicate observations and experiments which we may suppose made by one who can perceive and handle the individual molecules, which we deal with only in large masses.

Statistical knowledge of bodies.

In dealing with masses of matter, while we do not perceive the individual molecules, we are compelled to adopt what has been described as the statistical method of calculation, and to abandon the strict dynamical method, in which we follow every motion by the calculus.

It would be interesting to inquire how far those ideas about the nature and methods of science which have been derived from examples of scientific investigation, in which the dynamical method is followed, are applicable to our actual knowledge of concrete things, which, as we have seen, is of an essentially statistical nature, because no one has yet discovered any practical method of tracing the path of a molecule, or of identifying it at different times.

We not think, however, that the perfect identity which we observe between different portions of the same kind of matter, can be explained on the statistical principle of the stability of the averages of large numbers of quantities, each of which may differ from the mean. For if of the molecules of some substance such as hydrogen, some were of sensibly greater mass than others, we have the means of producing a separation between molecules of different masses, and in this way we should be able to produce two kinds of hydrogen, one of which would be somewhat denser than the other. As this cannot be done, we must admit that the equality which we assert to exist between the molecules of hydrogen applies to each individual molecule, and not merely to the average of groups of millions of molecules

NATURE AND ORIGIN OF MOLECULES.

Nature and origin of molecules.

We have thus been led by our study of visible things to a theory that they are made up of a finite number of parts or molecules, each of which has a definite mass, and possesses other properties. The molecules of the same substance are all exactly alike, but different from those of other substances. There is not a regular gradation in the mass of molecules from that of hydrogen, which is the least of those known to us, to that of bismuth; but they all fall into a limited number of classes or species, the individuals of each species being exactly similar to each other, and no intermediate links are found to connect one species with another by a uniform gradation.

We are here reminded of certain speculations concerning the relations between the species of living things. We find that in these also the individuals are naturally grouped into species, and that intermediate links between the species are wanting. But in each species variations occur, and there is a perpetual generation and destruction of the individuals of which the species consist.

Hence it is possible to frame a theory to account for the present state of things by means of generation, variation, and discriminative destruction.

In the case of the molecules, however, each individual is permanent; there is no generation or destruction, and no variation, or rather no difference, between the individuals of each species.

Hence the kind of speculations with which we have become so familiar under the name of theories of evolution is quite inapplicable to the case of molecules.

It is true that Descartes, whose inventiveness knew no bounds, has given a theory of the evolution of molecules. He supposes that the molecules with which the heavens are nearly filled have received spherical form from the long-continued grinding of their projecting parts, so that, like marbles in a mill, they have 'rubbed each other's angles down.' The result of this attrition forms the finest kind of molecules, with which the interstices between the globular molecules are filled. But, besides these, he describes another elongated kind of molecules, the *particulae striatae*, which have received their form from their often threading the interstices between three spheres in contact. They have thus acquired three longitudinal ridges, and, since some of them during their passage are rotating on their axes, these ridges are not in general parallel to the axes, but are twisted like the threads of a screw. By means of these little screws he most ingeniously attempts to explain the phenomena of magnetism.

But it is evident that his molecules are very different from ours. His seem to be produced by some general break-up of his solid space, and to be ground down in the course of ages, and, though their relative magnitude is in some degree determinate, there is nothing to determine the absolute magnitude of any of them.

Our molecules, on the other hand, are unalterable by any of the processes which go on in the present state of things, and every individual of each species is of exactly the same magnitude, as though they had all been cast in the same mould, like bullets, and not merely selected and grouped according to their size, like small shot.

The individuals of each species also agree in the nature of the light which they emit—that is, in their natural periods of vibration. They are, therefore, like tuning-forks all tuned to concert pitch, or like watches regulated to solar time.

In speculating on the cause of this equality we are debarred from imagining any cause of equalization, on account of the immutability of each individual molecule. It is difficult, on the other hand, to conceive of selection and elimination of intermediate varieties, for where can these eliminated molecules have gone to, if, as we have reason to believe, the hydrogen, &c., of the fixed stars is composed of molecules identical in all respects with our own? The time required to eliminate from the whole of the visible universe every molecule whose mass differs from that of some of our so-called elements, by processes similar to Graham's method of dialysis, which is the only method we can conceive of at present, would exceed the utmost limits ever demanded by evolutionists as many times as these exceed the period of vibration of a molecule.

But if we suppose the molecules to be made at all, or if we suppose them to consist of something previously made, why should we expect any irregularity to exist among them? If they are, as we believe, the only material things which still remain in the precise condition in which they first began to exist, why should we not rather look for some indication of that spirit of order, our scientific confidence in which is never shaken by the difficulty which we experience in tracing it in the complex arrangements of visible things, and of which our moral estimation is shown in all our attempts to think and speak the truth, and to ascertain the exact principles of distributive justice?

ON THE DETERMINATION OF HEIGHTS BY THE BAROMETER.

The barometer is an instrument by means of which the pressure of the air at a particular place may be measured. In the mercurial barometer, which is the most perfect form of the instrument, the pressure of the air on the free surface of the mercury in the cistern is equal to that of a column of mercury whose height is the difference between the level of the mercury in the cistern, which sustains the pressure of the air, and that of the mercury in the tube, which has no air above it. The pressure of the air is often expressed in terms of the height of this column. Thus we speak of a pressure of 30 inches of mercury, or of a pressure of 760 millimeters of mercury.

To express a pressure in absolute measure we must consider the force exerted against unit of area. For this purpose we must find the weight of a column of mercury of the given height standing on unit of area of base.

If h is the height of the column, then, since its section is unity, its volume is expressed by h.

To find the mass of mercury contained in this volume we must multiply the volume by the density of mercury. If this density is denoted by ρ, the mass of the column is ρh. The pressure, which we have to find, is the force with which this force is drawn downwards by the earth's attraction. If g denotes the force of the earth's attraction on unit of mass, then the force on the column will be $g \rho h$. The pressure, therefore, of a column of mercury of height h is expressed by

$$g \rho h,$$

where h is the height of the column, ρ the density of mercury, and g the intensity of gravity at the place. The density of mercury diminishes as the temperature increases. It is usual to reduce all pressures measured in this way to the height of a column of mercury at the freezing temperature of water.

If two barometers at the same place are kept at different temperatures, the heights of the barometers are in the proportion of the volumes of mercury at the two temperatures.

The intensity of gravitation varies at different places, being less at the equator than at the poles, and less at the top of a mountain than at the level of the sea.

It is usual to reduce observed barometric heights to the height of a column of mercury at the freezing point and at the level of the sea in latitude 45°, which would produce the same pressure.

If there were no tides or winds, and if the sea and the air were perfectly calm in the whole region between two places, then the actual pressure of the air at the level of the sea must be the same in these two places; for the surface of the sea is everywhere perpendicular to the force of gravity. If, therefore, the pressure on its surface were different in two places, water would flow from the place of greater pressure to the place of less pressure till equilibrium ensued.

Hence, if in calm weather the barometer is found to stand at a different height in two different places at the level of the sea, the reason must be that gravity is more intense at the place where the barometer is low.

Let us next consider the method of finding the depth below the level of the sea by means of a barometer carried down in a diving bell.

Barometer in a diving bell.

If D is the depth of the surface of the water in the diving bell below the surface of the sea, and if p is the pressure of the atmosphere on the surface of the sea, then the pressure of the air in the diving bell must exceed that on the surface of the sea by the pressure due to a column of water of depth D. If σ is the density of sea water, the pressure due to a column of depth D is $g \sigma D$.

Let the height of the barometer at the surface of the sea be observed, and let us suppose that in the diving bell it is found to be higher by a height h, then the additional pressure indicated by this rise is $g \rho h$, where ρ is the density of mercury. Hence

$$g \sigma D = g \rho h,$$

or

$$D = \frac{\rho h}{\sigma} = s\,h,$$

where $s = \frac{\rho}{\sigma} = \frac{\text{density of mercury}}{\text{density of water}}$ = specific gravity of mercury.

The depth below the surface of the sea is therefore equal to the product of the rise of the barometer multiplied by the specific gravity of mercury. If the water is salt, we must divide this result by the specific gravity of the salt water at the place of observation.

The calculation of depths under water by this method is comparatively easy, because the density of the water is not very different at different depths. It is only at great depths that the compression of the water would sensibly affect the result.

Measurement of heights by the barometer.

If the density of air had been as uniform as that of water, the measurement of heights in the atmosphere would have been as easy. For instance, if the density of air had been equal to σ at all pressures, then, neglecting the variation of gravity with height above the earth, we should find the height H of the atmosphere thus: Let h be the height of the barometer, and ρ the density of mercury; then the pressure indicated by the barometer is

$$p = g\,\rho\,h.$$

If H is the height of an atmosphere of density σ, it produces a pressure

$$p = g\,\sigma\,H$$

Hence

$$H = h\frac{\rho}{\sigma}.$$

This is the height of the atmosphere above the place on the *false* supposition that its density is the same at all heights as it is at that place. This height is generally referred to as the *height of the atmosphere supposed of uniform density*, or, more briefly and technically, as the height of the *homogeneous atmosphere*.

Let us for a moment consider what this height (which evidently has nothing to do with the real height of the atmoshere) really represents. From the equation

$$p = g\,\sigma\,H,$$

remembering that σ the density of air is the same thing as the reciprocal of v, the volume of unit of mass, we get

$$H = \frac{p\,v}{g},$$

or H is simply the product $p\,v$ expressed in gravitation measure instead of absolute measure.

Now, by Boyle's law the product of the pressure and the volume at a constant temperature is constant, and by Charles' law this product is proportional to the absolute temperature. For dry air at the temperature of melting ice, and when $g = 32{\cdot}2$,

$$H = \frac{p\,v}{g} = 26\,214 \text{ feet},$$

or somewhat less than five statute miles.

It is well known that Mr Glaisher has ascended in a balloon to the height of seven miles. This balloon was supported by the air, and, though the air at this great height was more than three times rarer than at the earth's surface, it was possible to breathe in it. Hence it is certain that the atmosphere must extend above the height H, which we have deduced from our false assumption that the density is uniform.

But though the density of the atmosphere is by no means uniform through great ranges of height, yet if we confine ourselves to a very small range, say the millionth part of H—that is, about 0·026 feet, or less than the third of an inch—the density will only vary one-millionth part of itself from the top to the bottom of this range, so that we may suppose the pressure at the bottom to exceed that at the top by exactly one-millionth.

Let us now apply this method to determine the height of a mountain by the following imaginary process, too laborious to be recommended, except for the purpose of explaining the practical method:

We shall suppose that we begin at the top of the mountain, and that, besides our barometer, we have one thermometer to determine the temperature of the mercury, and another to determine the temperature of the air. We are also provided with a hygrometer to determine the quantity of aqueous vapor in the air, so that by the thermometer and hygrometer we can calculate H, the height of the homogeneous atmosphere, at every station of our path.

On the top of the mountain, then, we observe the height of the barometer to be p. We now descend the mountain till we observe the mercury in the barometer to rise by one-millionth part of its own height. The height of the barometer at this first station is

$$p_1 = (1{\cdot}000001)\,p.$$

The distance we have descended is one-millionth of H, the height of the homogeneous atmosphere for the observed temperature at the first stage of the descent. Since it is at present impossible to measure pressures, etc., to one-millionth of their value, it does not matter whether H be measured at the top of the mountain or one third of an inch lower down.

Now let us descend another stage, till the pressure again increases one-millionth of itself, so that if p_2 is the new pressure,

$$p_2 = (1{\cdot}000001)\,p_1,$$

and the second descent is through a height equal to the millionth of H_2, the height of the homogeneous atmosphere in the second stage.

If we go on in this way n times, till we at last reach the bottom of the mountain, and if p_n is the pressure at the bottom

$$\begin{aligned} p_n &= (1{\cdot}000001)\,p_{n-1} \\ &= (1{\cdot}000001)^2\,p_{n-2} \\ &= (1{\cdot}000001)^n\,p, \end{aligned}$$

and the whole vertical height will be

$$h = \frac{H_1 + H_2 + \&c. + H_n}{1{,}000{,}000}.$$

If we assume that the temperature and humidity are the same at all heights between the top and the bottom, then $H_1 = H_2 = \&c. = H_n = H$, and the height of the mountain will be

$$= \frac{n}{1{,}000{,}000}H.$$

If we know n, the number of stages, we can determine the height of the mountain in this way. But it is easy to find n without going through the laborious process of descending by distances of the third of an inch, for since $p_n = P$ is the pressure at the bottom, and p that at the top, we have the equation

$$P = (1{\cdot}000001)^n\,p.$$

Taking the logarithm of both sides of this equation, we get

$$\log P = n \log (1{\cdot}000001) + \log p,$$

or

$$n = \frac{\log P - \log p}{\log (1{\cdot}000001)}.$$

Now $\log 1{\cdot}000001 = 0{\cdot}0000004342942648$.

Substituting this value in the expression for h, we get

$$h = \frac{H}{{\cdot}434294} \log \frac{P}{p},$$

where the logarithms are the common logarithms to base 10, or

$$h = 2{\cdot}302585\,H \log \frac{P}{p}.$$

For dry air at the temperature of melting ice H = 26,214 feet; hence

$$h = \log \frac{P}{p} \times \left\{ 60360 + (\theta - 32^\circ)\,(122{\cdot}68) \right\}$$

gives the height in feet for a temperature θ on Fahrenheit's scale

For rough purposes, the difference of the logarithms of the heights of the barometer multiplied by 10 000 gives the difference of the heights in fathoms of six feet.

THE PROPAGATION OF WAVES.

The following method of investigating the conditions of the propagation of waves is due to Prof. Rankine.* It involves only elementary principles and operations, but leads to results which have been hitherto obtained only by operations involving the higher branches of mathematics.

The kind of waves to which the investigation applies are those in which the motion of the parts of the substance is along straight lines parallel to the direction in which the wave is propagated, and the wave is defined to be one which is propagated with constant velocity, and the type of which does not alter during its propagation.

In other words, if we observe what goes on in the substance at a given place when the wave passes that place, and if we suddenly transport ourselves a certain distance forward in the direction of propagation of the wave, then after a certain time we shall observe exactly the same things occurring in the same order in the new place, when the wave reaches it. If we travel with the velocity of the wave, we shall therefore observe no change in the appearance presented by the wave as it travels along with us. This is the characteristic of a wave of permanent type.

We shall first consider the quantity of the substance which passes in unit of time through unit of area of a plane which we shall suppose fixed, and the perpendicular to the direction of motion.

Let u be the velocity of the substance, which we shall suppose to be uniform, then in unit of time a portion of the substance whose length is u passes through any section of a plane perpendicular to the direction of motion. Hence the volume which passes through unit of area is represented by u.

Now let Q be the quantity of the substance which passes through, and let v be the volume of unit of mass of the substance, then the whole volume is Qv, and this, by what we have said, is equal to u, the velocity of the substance. If the plane, instead of being fixed, is moving forward with a velocity U, the quantity which passes through it will depend, not on the absolute velocity, u, of the substance, but on the relative velocity, $u - U$, and if Q is the quantity which passes through the plane from *right* to *left*,

$$Qv = U - u \quad . \; . \; . \; . \; . \; . \; . \; . \; . \quad (1)$$

Let A be an imaginary plane moving from *left* to *right* with velocity U, and let this be the velocity of propagation of the wave, then, as the plane A travels along, the values of u and all other quantities belonging to the wave at the plane A remain the same. If u_1 is the absolute velocity of the substance at A, v_1 the volume of unit of mass, and p_1 the pressure, all these quantities will be constant, and

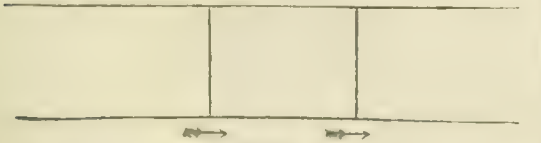
Fig. 21

$$Q_1 v_1 = U - u_1 \quad . \; . \; . \; . \; . \; . \; . \; . \; . \quad (2)$$

If B be another plane, traveling with the same velocity U, and if Q_2 u_2 v_2 p_2 be the corresponding values at B

$$Q_2 v_2 = U - u_2 \quad . \; . \; . \; . \; . \; . \; . \; . \; . \quad (3)$$

The distance between the planes A and B remains invariable, because they travel with the same velocity. Also the quantity of the substance intercepted between them remains the same, because the density of the substance at corresponding parts of the wave remains the same as the wave travels along. Hence the quantity of matter which enters the space between A and B at A must be equal to that which leaves it at B, or

$$Q_1 = Q_2 = Q \text{ (say)} \quad . \; . \; . \; . \; . \; . \; . \; . \quad (4)$$

Hence

$$u_1 = U - Qv_1 \quad u_2 = U - Qv_2 \quad . \; . \; . \quad (5)$$

so that when we know U and Q and the volume of unit of mass, we can find u_1 and u_2.

Let us next consider the forces acting on the matter contained between A and B. If p_1 is the pressure at A, and p_2 that at B, the force arising from these pressures tending to increase the momentum from left to right is $p_2 - p_1$.

This is the momentum generated in unit of time by the external pressures on the portion of the substance between A and B.

Now we must recollect that, though corresponding points of the substance in this interval are always moving in the same way, the matter itself between A and B is continually changing, a quantity Q entering at A, and an equal quantity Q leaving at B.

Now the portion Q which enters at A has a velocity u_1, and therefore a momentum Qu_1, and that which issues at B has a velocity u_2, and thereforh a momentum Qu_2.

Hence the momentum of the entering fluid exceeds that of the issuing fluid by

$$Q(u_1 - u_2).$$

The only way in which this momentum can be produced is by the action of the external pressures p_1 and p_2; for the mutual actions of the parts of the substance cannot alter the momentum of the whole. Hence we find

$$p_1 - p_2 = Q(u_1 - u_2) \quad . \; . \; . \; . \; . \; . \quad (6)$$

Substituting the values of u_1 and u_2 from equation (5), we find

$$p_1 - p_2 = Q^2(v_2 - v_1) \quad . \; . \; . \; . \; . \; . \quad (7)$$

Hence

$$p_1 + Q^2 v_1 = p_2 + Q^2 v_2. \quad . \; . \; . \; . \; . \; . \quad (8)$$

Now the only restriction on the position of the plane B is that it must remain at a constant distance behind A, and whatever be the distance between A and B, the above equation is always true.

Hence the quantity $p + Q^2v$ must continue constant during the whole process involved in the passage of the wave. Calling this quantity P, we have

$$p = P - Q^2 v \quad . \; . \; . \; . \; . \; . \; . \; . \; . \quad (9)$$

or the pressure is equal to a constant pressure, P, diminished by a quantity proportional to the volume v.

This relation between pressure and volume is not fulfilled in the case of any actual substance. In all substances it is true that as the volume diminishes the pressure increases, but the increase ef pressure is never strictly proportional to the diminution of volume. As soon as the diminution of volume becomes considerable, the pressure begins to increase in a greater ratio than the volume diminishes.

But if we consider only small changes of volume and pressure, we may make use of our former definition of elasticity at p. 107—namely, the ratio of the number expressing the increment of pressure to that expressing the voluminal compression, or, calling the elasticity E,

$$E = v\frac{p_2 - p_1}{v_1 - v_2} = vQ^2 \text{ by equation (7)} \quad (10)$$

where v is the volume of unit of mass, and since v_1 and v_2 are very nearly equal, we may take either for the value of [illegible]. Again, if v is the volume of unit of mass in those parts of the substance which are not disturbed by the wave, and for which, therefore, $u = 0$,

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* *Phil. Trans.* 1870: "On the Thermodynamic Theory of Waves of Finite Longitudinal Disturbance."

$$U = Q v \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (11)$$

Hence we find

$$U^2 = Q^2 v^2 = E v \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (12)$$

which shows that the square of the velocity of propagation of a wave of longitudinal displacement in any substance is equal to the product of the elasticity and the volume of unit of mass.

In calculating the elasticity we must take into account the conditions under which the compression of the substance actually takes place. If, as in the case of sound waves, it is very sudden, so that any heat which is developed cannot be conducted away, then we must calculate the elasticity on the supposition that no heat is allowed to escape.

In the case of air or any other gas the elasticity at constant temperature is numerically equal to the pressure. If we denote, as usual, the ratio of the specific heat at constant pressure to that at constant volume by the symbol γ, the elasticity when no heat escapes is

$$E = \gamma p \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (13)$$

Hence, if U is the velocity of sound,

$$U^2 = \gamma p v \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (14)$$

We know that when the temperature is the same the product $p v$ remains constant. Hence the velocity of sound is the same for the same temperature, whatever be the pressure of the air.

If H is the height of the atmosphere supposed homogeneous—that is to say, the height of a column of the same density as the actual density, the weight of which would produce a pressure equal to the actual pressure—then, if the section of the column is unity, its volume is H, and if m is its mass, $H = m v$.

Also the weight of this column is $p = m g$, where g is the force of gravity.

Hence

$$p v = g H$$

and

$$U^2 = g \gamma H.$$

The velocity of sound may be compared with that of a body falling a certain distance under the action of gravity. For if V is the velocity of a body falling through a height s, $V^2 = 2 g s$.

If we make V = U, then $s = \frac{1}{2} \gamma H$.

At the temperature of melting ice H = 26,214 feet if the force of gravity is [illegible].

At the same temperature the velocity of sound in air is [illegible] feet per second by experiment.

The square of this is 1 188 100, whereas the square of the velocity due to half the height of the homogeneous atmosphere is [illegible]. Hence by means of the known velocity of sound we can determine [illegible] to be 1 [illegible].

The height of the homogeneous atmosphere is proportional to the temperature reckoned from absolute zero. Hence the velocity of sound is proportional to the square root of the absolute temperature. In several of the more perfect gases the value of [illegible] to be [illegible]. Hence in these [illegible] the velocity of sound is inversely as the square root of [illegible] compared with air.

[illegible]

$$p - Q^2 v$$

[illegible] but in the case of very violent sounds and other disturbances of the air the changes of p and v may be so great that this approximation ceases to be near the truth. To understand what takes place in these cases we must remember that the changes of p and v are not proportional to each other, for in almost all substances p increases faster for a given diminution of v as p increases and v diminishes.

Hence Q, which represents the mass of the substance traversed by the wave, will be greater in those parts of the wave where the pressure is great than in those parts where the pressure is small; that is, the condensed portions of the wave will travel faster than the rarified portions. The result of this will be that if the wave originally consists of a gradual condensation followed by a gradual rarefaction, the condensation will become more sudden and the rarefaction more gradual as the wave advances through the air, in the same way and for nearly the same reason as the waves of the sea on coming into shallow water become steeper in front and more gently sloping behind, till at last they curl over on the shore.

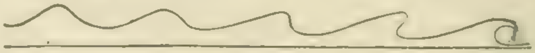


Fig. [illegible]

DIFFUSION, CONDUCTION AND VISCOSITY.

Coefficient of Viscosity

Sec. 18. The relation between diffusion and viscosity may be explained as follows. [illegible]

[illegible]

CONDUCTION OF HEAT.

[illegible]

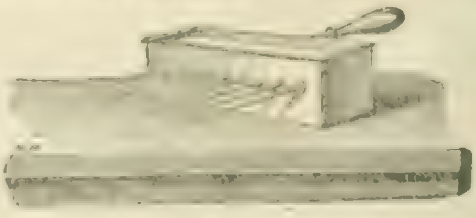


Fig. 18

[illegible] of the ordinary forms of [illegible] experiment [illegible]

Experiments of [illegible] [illegible]

[illegible]

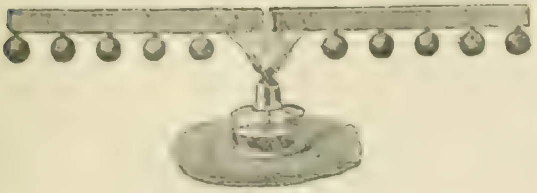


Fig. 49.

[illegible] wax [illegible] sides and [illegible] temperature [illegible] And [illegible] the part [illegible] copper at not [illegible]

[illegible] be measured by the [illegible] per unit of [illegible] of the [illegible] of tempera-[illegible] below. [illegible]

[illegible] the foot, the minute, [illegible]

[illegible] conductivity to the [illegible] Maxwell's Theory [illegible] Forbes, [illegible] temperature [illegible] the following [illegible]

[illegible]

[illegible]

[illegible] or similar units, were [illegible] a repetition and extension of Forbes' experi-[illegible] of the Brit-[illegible] of Forbes.

[illegible]

[illegible] seem to improve in ther-[illegible]

[illegible] as defined [illegible] of the [illegible] substance, [illegible] indicated [illegible]

[illegible] of Forbes, with some [illegible]

[illegible] AND COPPER

[illegible]

[illegible] Copper.

[illegible] Forbes. [illegible] Ångström [illegible] Tait. [illegible]

[illegible] with [illegible]

[illegible] P. G. Tait, [illegible]

[illegible] earth's surface. [illegible]

$$\frac{dv}{dt} = \frac{d}{dx}\left(\frac{dv}{dx}\right)\delta x.$$

[illegible] denotes the rate at which [illegible] to a slab of crust a [illegible] whence, if c be the thermal [illegible] of the crust, we have as another ex-[illegible] to the slab, per [illegible]

[illegible] expressions for the same quantity of heat [illegible]

When there is a steady state of temperature we have

where

$$\frac{d}{dx}\left(\frac{dv}{dx}\right) = 0, \text{ or } v = A + Bx.$$

Here A is the surface temperature and B is the rate at which temperature rises per foot as we descend.

Hence [illegible] near the earth's surface, [illegible] uniform rise of tempera-[illegible] per foot of descent, if the strata are all of the same conducting power.

If the conducting power be different in different strata, the rise of temperature per foot is greater in [illegible] proportion as the con-[illegible] is less. It is [illegible] to be observed that, as we are deal-[illegible] with a steady state of temperature, the thermal capacity of the crust does not appear in our equation.

The quantity of heat which, in one minute, passes through a square foot of area of any stratum is [illegible] the product of the conductivity of the rate of increase of temperature per foot of depth.

This is of no consequence in tropical or temperate regions, but towards the poles it forms a [illegible] among the causes which prevent the formation of an ice crust of more than some 400 or 500 feet in thickness.

[illegible] solutions of the equation, such as are due to [illegible] any number of which solutions may exist simultaneously because the equation is linear, are necessarily of the form

$$v_0 \epsilon^{-px} \cos\left(\frac{2\pi}{T}t - px + A\right),$$

where T is the period of the disturbance, and $2v_0$ its range at the surface. If we substitute this value in the equation of section 249 we find the condition

$$p^2 = \frac{\pi c}{kT}.$$

But the ranges of temperature at successive equal increments of depth diminish in geometrical progression. The factor for unit of depth is

$$\epsilon^{-p} \text{ or } \epsilon^{-\sqrt{\frac{\pi c}{kT}}}.$$

[illegible] temperature arrives at any depth is later in simple proportion as the depth is greater.

The rate at which the crest of the periodic heat wave travels is

$$\frac{2\pi}{pT} = 2\sqrt{\frac{\pi k}{cT}}.$$

It is therefore directly as the square root of the conductivity, and inversely as the square roots of the period and of the thermal capacity.

As the result of careful experiment we find the following results:

Conductivity of [illegible]

Conductivity of [illegible] 0·011.

Conductivity of [illegible]

Sir W. Thomson [illegible] occurred in the [illegible] than [illegible] years [illegible] of molten matter on which [illegible]

[illegible] energy of the system [illegible] and if the [illegible] the total [illegible] would not depend [illegible]

[illegible] thin stratum close to the surface [illegible] the interior of the [illegible] due to this cause will be pro-[illegible]

[illegible] two parts: the [illegible] of the fluids and [illegible] The second is propor-[illegible]

It is on the [illegible] of the energy that the phenomena of [illegible] depend.

[illegible] the greater the [illegible] according to Plateau, about [illegible] per square metre [illegible] This is the amount of work required to [illegible] whose [illegible] ficial extent is one square metre. As the soap bubble has two surfaces exposed to air the energy of a single surface is only 2·8 gramme-metres per square metre.

We shall call this the superficial energy of the soap bubble. It is measured by the energy in unit of surface, and its dimensions when expressed in dynamical measure are therefore:

$$\frac{\text{energy}}{\text{area}} = \frac{L^2 M}{T^2} \cdot \frac{1}{L^2} = \frac{M}{T^2}$$

or it is of one dimension as regards mass, and of two dimensions inversely as regards time, and it is independent of the unit of length. Superficial energy depends on the nature of both the media of which the surface is a boundary. The media must be such as do not mix with each other, otherwise diffusion occurs, and the surface of separation becomes indistinct, but there is a coefficient of superficial energy for every surface which separates two liquids which do not mix, [illegible] for the surface which separates a liquid [illegible] which will dissolve the [illegible]. There is also a coefficient of superficial energy for the surface separating a gas and a solid, or two solids, but as any two gases diffuse into each other, they can have no surface of separation.

Sec. 7.—*Superficial Tension.*—When the area of the surface is increased in any way, work has to be done, and when the surface is allowed to contract, it does work on other bodies. Hence it acts like a stretched sheet of india-rubber, and exerts a tension of the same kind. The only difference is, that the tension in the sheet of india-rubber depends on the amount of stretching, and may be greater in one direction than in a direction at right angles to it, whereas the tension of the soap bubble remains the same however much the film is extended, and the tension at any point is the same in all directions.

If we draw a straight line P Q across the surface A B D C, and if the whole force exerted by the surface across the line P Q is F, then the superficial tension is measured by the tension across unit of length of the line P Q; or, since F is the tension across the whole line, if T is the superficial tension across unit of length,

$$F = T . PQ.$$

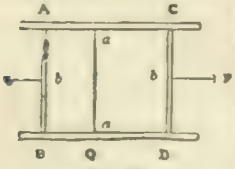


Fig. 20.

Now let us suppose that the lines A B and C D were originally in contact and that the surface A B D C was produced by drawing C D away from A B by the action of the force F.

If we suppose A B and B C to be rods wet with soap-suds, placed between two parallel rods A C and B D and then drawn asunder, the soap film A B D C will be formed. If S is the superficial energy of the film per unit of area, then the work done in drawing it out will be S . AB . AC. But if F is the force required to draw A B from C D the same work may be written F . AC, or, putting for F its value in terms of T and equating the two expressions for the work,

$$S . AB . AC = T . PQ . AC$$

$$\text{or} = T . AB . AC$$

Hence

$$S = T,$$

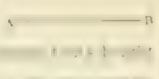
or the numerical value of the superficial energy per unit of area is equal to that of the superficial tension per unit of length. This quantity is generally called the Coefficient of Capillarity because it was first investigated with reference to the ascent of liquids in capillary tubes. See CAPILLARY ACTION.

When the tension of the surface separating the two fluids is greater than the sum of the tensions of the surfaces separating [illegible] then the surface of separation of the two [illegible] T_{ab} [illegible]

[illegible]

Sec. 8.—*Definition of the Coefficient of Viscosity.*—Consider a [illegible]

Fig. 21.



[illegible]

$$F = [illegible]$$

[illegible] rectangular area of length [illegible]

$$L = [illegible]$$

and

$$\mu = \frac{Rc}{Vab}$$

If V, a, b and c are each unity, then μ = R.

Definition.—The viscosity of a substance is measured by the tangential force on the unit of area of either of two horizontal planes at the unit of distance apart, one of which is fixed, while the other moves with the unit of velocity, the space between being filled with the viscous substance.

The dimensions of μ may be easily determined. If R is the moving force which would generate a certain velocity v in the mass M in the time t, then $R = \frac{Mv}{t}$, and

$$\mu = \frac{Mvc}{tVab}$$

Here a, b, c are lines, and V and v are velocities, so that the dimensions of μ are $[M L^{-1} T^{-1}]$, where M, L and T are the units of mass, length and time.

When we wish to express the absolute forces called into play by the viscosity of a substance, we must use the ordinary unit of mass (a pound, a grain, or gramme), but if we wish only to investigate the motion of the viscous substance, it is convenient to take as our unit of mass that of unit of volume of the substance itself. If ρ is the density of the substance, or the mass of unit of volume, the viscosity measured in this kinematic way is related to μ, its value by the former, or dynamical method, by the equation

$$\mu = \nu \rho$$

The dimensions of ν, the kinematic viscosity, are $[L^2 T^{-1}]$.

Investigations of the value of viscosity have been made for solids by Sir W. Thomson, for liquids by Poiseuille, Graham, O. E. Meyer and Helmholtz, and for gases by Graham, Stokes, O. E. Meyer and myself.

I find the value of μ for air at θ° Centigrade to be

$$\mu = \cdot0001878 (1 + \cdot00366\theta),$$

the centimetre, gramme, and second being units.

In British measure, using the foot, the grain, and the second, and Fahrenheit's thermometer, this becomes

$$\mu = 0\cdot0179 (461 + \theta).$$

The viscosity μ is proportional to the absolute temperature, and independent of the pressure, being the same for a pressure of half an inch as for a pressure of thirty inches of mercury.

The kinematic measure, ν, of the viscosity is found by dividing μ by the density. It is, therefore, directly proportional to the square of the absolute temperature, and inversely proportional to the pressure.

The value of μ for hydrogen is less than half that for air. Oxygen, on the other hand, has a viscosity greater than that of air. That of carbonic acid is less than that of air.

THE DIFFUSION OF FLUIDS.

Diffusion of fluids.

There are many liquids which, when they are intermingled by being stirred together, remain mixed, and, though their densities are different, they do not separate from each other as oil and water do. When liquids which are capable of being permanently mixed are placed in contact with each other, the process of mixture goes on in a slow and gradual manner, and continues till the composition of the mixture is the same in every part.

Thus, if we put a strong solution of any salt in the lower part of a tall glass jar, we may, by pouring water in a gentle stream on a small wooden float, fill up the jar with water without disturbing the solution. The process of diffusion will then go on between the water and the solution, and will continue for weeks or months, according to the nature of the salt and the height of the jar.

If the solution of the salt is strongly colored, as in the case of sulphate of copper, bichromate of potash, etc., we may trace the process of diffusion by the gradual rise of the color into the upper part of the jar, and the weakening of the color in the lower part. A more exact method is that employed by Sir William Thomson, of placing a number of glass bulbs or beads in the jar, whose specific gravities are intermediate between that of the strong solution and that of water. At first the beads all float in the surface of separation between the two liquids, but as diffusion goes on they separate from each other and indicate by their positions the specific gravity of the mixture at various depths. It is necessary to expel the air very thoroughly from both liquids by boiling before commencing this experiment. If this is not done, air separates from the liquids, and attaches itself in the form of small bubbles to the specific gravity beads, so that they no longer indicate the true specific gravity of the fluid in which they float. In order to determine the strength of the solution at any point, as indicated by one of the beads, we have only to measure the amount of the salt which must be added to a known quantity of pure water, in order to make the bead swim in the mixture.

Investigations of Voit.

Voit has investigated the process of diffusion of a solution of sugar by passing a ray of plane polarized light horizontally through the liquid at various depths. The solution of sugar causes the plane of polarization to rotate through a certain angle, and from this angle the percentage of sugar in any given stratum of the fluid can be determined without disturbing the vessel.

There are many pairs of liquids which do not diffuse into each other, and there are others in which the diffusion, after going on for some time, stops as soon as a certain small proportion of the heavier liquid has become mixed with the lighter, and a small proportion of the lighter has become mixed with the heavier.

In the case of gases, however, there is no such limitation. Every gas diffuses into every other gas, so that, however different the specific gravities of two gases may be, it is impossible to keep them from mixing if they are placed in the same vessel, even when the denser gas is placed below the rarer.

Investigations of Priestley and Graham.

The fact of the diffusion of gases was first remarked by Priestley. The laws of the phenomena were first investigated by Graham. The rate at which the diffusion of any substance goes on is in every case proportional to the rate of variation of the strength of that substance in the fluid as we pass along the line in which the diffusion takes place. Each substance in the mixture flows from places where it exists in greater quantity to places where it is less abundant.

The law of diffusion of matter is therefore of exactly the same form as that of the diffusion of heat by conduction, and we can at once apply all that we know about the conduction of heat to assist us in understanding the phenomena of the diffusion of matter.

To fix our ideas, let us suppose the fluid to be contained in a vessel with vertical sides, and let us consider a horizontal stratum of the fluid of the thickness c. Let the composition of the fluid at the upper surface of this stratum be denoted by A, and that of the fluid at the lower surface of the stratum by B.

The effect of the diffusion which goes on in the stratum will be the same as if a certain volume of fluid of composition A had passed downwards through the stratum while an equal volume of fluid of composition B had passed upwards through the stratum at the same time.

Let d be the thickness of the stratum which either of these equal volumes of fluid would form in the vessel, then d is evidently proportional:—

1st. To the time of diffusion.

2nd. Inversely to the thickness of the stratum through which the diffusion takes place.

3rd. To a coefficient depending on the nature of the interdiffusing substances. Hence if t is the time of diffusion and k the coefficient of diffusion,

$$d = k\frac{t}{c} \qquad \text{or} \qquad k = \frac{cd}{t}$$

We thus find that the dimensions of k, the coefficient of diffusion, are equal to the square of a length divided by a time.

Hence, in the experiment with the jar, the vertical distance between strata of corresponding densities, as indicated by the beads which float in them, varies as the square root of the time from the beginning of the diffusion.

When the mixture of two liquids or gasses is effected in a more rapid manner by agitation or stirring, the only effect of the mechanical disturbance is to increase the area of the surfaces through which diffusion takes place. Instead of the surface of separation being a single horizontal plane, it becomes a surface of many convolutions, and of great extent, and in order to effect a complete mixture, the diffusion has to extend only over the distance between the successive convolutions of this surface instead of over half the depth of the vessel.

TABLE 1.—Of the SPECIFIC HEAT of SOLID and LIQUID BODIES, being the number of Units of Heat necessary to heat One Pound of the Body 1° Fahrenheit.

	SPECIFIC HEAT	AUTHORITY.
METALS.—		
Cast Iron	·12983	Regnault.
Wrought Iron	·11379	"
Zinc	·09555	"
Copper	·09515	"
Brass	·09391	"
Silver	·05701	"
Tin	·05623	"
Mercury	·03332	"
Gold	·03244	"
Platina	·03243	"
Lead	·03140	"
Bismuth	·03084	"
WOODS.—		
Pine	·650	Mayer.
Oak	·570	"
Birch	·480	"
EARTHS, ETC.		
Ice	·504	Person.
Beeswax	·450	Gadolin.
Spermaceti	·320	Irvine.
Coal	·2777	Crawford.
Marble	·21585	Regnault.
Chalk	·21485	"
Sulphur	·20259	"
Coke	·20085	"
Glass	·19768	"
Burnt Clay	·175	Gadolin.
LIQUIDS.—		
Water at 32°	1·000	"
Alcohol (sp. gr. ·793)	·622	Dalton.
Ether, Sulphuric	·477	Regnault.
Oil of Turpentine	·472	Despretz.
Petroleum	·434	Regnault.
Olive oil	·3096	Lavoisier.

TABLE 2.—Of the SPECIFIC HEAT of WATER at different Temperatures, according to the Experiments of Regnault.

Temperature by an Air-Thermometer Fahr.	Difference from 32°.	Units of Heat to raise 1 lb. of Water from 32° to the given Temperature.	Mean Specific Heat between 32° and the given Temperature.	Specific Heat at the given Temperature.
32°	0	0·0000	....	1·0000
50	18	18·0036	1·0002	1·0005
68	36	36·0180	1·0005	1·0012
86	54	54·0468	1·0009	1·0020
104	72	72·0918	1·0013	1·0030
122	90	90·1566	1·0017	1·0042
140	108	108·2466	1·0023	1·0056
158	126	126·3780	1·0030	1·0072
176	144	144·5076	1·0035	1·0089
194	162	162·6858	1·0042	1·0109
212	180	180·9000	1·0050	1·0130
230	198	199·1538	1·0058	1·0153
248	216	217·4508	1·0067	1·0177
266	234	235·7946	1·0076	1·0204
284	252	254·1870	1·0087	1·0232
302	270	272·6316	1·0097	1·0262
320	288	291·1338	1·0109	1·0294
338	306	309·6936	1·0121	1·0328
356	324	328·3164	1·0133	1·0364
374	342	347·0022	1·0146	1·0401
392	360	365·7600	1·0160	1·0440
410	378	384·5880	1·0174	1·0481
428	396	403·4916	1·0189	1·0524
446	414	422·4744	1·0204	1·0568
(1)	(2)	(3)	(4)	(5)

TABLE [illegible].—Of the RESULTS of EXPERIMENTS on the VELOCITY of SOUND in AIR [illegible].

Observers, [illegible]	[illegible] Stations.		Observed Velocity [illegible]	Height [illegible]	Half the height of Homogeneous Atmosphere	Ratio H/[illegible]
	[illegible]	M[illegible]				
Benzenberg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1·4[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
M[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A[illegible]	61034	[illegible]	[illegible]	[illegible]	13110	[illegible]
[illegible]	[illegible]	2,549	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	18[illegible]	[illegible]	[illegible]
Mean of the [illegible]	....	....	[illegible]3	181[illegible]	[illegible]	[illegible]

TABLE [illegible].—Of [illegible] Heat of Gases and Vapours.

Relative Specific Gravity, Air = 1·0.	Gas, &c.	Apparent Specific Heat with pressure constant by Regnault Experiments.	Normal Specific Heat with Volume constant Calculated.	Ratio of Specific Heat [illegible] Specific Heat with Volume Constant.	
				[illegible]	[illegible]
[illegible]	Air	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Oxygen ...	[illegible]	[illegible]	[illegible]	1·415
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1·338
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	..
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE [illegible].—Of the [illegible] of [illegible], according to [illegible].

	[illegible]	
[illegible]	[illegible]	M. [illegible].
[illegible]	[illegible]	"
[illegible]	[illegible]	"
[illegible]	[illegible]	"
[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]

TABLE 6.—Of the VARIATION in the SPECIFIC HEAT of BODIES at different Temperatures.

	BETWEEN 32° AND 212°.	BETWEEN 32° AND [illegible].	BETWEEN 32° AND 572°.
Mercury, Dulong, [illegible]	[illegible]	..	[illegible]
[illegible] "	[illegible]		[illegible]
Z[illegible] "	[illegible]		[illegible]
[illegible] "	[illegible]	·1013	......
[illegible] "	[illegible]	[illegible]	[illegible]
[illegible] "	[illegible]		[illegible]
[illegible] "	[illegible]		[illegible]
[illegible] "	[illegible]		[illegible]

	At [illegible]	At 572	At [illegible]	At 12[illegible]	At 18[illegible]	At 2192°
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 7.—Of the ATOMIC WEIGHT of METALS [illegible] by their SPECIFIC HEAT.

M[illegible]	Specific Heat, S. Regnault.	Atomic Weights, W.	Product, S × W.
Wrought iron	[illegible]	[illegible]	[illegible]
Z[illegible]	[illegible]	[illegible]	[illegible]
C[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Lead	[illegible]	[illegible]	[illegible]
Bismuth	[illegible]	[illegible]	41·03
Sulphur	[illegible]	[illegible]	[illegible]
Mean			[illegible]

TABLE 8.—Of the LATENT HEAT of [illegible] the [illegible] of different Bodies [illegible].

	[illegible]	[illegible]	Authority.
[illegible] Water	[illegible]	[illegible]	Person.
Sulphur	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible]	[illegible]	[illegible]	"
[illegible]	2[illegible]	[illegible]	Clement.
[illegible]	78·7	[illegible]	Irvine.
[illegible]	[illegible]	[illegible]	"

TABLE 9.—Of the M[illegible] of ALLOYS of BISMUTH, [illegible].

Temp.	Bismuth.	Lead.	Tin.	Temp.	Lead.	Tin.
[illegible]	8	5	3	[illegible]	4	22
[illegible]	8	[illegible]	3	[illegible]	[illegible]	4
[illegible]	8	[illegible]	[illegible]	[illegible]	11	8
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	16
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	8
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	8
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4
[illegible]		4	[illegible]	[illegible]	[illegible]	4
[illegible]		4	[illegible]	[illegible]		4
[illegible]		4	[illegible]	[illegible]		4
[illegible]		4	[illegible]	[illegible]	[illegible]	4

TABLE [illegible].—Of [illegible] according to [illegible].

		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE 11.—Of the Temperature of the Boiling Point of various Liquids under different Pressures, deduced from the Experiments of Regnault.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 12.—[illegible]

Number of Heats	Observed Contractions.		
	Per Heat.	Total.	In parts of the Length.
		inches	
1	[illegible]	[illegible]	[illegible]
2	[illegible]	1	[illegible]
3	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]
5	[illegible]	2	[illegible]
6	[illegible]	[illegible]	[illegible]
7	[illegible]	3	[illegible]
8	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]
10	[illegible]	4	[illegible]
11	[illegible]	5	[illegible]
12	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE 13.—Of the Expansion of Bodies by Heat for 1° Fahrenheit [illegible] Expressed per Degree between 32° and 212° [illegible] being 1·0.

	Expansion for 1° Fahrenheit.		No. of Authorities
	In Length	In Volume	
Fire Brick	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	2
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	·000013157	1
* [illegible]	[illegible]	[illegible]	5
[illegible]	[illegible]	[illegible]	2
[illegible]	[illegible]	[illegible]	1
Cast Iron	[illegible]	[illegible]	3
[illegible]	[illegible]	[illegible]	4
Wrought Iron	[illegible]	[illegible]	4
[illegible]	[illegible]	[illegible]	2
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	4
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	6
[illegible]	[illegible]	[illegible]	1
Lead	[illegible]	[illegible]	2
[illegible]	[illegible]	[illegible]	1
[illegible]	[illegible]	[illegible]	3
[illegible]	[illegible]	[illegible]	1
Absolute Expansion of Liquids.			
* Mercury		[illegible]	7
* [illegible]		[illegible]	1
[illegible]		[illegible]	1
[illegible]		[illegible]	1
Sulphuric Ether at 32°.		[illegible]	1
[illegible]		[illegible]	1
Linseed Oil, 32° to 212°		[illegible]	1
Expansion in Glass.			
Mercury		[illegible]	[illegible]
[illegible]		[illegible]	1
[illegible]		[illegible]	1
[illegible]		[illegible]	1
Sulphuric Ether at [illegible]		[illegible]	1
[illegible]		[illegible]	1
Linseed Oil, [illegible] 212°		[illegible]	1

* See Table 22. * See Table 21.

TABLE 14.—Of the Contraction of a Bar of Wrought Iron 40 inches long, by repeated Heating and Quenching.

Number of Heats	Observed Contractions in Inches.		Reduced Results.		
	Per Heat	Total	Contraction per Heat	Total Contraction	
			Inches	Inches	In parts of the Length
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	·0190	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	·0155	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 15.—Of the Variation in the Boiling Point of Water, with Variations in the Barometric Pressure, calculated from Regnault's Experiments.

Temperature of Steam.	Pressure in Inches of Mercury at 32°.	Temperature of Steam.	Pressure in Inches of Mercury at 32°.	Temperature of Steam.	Pressure in Inches of Mercury at 32°.
°		°		°	
210·0	28·746	211·4	29·553	212·8	30·381
210·1	28·804	211·5	29·611	212·9	30·441
210·2	28·862	211·6	29·669	213·0	30·502
210·3	28·919	211·7	29·728	213·1	30·563
210·4	28·976	211·8	29·787	213·2	30·624
210·5	29·033	211·9	29·846	213·3	30·685
210·6	29·090	212·0	29·905	213·4	30·746
210·7	29·147	212·1	29·964	213·5	30·807
210·8	29·205	212·2	30·023	213·6	30·868
210·9	29·263	212·3	30·082	213·7	30·929
211·0	29·321	212·4	30·141	213·8	30·990
211·1	29·379	212·5	30·201	213·9	31·051
211·2	29·437	212·6	30·261	214·0	31·112
211·3	29·495	212·7	30·321	214·1	31·173

TABLE 16. Of the Contraction of Metals in Casting.

	Length of Pattern.		Contraction.			
			Total in Inches.	Per Foot.		
				Of Pattern	Of Casting	
	ft.	in.		In.	In.	
Cast iron girder	21	8¼	2·11	[illegible]	·1246	
" "	16	9	2·05	[illegible]	[illegible]	
Gun metal bar.	5	[illegible]	1·0	[illegible]	[illegible]	Maximum.
"	5	[illegible]	·936	[illegible]	·1676	
"			·97	[illegible]	·1737	
"	6	0¼	1·0	[illegible]	[illegible]	
"	5	[illegible]	·92	[illegible]	·1695	
"	"		·90	[illegible]	[illegible]	
"	"		·88	[illegible]	[illegible]	
"	"		·84	·1526	[illegible]	Minimum.
"	....		.....	·1607	·1622	Mean of 8.
Copper and Tin, Copper 1·3, Tin 10	5	[illegible]	·895	·1623	·1645	Maximum
" "	"		·880	·1595	·1617	
" "	"		·880	·1595	·1617	
" "	"		·855	·1550	·1570	Minimum
" "	"		....	·1591	·1612	Mean of 4.
Yellow Brass....	2	[illegible]	·5	·1811	·1839	
Copper	7	10	1·54	·1948	·1980	Minimum.
"	7	[illegible]	1·465	·1972	·2005	
"	"		1·465	·1972	·2005	Maximum
"	......		....	·1954	·1996	Mean of 4.
Lead	2	0	·21	[illegible]	[illegible]	
Zinc, cast in iron mold ..	2	[illegible]	·455	·2257	·2301	Minimum.
" "	"		·465	·2307	·2352	Maximum.
" "	...			·2282	·2326	Mean of 2

TABLE 17.—Of the BOILING POINTS of various SALTS, at ordinary Atmospheric Pressure, from the Experiments of M. LEGRAND and others.

			Temperature of Ebullition.	Weight of Salt in 100 lbs. of Water.
			°	lbs.
Saturated solution of	Chlorate of Potassa	..	[illegible]	[illegible]
..	..	Carbonate of Soda	[illegible]	[illegible]
..	..	Phosphate of Soda	[illegible]	[illegible]
..	..	Chloride of Potassium	[illegible]	[illegible]
..	..	Common Salt	[illegible]	41·20
..	..	Neutral Tartrate of Potassa	[illegible]	[illegible]
..	..	Nitre, or Saltpetre	[illegible]	[illegible]
..	..	Nitrate of Soda	[illegible]	[illegible]
..	..	Acetate of Soda	[illegible]	[illegible]
..	..	Carbonate of Potash	[illegible]	[illegible]
..	..	Nitrate of Lime	[illegible]	[illegible]
..	..	Acetate of Potassa	[illegible]	[illegible]
..	..	Chloride of Calcium	[illegible]	[illegible]
..	..	Nitrate of Ammonia	[illegible]	Infinite

TABLE 18.—Of the LATENT HEAT of VAPORIZATION, being the number of Units of Heat required to convert Liquids from their respective Boiling Points to Vapor, under a Pressure of 30 inches of Mercury.

	Latent Heat in Units.	Increase of Temperature of Liquid if Heat had not become Latent.	
		°	
Water	966	966	Regnault.
Alcohol	457	735	Ure.
Ether	313	473	..
Oil of Turpentine	184	310	..
Naphtha	184	413	..

TABLE 19.—Of the CONTRACTION in CASTING SPUR WHEELS in Cast Iron.

External Diameter of Wheel Casting.	Pitch in Inches.	Width of Teeth in Inches.	Contraction.		
			Total in Inches.	Per Foot	
				Of Casting.	Of Pattern.
ft. in.				inches.	inches.
10 [illegible]	3½	12	[illegible]	[illegible]	[illegible]
6 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5 [illegible]	[illegible]	11	[illegible]	[illegible]	[illegible]
5 [illegible]	[illegible]	11	[illegible]	[illegible]	[illegible]
2 [illegible]	[illegible]	[illegible]	11	[illegible]	[illegible]
2 [illegible]	[illegible]	9	[illegible]	[illegible]	[illegible]

TABLE 20.—Of the VOLUME, SPECIFIC GRAVITY, EXPANSION and WEIGHT of WATER at different Temperatures.

Tem. Fahr.	Volume.	Specific Gravity.	Weight of a Cubic Foot in Pounds.	Expansion for 1° between the different Temperatures.
°				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 21.—Of the HEAT required to convert WATER to STEAM of different PRESSURES.

Pressure above the Atmosphere in lbs. per Square Inch.	Temperature of the Steam.	Units per lb. Water.	
		Latent Heat.	Total Heat from 32°.
	°		
7	[illegible]	950	1152
15	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	1160
25	[illegible]	[illegible]	1163
30	274	[illegible]	1165
45	[illegible]	[illegible]	1171
60	307	[illegible]	1175
75	[illegible]	[illegible]	[illegible]
100	338	[illegible]	[illegible]
125	353	[illegible]	[illegible]
150	[illegible]	[illegible]	[illegible]
175	[illegible]	[illegible]	[illegible]
200	[illegible]	840	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE 22.—Of the ABSOLUTE EXPANSION of MERCURY and of COMMON GLASS, calculated from REGNAULT'S Experiments.

MERCURY.

Temperature by an Air-Thermometer.	Volume at the given Temperature.	Expansion in Volume for 1° Fahr.	
		Between 32° and the given Temperature.	At the given Temperature.
32°	[illegible]		[illegible]
122	[illegible]	[illegible]	[illegible]
212	1·018153	[illegible]	[illegible]
302	[illegible]	[illegible]	[illegible]
392	[illegible]	[illegible]	[illegible]
482	[illegible]	[illegible]	[illegible]
572	[illegible]	[illegible]	[illegible]
662	[illegible]	[illegible]	[illegible]

GLASS.

Temperature by an Air-Thermometer.	Volume at the given Temperature.	Mean Expansion for 1° Fahr., between 32° and the given Temperature.	
		In Volume.	In Length.
32	[illegible]		
122	[illegible]	[illegible]	[illegible]
212	[illegible]	[illegible]	[illegible]
302	[illegible]	[illegible]	[illegible]
392	[illegible]	[illegible]	[illegible]
482	[illegible]	[illegible]	[illegible]
572	[illegible]	[illegible]	[illegible]
662	[illegible]	[illegible]	[illegible]

TABLE 23.—Of the VOLUME and WEIGHT of DRY AIR at different Temperatures under a constant Atmospheric Pressure of 29·92 inches of Mercury in the Barometer, the Volume at 32° being 1.

Temperature.	Volume.	Weight of a Cubic Foot in Pounds.	Temperature.	Volume.	Weight of a Cubic Foot in Pounds.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32	1·000	[illegible]	[illegible]	[illegible]	[illegible]
42	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
52	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
62	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
82	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
92	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
112	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1·204	[illegible]	1400	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	3·483	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	·0161
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 2[illegible].—Of the VARIATION [illegible] EXPANSION of BODIES at different Temperatures, from the Experiments of Dulong and Regnault.

	[illegible]			
	Linear Expansion [illegible]		[illegible]	Authorities.
F[illegible]	[illegible]		[illegible]	Du[illegible]
[illegible]	[illegible]		[illegible]	"
[illegible]	[illegible]		[illegible]	"
[illegible]	[illegible]	[illegible]	[illegible]	"
	[illegible]	[illegible]	[illegible]	Regnault
	Expansion in Volume [illegible]			
M[illegible]	[illegible]	[illegible]	[illegible]	Dulong.
	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 25.—Of the EXPANSION of DRY AIR by HEAT.

Temperature.	Volume by Experiment of Dulong and Petit.	Volume by Calculation.	Temperature.	Volume by Experiment of Dulong and Petit.	Volume by Calculation.
[illegible]	[illegible]	[illegible]	3[illegible]2	1.7[illegible]89	1.7[illegible]4
[illegible]	1.0000	1.000	482	1.9[illegible]8	1.918
[illegible]	[illegible]	1.3[illegible]7	572	2.0[illegible]	2.0[illegible]1
[illegible]	[illegible]	1.[illegible]61	680	2.[illegible]25	2.[illegible]2

TABLE 2[illegible].—Of the VARIATION with different PRESSURES in the RATE of EXPANSION of DRY AIR and CARBONIC ACID GAS by HEAT, the Volume being constant. From the Experiments of REGNAULT.

ATMOSPHERIC AIR.

Total Pressure by a Column of Mercury at 32° — At at 32°.	Total Pressure by a Column of Mercury at 32° — At at 212°.	Ratio of Densities at 32°.	P / p	Reduced Coefficient of Expansion from 32° to 212°.	Absolute Zero with Volume Constant
p Inches.	P Inches.				°
[illegible]	5.8[illegible]5	.1444	1.3581	.36482	-461.4
[illegible]	9.[illegible]4	.2294	1.3[illegible]	.36513	-461.0
[illegible]	[illegible]	.35[illegible]	1.48[illegible]	.365[illegible]2	-460.6
[illegible]	2[illegible]065	.4[illegible]	1.3621	.36586	-460.0
[illegible]	40.885	1.0000	1.3665	.36650	-459.1
[illegible]	[illegible]024	2.2084	1.3621	.36760	-457.7
[illegible]	115.194	2.8213	1.3649	.36894	-455.9
1[illegible]	1[illegible]	4.8100	1.3[illegible]3	.37092	-453.1

CARBONIC ACID GAS.

[illegible]	40.72[illegible]8	1.0000	1.3[illegible]7	.36[illegible]58	-456.4
[illegible]	47.[illegible]17	1.1879	1.[illegible]	.36942	-455.3
[illegible]	94.[illegible]	2.2[illegible]	1.37[illegible]	.37523	-448.8
1[illegible]7	187.[illegible]	4.7318	1.32040	.38598	-434.3
(1)	(2)	(3)	(4)	(5)	(6)

TABLE 27.—Of the HEAT produced by COMPRESSION of AIR, and COLD by DILATATION, the Volume of Atmospheric Pressure being 1.0 at the Temperature of 60° Fahrenheit.

PRESSURE — Above a Vacuum. — Atmospheres.	PRESSURE — Above a Vacuum. — Inches of Mercury.	PRESSURE — Above a Vacuum. — Pounds per Sq. Inch.	PRESSURE — Above the Atmosphere in pounds per Sq. Inch	Volume.	Temperature of the air throughout the Process.	Total Increase or Decrease of Temperature.
.1[illegible]7	5	2.45	......	3.56	-1[illegible]2.6	-210.6
[illegible]	10	4.9	......	2.18	-81.8	-141.8
.5	15	7.35	......	1.634	-36.7	-94.7
.667	20	9.8	......	1.3[illegible]3	2.4	-57.6
.8[illegible]	25	12.25	......	1.1[illegible]	33.0	-27.0
1.0	30	14.7	0.00	1.000	60	00.0
1.1	33	16.17	1.47	.9[illegible]	74.6	+14.6
1.25	37.5	18.37	3.67	.85[illegible]	94.8	34.8
1.5	45.0	22.05	7.35	.7[illegible]	124.9	64.9
1.75	52.5	25.81	11.11	.6[illegible]24	151.6	91.6
2.0	60	29.4	14.7	.6117	175.8	115.8
2.5	75	36.7	22.0	.5221	218.3	158.3
3.0	90	44.1	29.4	.4588	255.1	195.1
3.5	105	51.4	36.7	.4115	287.8	227.8
4.0	120	58.8	44.1	.3741	317.4	257.4
5.0	150	73.5	58.8	.3194	369.4	309.4
6.0	180	88.2	73.5	.2806	414.5	354.5
7.0	210	102.9	88.2	.2516	451.5	391.5
8.0	240	117.6	102.9	.2288	490.6	430.6
9.0	270	132.3	117.6	.2105	523.7	463.4
10.0	300	147.0	132.3	.1953	554	494
15.0	450	220.5	205.8	.1465	681	621
20.0	600	294.0	279.3	.1195	781	721
25.0	750	367.5	352.8	.1020	864	804

APPROXIMATE TABLE.

1.0	30.0	14.7	0.00	1.0	60	00°
1.15	34.5	16.91	2.21	.9	85	24
1.37	41.1	20.14	5.44	.8	109	49
1.65	49.5	24.25	9.55	.7	141	81
2.06	61.8	30.28	15.58	.6	179	119
2.66	79.8	39.10	24.40	.5	229	169
3.63	108.9	53.36	38.66	.4	294	234
5.48	164.4	80.56	65.86	.3	392	332
9.65	289.5	141.85	127.15	.2	540	480
25.72	771.6	378.08	363.38	.1	869	809
(1)	(2)	(3)	(4)	(5)	(6)	(7)

TABLE 36.—Of FRIGORIFIC MIXTURES for the ARTIFICAL PRODUCTION of COLD, from the Experiments of MR. WALKER.

	Proportional Parts, by Weight, in the Mixture.											
Water	16	1										
Sal Ammoniac	5									1	5	
Nitre	5										5	
Common Salt					1				1	2	10	5
Nitrate of Ammonia		1	5	6								5
Sulphate of Soda	8		6									
Carbonate of Soda		1										
Phosphate of Soda				9								
Potash								4				
Muriate of Lime							5					
Snow or pounded Ice					1	8	4	3	2	5	24	12
Diluted Nitric Acid			4	4								
Diluted Sulphuric Acid						10						
Temp. of Ingredients.	+50	+50	+50	+50	+32	-68	+32	+32				
Temp. of the Mixture.	+4	-7	-14	-21	0	-91	-40	-51	-5	-12	-18	-25
Cold produced	46°	57	64	71	32	23	72	83				

NOTE.—To obtain these results the temperature of the ingredients must be reduced previously to the given temperature by some of the other mixtures. The four last compounds yield the temperature given, whatever may be the previous temperatures of the ingredients.

TABLE 28.—Of the ABSOLUTE EXPANSION of GASES from 32° to 212° by the experiments of REGNAULT.

	Pressure Constant. — Expansion.	Pressure Constant. — Absolute Zero.	Volume Constant. — Expansion.	Volume Constant. — Absolute Zero.
Air, Atmospheric.	.3670	—458.4	.3665	—459.1
Hydrogen	.3661	—459.7	.3667	—458.9
Nitrogen	....	....	.3668	—458.7
Carbonic acid	.3710	—453.2	.3688	—456.1
Carbonic Oxide	.3669	—458.6	.3667	—458.9
Sulphurous Acid.	.3903	—429.2	.3845	—436.2
	(1)	(2)	(3)	(4)

TABLE 29.—Of the COLORS of POLISHED STEEL at different Temperatures.

Kind of Tools, Etc.	Temperature.
	°
Very faint yellow for lancets	420
Pale straw yellow for razors, etc	440
Orange for penknives and chisels	470
Brown for scissors, etc	490
Red for carpenters' tools	510
Purple for watch springs	530
Bright blue for lock springs	550
Full blue for fine saws and needles	560
Dark blue for common saws	600
Greenish	630
Grey	750

TABLE 30—Of the DENSITY and CORRESPONDING PRESSURE of AIR and GASES. REGNAULT.

Density.	Atmospheric Air.	Nitrogen.	Carbonic Acid.	Hydrogen.
1	1.000000	1.000000	1.00000	1.000000
5	4.979440	4.986750	4.82880	5.011615
10	9.916220	9.914890	9.22620	10.056070
15	14.824815	14.875770	13.18695	15.130650
20	19.719880	19.788580	16.70540	20.268720

TABLE [illegible].—Of the MEAN TEMPERATURE of every WEEK and MONTH in the YEAR at GREENWICH [illegible] Fifty Years' Observations.

Months.	Mean of Month.	1st Week.	2nd Week.	3rd Week.	4th Week.
	°	°	°	°	°
January	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
February	[illegible]	[illegible]	38·1	[illegible]	[illegible]
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
April	46·0	[illegible]	[illegible]	[illegible]	[illegible]
May	[illegible]	51·1	[illegible]	[illegible]	[illegible]
June	58·8	[illegible]	[illegible]	[illegible]	[illegible]
July	[illegible]	61·5	[illegible]	[illegible]	[illegible]
August	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
September	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
October	[illegible]	[illegible]	51·3	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	39·3	[illegible]	[illegible]	[illegible]	[illegible]

TABLE [illegible].—[illegible]

	[illegible]	Mean Temperature				
		Year.	Spring.	Summer.	Autumn.	Winter.
		°	°	°	°	°
Irkutsk, Siberia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	51·3	18·0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16·7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34·9	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	42.4	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	43·7	[illegible]	[illegible]	47·1	17·5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27·5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	48·7	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	42·1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	56·7	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Buenos Ayres	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTE.—[illegible]

TABLE [illegible].—[illegible]

Temperature.	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE [illegible].—Of the ATOMIC WEIGHTS of ELEMENTARY BODIES, Oxygen being = 100.

Element.	Combining Weights.	Element.	Combining Weights.	Element.	Combining Weights.
Aluminium	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Hydrogen	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Iron	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1351·61
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE [illegible].—[illegible] Fahr.

Pounds per Sq. Inch.	Feet of Water.	Inches of Mercury.	Pounds per Sq. Inch.	Feet of Water.	Inches of Mercury.
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EXAMPLE.—[illegible]

Feet of Water.	Pounds per Square Inch.	Inches of Mercury.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

TABLE [illegible] Etc.

[illegible]

TABLE [illegible]—[illegible] of the COMMON MERCURIAL THERMOMETER [illegible] GLASS [illegible] from the EXPERIMENTS of REGNAULT.

[illegible]	Degrees of Mercurial [illegible]	[illegible]	Degrees of Mercurial [illegible]	[illegible]	Degrees of Mercurial [illegible] in Degrees [illegible]
°		°		°	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		

TABLE [illegible]—[illegible] SPECIFIC GRAVITY and WEIGHT of MATERIALS, [illegible]

	Specific Gravity.	Weight of a Cubic Foot in Pounds.	Weight of a Cubic Inch in Pounds.	No. of Cubic Feet in One Ton.
Mercury	[illegible]	847·3	[illegible]	2·644
Lead	11·352	[illegible]	[illegible]	3·166
Copper, sheet	[illegible]	547·5	[illegible]	4·091
Gun Metal, cast	[illegible]	[illegible]	[illegible]	4·115
Copper, cast	[illegible]	[illegible]	·3104	4·176
Brass, cast	[illegible]	[illegible]	[illegible]	4·282
Wrought Iron	7·788	[illegible]	[illegible]	4·615
Tin, cast	7·291	[illegible]	[illegible]	4·930
Zinc, sheet	[illegible]	448·1	[illegible]	4·999
Cast Iron, British mean	[illegible]	[illegible]	[illegible]	5·07
Zinc, cast	[illegible]	[illegible]	·2474	5·24
Slate	[illegible]	176·7	[illegible]	12·68
Glass	[illegible]	[illegible]	[illegible]	13·02
[illegible]	[illegible]	[illegible]	[illegible]	13·50
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Brick [illegible]	[illegible]	114·7	[illegible]	[illegible]
Sand [illegible]	[illegible]	[illegible]	[illegible]	23·25
Coal [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Water, distilled	1·000	62·321	[illegible]	35·95
Ice [illegible]	[illegible]	57·96	[illegible]	38·65
Ash [illegible]	[illegible]	[illegible]	[illegible]	44·21
Oak [illegible]	·9153	57·04	·03301	39·27
Oak, seasoned	[illegible]	48·42	[illegible]	46.26
Elm [illegible]	[illegible]	36·65	·0212	61·13
Mahogany, Honduras, seasoned	·560	34·9	·0202	64·18
Pine [illegible], seasoned	·483	30·1	·01742	74·41
[illegible]	[illegible]	[illegible]	·10273	101·8
Cork	·24	14·96	[illegible]	149·7

TABLE [illegible]—Of the VALUE of C or the CONDUCTING POWER of MATERIALS [illegible] quantity of Heat in Units transmitted per [illegible] by a Plate 1 inch thick, the two surfaces [illegible] Temperature 1°. From the Experiment of PECLET.

	Value of C.
Copper	515
Iron	233
Zinc	225
Lead	113
Marble, grey, fine grained	28
" white, coarse grained	22·4
Stone, calcareous, fine	16·7
" " ordinary	13·68
Glass	6·6
Baked clay, brickwork	4·83
Plaster, ordinary	3·86
Oak, perpendicular to the fibres	1·70
Walnut " "	·83
Fir " "	·748
Fir " parallel to the fibres	1·37
Walnut " "	1·40
Gutta-percha	1·38
India-rubber	1·37
Brick-dust, sifted	1·33
Coke, pulverized	1·29
Cork	1·15
Chalk, in powder	·869
Charcoal of wood, in powder	·636
Straw, chopped	·563
Coal, small, sifted	·547
Wood ashes	·531
Mahogany dust	·523
Canvas of hemp, new	·418
Calico, new	·402
White writing paper	·346
Cotton wool and sheep wool (any density)	·323
Eider down	·314
Blotting paper, grey	·274

TABLE [illegible]—TEMPERATURES corresponding to various DEGREES of LIGHT in HEATED METAL FURNACES, etc. M. POUILLET.

	Fahrenheit.
	°
Red, just visible	977
" dull	1290
" cherry, dull	1470
" " full	1650
" " clear	1830
Orange, deep	2010
" clear	2190
White heat	2370
" bright	2550
" dazzling	2730

TABLE [illegible]—Of the FORCE of RADIATION from the SUN, and to the SKY.

Months	Average Max. Temp. of Air in Shade	Solar Radiation. Mid day Temp in Sun. Mean.	Solar Radiation. Mid day Temp in Sun. Max.	Average Min. Temp. of the Air	Sky Radiation. Nocturnal Temp. of Sky. Mean.	Sky Radiation. Nocturnal Temp. of Sky. Min.	Daily Range. Sun and Sky, Cols. 3, 6.	Daily Range. In Air, Cols. 1, 4.
	°	°	°	°	°	°	°	°
Jan.	43·2	47	55	33·7	30	24	31	9·5
Feb.	44·7	55	81	34·2	30	24	57	10·5
March	50·0	66	99	35·3	30	25	76	14·7
April	56·8	85	104	38·6	32	26	78	18·3
May	64·4	95	121	44·2	40	29	92	20·2
June	71·2	111	136	50·2	45	33	103	21·0
July	73·8	110	129	53·2	50	38	91	20·6
Aug.	72·8	106	132	53·4	48	40	92	19·4
Sept.	67·4	99	121	48·9	44	37	84	18·5
Oct.	58·3	86	101	43·7	39	33	68	14·6
Nov.	49·3	56	73	37·7	34	28	45	11·6
Dec.	45·0	50	57	35·5	32	25	32	9.5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

TABLE 42.—Of the CALORIFIC POWER of COMBUSTIBLES, by Philosophical Experiment and Theory.

	Units of Heat per lb. of Fuel, by Experiment.	Authorities.	Units of Heat per lb. of Fuel, by Theory.
Hydrogen, burning to Water	62535	Dulong	......
" " "	62032	Favre & Silbermann.	......
" " "	42120	Laplace	......
" " "	39806	Clement	......
" " "	42552	Despretz	......
Carbon, burning to Car. Acid	12906	Dulong	......
" from wood, burning to Carbonic Acid	14544	Favre & Silbermann.	......
Carbon, burning to Carbonic Acid	14040	Despretz	......
Carbon, burning to Carbonic Oxide	2495	Dulong	......
Carbon, burning to Carbonic Oxide	4453	Favre & Silbermann.	......
Carbonic Oxide, burning to to Carbonic Acid.	4478	Dulong	.....
Carbonic Oxide, burning to Carbonic Acid	4325	Favre & Silbermann.	.....
1 lb. Carbon in the form of Carbonic Oxide, burning to Carbonic Acid	10411	Dulong	......
Wood, perfectly dried by artificial heat	6480	Rumford	6582
Wood, in ordinary state of dryness	5040	"	5265
Olive Oil	17752	Dulong	17482
"	16279	Rumford	
"	20153	Lavoisier	
Colza Oil	16553	Rumford	
Alcohol	12939	Dulong	12593
"	11151	Rumford	
Sulphuric Ether.	16974	Dulong	15095
Sulphuric Ether, density ·728 at 68°	11454	Rumford	
Tallow	15590	"	16792
"	12965	Laplace	
Oil of Turpentine	19505	Dulong	18663
Naphtha, density ·827	13208	Rumford	
Sulphur	4682	Dulong	
"	4032	Favre & Silbermann.	
Phosphorus	17500	Laplace	
Beeswax, white	18900	"	18873
" "	17422	Rumford	

TABLE 45.—Of the RADIATING and ABSORBING POWER of BODIES. Being the Units of Heat emitted or absorbed per square foot per hour for a difference in Temperature of 1° Fahr. From the experiments of PECLET.

	Value of R.
Silver* polished	·02657
Copper "	·03270
Tin "	·04395
Zinc and Brass, polished	·04920
Tinned Iron, "	·08585
Iron, Sheet, "	·09200
Lead, "	·13286
Iron, " ordinary	·5662
Glass	·5948
Cast Iron, new	·6480
Chalk	·6786
Cast and Sheet Iron, rusted	·6868
Wood Sawdust, fine	·7215
Building Stone, Plaster, Wood, Brick	·7358
Sand, fine	·7440
Calico	·7461
Woollen Stuffs, any color	·7522
Silk Stuffs, Oil Paint	·7583
Paper, any color	·7706
Lamp Black	·8085
Water	1·0853
Oil	1·4800

* Copper silvered.

TABLE 44.—Of the HEATING POWER of COMBUSTIBLES, the quantity of Air required for the Combustion of One Pound of Fuel and the Quantity and Temperature of the Air, etc., in the Chimney.

KIND OF FUEL.	Total Heat in a Pound.	Heat radiated.		Heat spent in Air supporting Combustion.		Air used.		Cubic Feet of Vapor at 62°.	Cubic Feet Air and Vapor in Chimney at 580°.	Temperature of Air as it leaves the Fire.	
	Units.	Per cent.	Units.	Per cent.	Units.	Lbs.	Cubic Feet at 62°.			Steam boiler with internal Fire.	Fire-brick Furnace.
										°	°
Coal	13000	50	6500	50	6500	22·4	294	9·84	608	1282	2256
Coke	11970	50	5985	50	5985	20·47	269		558	1188	2089
Wood, artificially dried	6582	23	1514	77	5068	12·25	161	10·05	342	1869	2173
" ordinary state (¼ water)	5265	23	1211	77	4054	9·81	129	12·1	282	1797	2091
" charcoal	12000	45	5400	55	6600	22·4	294		588	1326	2130
Peat, artificially dried	8726	50	4363	50	4363	15·28	202	11·38	427	1256	2211
" ordinary state (¼ water)	7151	50	3575	50	3575	12·4	163	13·3	352	1274	2244
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

TABLE 46.—Of the *Ratio* of HEAT EMITTED OR ABSORBED by CONTACT of AIR with given DIFFERENCES of TEMPERATURE.

Difference of Temperature of the Air and the Body in Contact.	Ratio of Heat.	Difference of Temperature of the Air and the Body in Contact.	Ratio of Heat.
°		°	
18	·94	252	1·742
36	1·11	270	1·774
54	1·22	288	1·800
72	1·305	306	1·827
90	1·372	324	1·852
108	1·432	342	1·874
126	1·486	360	1·897
144	1·533	378	1·920
162	1·575	396	1·940
180	1·615	414	1·960
198	1·650	432	1·980
216	1·684	450	2·000
234	1·720	468	2·017

TABLE 47.—Of the DENSITY of GASES and VAPORS, Air at the same Temperature and Pressure being 1·0, also the Weight of a Cubic Foot at 62°, under an Atmospheric Pressure of 29·92 inches of Mercury.

	Density, Air at the same Temperature and Pressure being 1. (Regnault.)	Specific gravity or Density, Water at 62°, being 1·0.		Weight of a Cubic Foot in Pounds.	Cubic Feet at 62° in 1 lb.
Air (Atmospheric)	1·0000	·00122 or	$\frac{1}{819}$	·07610	13·14
Hydrogen Gas	·06926	·0000846 "	$\frac{1}{11820}$	·00527	189·70
Oxygen Gas	1·10563	·00134 "	$\frac{1}{741}$	·08414	11·88
Nitrogen Gas	·97137	·00118 "	$\frac{1}{844}$	·07384	13·54
Carbonic Acid Gas	1·52901	·00187 "	$\frac{1}{535}$	·11636	8·59
Carbonic Oxide Gas	·9674	·00118 "	$\frac{1}{848}$	·07364	13·60
Vapor of Water	·6235	·000763 "	$\frac{1}{1311}$	·04745	21·07
" Alcohol	1·589	·00194 "	$\frac{1}{515}$	·12092	8·27
" Sulphuric Ether	2·586	·00316 "	$\frac{1}{316}$	·19680	5·08
" Oil of Turpentine	4·760	·00581 "	$\frac{1}{172}$	·36221	2·76
" Mercury	6·976	·00850 "	$\frac{1}{118}$	·53087	1·88
	(1)	(2)		(4)	(5)

NOTE.—The densities of the *vapors* in column (2) &c., are reduced from their real pressure and density by calculation.

TABLE 48.—Of the ELASTIC FORCE of the VAPOR of ALCOHOL, ETHER, etc., etc., in inches of Mercury, from the Experiments of REGNAULT.

Temp. Fahr.	Water.	Alcohol.	Ether.	Oil of Turpentine.	Sulphuret of Carbon.	Chloroform.
°						
-4	[illegible]	[illegible]	2·721			
14	[illegible]	[illegible]	[illegible]		[illegible]	
32	·181	[illegible]	[illegible]	[illegible]	[illegible]	
50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
68	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
86	1·242	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
104	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
122	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
158	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
176	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
194	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
212	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
230	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
248	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]
266	[illegible]	[illegible]	—	[illegible]	246·480	185·846
284	[illegible]	[illegible]	—	[illegible]	—	—
302	141·000	[illegible]	—	[illegible]	—	—

TABLE 49.—Of the Effect of Different Volumes of Air in Steam Boiler Furnaces.

State of the Oxygen.	Cubic Feet.	Lbs.	Increase of Temp.	Temp. of [illegible]	Temp. of Air as it leaves the Fire.
Half burnt	30 =	2·83	1158 +	62 =	1220
Quarter burnt	60 =	[illegible]	568 +	62 =	630
One-fifth burnt	75 =	[illegible]	455 +	62 =	517

TABLE 50.—Of the Heat given out by a Highly Heated Horizontal Stove pipe of Iron, 4 inches diameter, exposed to Air at 60°.

Mean Temp. of the Pipe.	By radiation to the Walls.					By contact to the Air.					Total per Square Foot per Hour
	R.	Diff.	Ratio.	Units.	Per Cent.	A.	Diff.	Ratio.	Units.	Per Cent.	Units.
° 1140	·7 ×	1080 ×	23·00 =	17388	or 92 and	·5745 ×	1080 ×	2·045 =	1269	or 8 =	18657
960	·7 ×	900 ×	12·68 =	7988	" 86 "	·5745 ×	900 ×	2·348 =	1214	" 14 =	9202
780	·7 ×	720 ×	7·17 =	3614	" 79 "	·5745 ×	720 ×	2·230 =	922	" 21 =	4536
600	·7 ×	540 ×	4·19 =	1584	" 71 "	·5745 ×	540 ×	2·085 =	647	" 29 =	2231
420	·7 ×	360 ×	2·25 =	568	" 59 "	·5745 ×	360 ×	1·895 =	392	" 41 =	960
240	·7 ×	180 ×	1·61 =	203	" 55 "	·5745 ×	180 ×	1·615 =	167	" 45 =	370
				Mean = 74						Mean = 26	

TABLE 51.—Of the Cubic Feet of Air (at the Temperature of the Room) heated from the External Temperatures, per hour per foot run of Steam pipes, heated to 210°, and exposed to Air, &c., having the Temperature of the Heated Room.

Temperature of the External Air.	Temperature of Air in the Room.						
	42°	52°	62°	72°	82°	92°	102°
	Cubic Feet of Air by 2-inch Pipe.						
° 12	451	302	225	186	151	124	102
22	626	403	281	223	176	141	115
32	1253	604	375	279	211	165	131
42	.	1208	513	372	261	198	153
52			1126	557	352	247	184
	Cubic Feet of Air by 3-inch Pipe.						
12	560	406	313	250	204	168	138
22	840	562	391	300	238	192	156
32	1680	813	521	375	285	224	178
42	....	1626	782	500	354	268	208
52	....	.	1563	750	475	335	250
	Cubic Feet of Air by 4-inch Pipe.						
12	685	495	382	307	249	206	170
22	1028	691	478	379	291	235	191
32	2056	992	637	461	349	274	219
42	....	1984	955	615	437	329	255
52	....		1910	922	583	411	306
	Cubic Feet of Air by 6-inch Pipe.						
12	960	702	526	428	351	264	240
22	1440	966	671	514	409	330	270
22	2881	1404	894	643	491	385	309
42	....	2809	1342	857	614	462	360
52	....	....	2683	1285	618	578	432

TABLE 52.—Of the Ratio of Loss of Heat at very High Temperatures, by the Formulæ of Dulong.

Temperature of the Heated Body.	Temperature of the Air in Contact with the Body, and of all Surrounding Objects.	Difference of Temperature of the Body and of the Air and Surrounding Objects.	Ratio of Heat lost at different Temps. by	
			Radiation	Contact of Air.
° 480	° 60	° 420	3·10	1·980
600	"	540	4·19	2·085
780	"	720	7·47	2·230
960 Red, just visible		900	12·68	2·348
1140 Red, just visible	"	1080	23·01	2·450
1320 Dull red	"	1260	42·70	2·540
1500 Dull Cherry red	"	1440	80·67	2·620
1680 Cherry red	"	1620	154·5	2·693
1860 Clear red	"	1800	299·7	2·760
2220 Clear orange	"	2160	1159·0	2·880
2580 White bright	"	2520	4604·0	2·985

TABLE 53.—Of the Heat required to Evaporate One Pound of Water at Temperatures below the Boiling Point, from open vessels exposed to Air at 52°, and Humidity 86.

Temp. of the Water.	Water Evaporated per Square Foot per Hour in Calm Air. By Experiment.			Time to Evaporate 1 lb. of water in hours.	Heat lost by Radiation from Surface, in Units.		Heat carried off by the air in Units.	Latent Heat of Vaporization. Units.	Total heat to evaporate 1 lb. of water, in Units by experiment.		Total Heat given out per Sq. Foot per Hour in Units.	Air at 52°, and Humidity 86, to Evaporate 1 lb. of Water.	
	Grains.	Lbs.	Depth in Inches.		Per Hour.	Total.			From the Temperature in col. 1	From 52°		Lbs.	Cubic Feet.
° 52	20	·0028	·0005	350·0	0·0	0	....	1078	....	....	....	2265	29190
62	100	·0143	·00275	70·0	11·3	791	888	1071	2750	2760	39	373	4807
72	240	·0343	·0066	29·2	23·4	683	753	1064	2500	2520	86	158	2036
82	430	·0615	·0118	16·3	35·2	574	649	1057	2280	2310	140	91	1160
92	690	·0986	·0190	10·2	47·0	475	555	1050	2080	2120	204	58	747
102	1050	·150	·0288	6·67	62·7	418	449	1043	1910	1960	287	37·7	486
112	1550	·221	·0425	4·52	78·7	347	387	1036	1770	1830	392	27·1	350
122	2210	·315	·0606	3·13	91·2	285	326	1029	1640	1710	524	19·6	253
132	3180	·454	·0873	2·20	106·8	235	278	1022	1535	1615	698	14·6	184
142	4440	·634	·122	1·58	122·5	194	241	1015	1450	1540	918	11·3	146
152	6100	·871	·168	1·15	141·1	162	206	1008	1376	1476	1197	8·65	112
162	8260	1·18	·227	·848	156·4	133	193	1000	1326	1436	1564	7·37	95
172	10990	1·57	·302	·637	175·5	112	179	993	1284	1404	2016	6·27	81
182	14420	2·06	·396	·485	193·2	94	168	986	1248	1378	2573	5·43	70
192	18620	2·66	·512	·374	215·7	81	164	979	1224	1364	3268	4·92	64
202	23870	3·41	·656	·293	237·7	70	161	972	1203	1353	4106	4·51	58
212	30200	4·32	·831	·232	257·0	60	160	966	1186	1346	5112	4·20	54
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)

Table 54.—Of the Effect of Stove pipes at different Temperature.

Temp. at Stove End of Pipe.	1050°	870°	690°	510°	330°	150°	Lbs. of Air per lb. of Coal.
	Total Units of Heat per Square Foot per Hour						
1200°	18908	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33·3
1050	…	[illegible]	[illegible]	[illegible]	[illegible]	1111	[illegible]
870	…	…	[illegible]	[illegible]	[illegible]	[illegible]	48·1
690	…	…	…	2231	[illegible]	[illegible]	[illegible]
510	…	…	…	…	[illegible]	[illegible]	[illegible]
330	…	…	…	…	…	[illegible]	[illegible]

Table 55.—Of the Loss of Heat by a Horizontal Pipe 4 inches outside Diameter, heated 210° to and exposed to Air, etc., at 60°, showing the effect of different kinds of Radiating Surface.

Kind of Surface.	R	Diff.	Ratio.	By Radiation Units.		A	Diff.	Ratio.	By Contact of Air Units.	Total per Hour per Square Foot Units.	Ratio, Cast Iron, rusted = 1.
Silvered Copper, polished	(·02657 × 150 × 1·50) =			5·98	+	(·5745 × 150 × 1·550) =			133·57	139·55	·4860
Tinned Iron do.	(·08585 × do.) =			19·32	+	do.			do.	152·89	·5325
Iron Sheet do.	(·092 × do.) =			20·7	+	do.			do.	154·27	·5373
Whitewashed	([illegible] × do.) =			152·7	+	do.			do.	286·27	·9971
Cast Iron, rusted	([illegible] × do.) =			153·53	+	do.			do.	287·10	1·0000
Lampblacked	([illegible] × do.) =			184·4	+	do.			do.	317·97	1·1070

Note.—The loss by pipes of other sizes, and by bodies of other forms will not differ very materially from the numbers given for a 4-inch horizontal pipe, so that this table may be used with approximate correctness for other cases. The difference between a whitened and a blackened pipe is shown to be less than is commonly supposed; the table gives the loss of a whitewashed pipe at $\frac{286·27}{317·97}$ = ·9, or 90 per cent. of the amount lost by a lampblacked one.

Table of the Coefficients of Interdiffusion of Gases (from the Measurements of Professor Loschmidt) in square centimetres per second.

		D.
Carbonic acid	Air	[illegible]
—	Hydrogen	[illegible]
—	Oxygen	[illegible]
—	Marsh gas	[illegible]
—	Carbonic oxide	[illegible]
—	Nitrous oxide	[illegible]
Oxygen	Hydrogen	[illegible]
—	Carbonic oxide	[illegible]
Carbonic oxide	Hydrogen	·642
Sulphurous acid	Hydrogen	·480

Professor J. Stefan, also of Vienna, has undertaken a series of very delicate experiments to determine the thermal conductivity of air and other gases. He finds the thermometric conductivity, κ, of air 0·256 square centimetres per second. The rate of propagation of thermal effects in still air is therefore intermediate between the rate in iron, for which κ = 0·183, and in copper, for which κ = 1·077. [illegible] between iron and [illegible].

The [illegible] conductivity, k, [illegible] for air, or about 20,000 times less than that of copper, and [illegible] times less than that of iron. As calculated from the coefficient of viscosity by the writer k = [illegible].

Stefan has also found that the calorimetric conductivity is independent of the pressure, and that it is seven times greater for hydrogen than for air. Both these results had been predicted by the molecular theory. See Maxwell "On the Dynamical Theory of Gases," *Phil. Trans.* 1867, p. 88.

Table 56.—For Hot water Pipes, showing the Minimum Velocity of Current necessary for the Removal of the Heat in a Pipe [illegible], with different Temperatures of Pipe, exposed to Air at 60°.

Temp. of the Water in the Pipe.				Diam. of Pipe in inches inside.			
Mean.	As it leaves the Boiler.	As it returns to the Boiler.	Difference.	2	3	4	6
				Velocity in Feet per Second.			
205°	210°	200°	10°	[illegible]	[illegible]	·164	·1040
200	210	190	20	[illegible]	[illegible]	[illegible]	·0510
190	210	170	40	[illegible]	[illegible]	[illegible]	[illegible]
180	210	150	60	[illegible]	[illegible]	[illegible]	[illegible]
170	210	130	80	[illegible]	·0219	[illegible]	[illegible]
160	210	110	100	[illegible]	[illegible]	[illegible]	[illegible]
150	210	90	120	[illegible]	·0119	[illegible]	·0049

Table 57.—Of Evaporation at Natural Temperature, and with Air in different states of Dryness.

Temp. of the Air and Water.	Humidity of the Air: Saturation = 100.							
	Dry.	30	40	50	60	70	80	90
	Grains evaporated per Square Foot per Hour in calm Air.							
32°	69	48	41	34	28	21	14	7
42	101	71	61	51	41	30	20	10
52	147	103	88	74	[illegible]	44	29	15
62	211	148	127	[illegible]	84	63	42	21
72	298	[illegible]	[illegible]	149	119	89	60	30
82	[illegible]	298	[illegible]	[illegible]	[illegible]	128	85	43
92	[illegible]	400	[illegible]	[illegible]	[illegible]	171	114	57

Table 58.—Of the Heating Power of Combustibles, from Cases in Practice.

Kind of Fuel.	Units of Heat or lbs. of Water heated 1° per lb. of Fuel.	Lbs. of Water at 212° evaporated per lb. of Fuel.	Lbs. of Fuel to evaporate 1 cubic foot of Water [illegible]	Authority.
Welsh Coals, max.	[illegible]	[illegible]	[illegible]	H. M. Commissioners.
" min.	[illegible]	[illegible]	[illegible]	" "
" 37 mean.	[illegible]	[illegible]	[illegible]	" "
Newcastle, max.	[illegible]	[illegible]	[illegible]	" "
" min.	[illegible]	[illegible]	[illegible]	" "
" 18 mean.	[illegible]	[illegible]	[illegible]	" "
Lancashire, max.	[illegible]	[illegible]	[illegible]	" "
" min.	[illegible]	[illegible]	[illegible]	" "
" 28 mean.	[illegible]	[illegible]	[illegible]	" "
Scotch, max.	[illegible]	[illegible]	[illegible]	" "
" min.	[illegible]	[illegible]	[illegible]	" "
" 8 mean.	[illegible]	[illegible]	[illegible]	" "
Derbyshire, max.	[illegible]	[illegible]	[illegible]	" "
" min.	[illegible]	[illegible]	[illegible]	" "
" 7 mean.	[illegible]	[illegible]	[illegible]	" "
Dudley Coals	[illegible]	[illegible]	[illegible]	[illegible] & Ames.
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	" (weekly)
[illegible]	[illegible]			" "
[illegible]	[illegible]			[illegible] ….
[illegible] Water	[illegible]			……
Peat ..	[illegible]	[illegible]	[illegible]	[illegible] ….
	[illegible]			

Table 59.—Of the Distribution of the Heat in One Pound of Coals by an ordinary Boiler, with [illegible]

In Ashes, [illegible] unburned	[illegible]	[illegible] = [illegible] units
Lost by [illegible]	[illegible]	[illegible] = [illegible] "
Lost [illegible] in the chimney	[illegible]	[illegible] = [illegible] "
[illegible] of steam	[illegible]	[illegible] = [illegible] "
Total		[illegible] "

Table 60.—Of the Weight of Water in Woven Fabrics after Wringing, &c., the Weight when Dry being 1·0.

	Flannel	Calico	Silk.	Linen.
After hand wringing	2·0	1·0	[illegible]	·75
After a powerful press	1·0	·6	·5	·4
After rotary hydro-extractor	·6	·35	·3	·25

Table 61.—Of Experiments on the Evaporation of Water at different Temperatures, from open Vessels exposed to Air at [illegible], and Humidity 66.

Weight of Water.	Temperature [illegible] observed	Weight Evaporated	Time to Evaporate the Weight [illegible]	Water Evaporated per Sq. Foot per Hour.	Mean Temperature of the Water.	Mean Weight of Water.		Loss of Heat by the Weight in Col. 8.	Units of Heat to Evaporate Col. 3 from Temperature in Col. 6	Heat to Evaporate 1 lb. of Water from The Temp. in Col. 6.	Heat to Evaporate 1 lb. of Water from From 32°
grains.	°	grains.	seconds	grains.	°	grains.	lbs.	8		units.	units.
54280	18[illegible]	480	[illegible]	[illegible]	185¼	54040	7·720	9	68·48	1013	1167
53800	18[illegible]	480	145	[illegible]	175¾	53560	7·651	10½	80·33	1171	1315
53320	17[illegible]½	480	190	9005	164¼	53080	7·583	11¼	87·20	1272	1399
52840	1[illegible]	480	270	[illegible]	153½	52600	7·514	11½	89·41	1260	1382
52360	147½	480	335	[illegible]	141½	52120	7·446	12½	93·07	1357	1467
51880	1[illegible]	480	6[illegible]	2580	128¼	51640	7·377	13¼	99·59	1452	1548
51400	1[illegible]	480	1020	1694	114	51160	7·308	15¼	111·40	1624	1716
50920	1[illegible]	480	2060	839	97	50680	7·240	18¼	135·70	1979	2044
50440	87½	180	1135	455	83½	50350	7·193	8	57·54	2238	2290
50260	79¾										
					Second Experiment.						
54280	195	480	85	[illegible]	190	54040	7·720	10	77·20	1126	1284
53800	185	480	135	[illegible]	179½	53560	7·651	11	84·15	1227	1375
53320	174	480	175	9874	168¼	53080	7·583	11½	87·20	1272	1408
52840	162½	480	245	[illegible]	157	62600	7·514	11	82·65	1206	1331
52360	151½	480	330	[illegible]	145½	52120	7·446	12	89·35	1303	1417
51880	139½	480	[illegible]	[illegible]	132¾	51640	7·377	13¼	99·59	1452	1553
51400	126	480	[illegible]	[illegible]	118¾	51160	7·308	14½	107·4	1566	1653
50920	111½	480	[illegible]	[illegible]	102¾	50680	7·240	17½	126·7	1848	1919
50440	94	480	[illegible]	436	83¼	50200	7·170	21½	154·2	2249	2300
[illegible]	72½	100	[illegible]	214	70	59910	7·130	5	35·65	2496	2535
[illegible]	67½	100	3480	124	64¼	59800	7·114	6½	46·24	2697	2739
49740	61	100	[illegible]	70	58¾	59600	7·099	4½	31·94	2236	2263
[illegible]	56½	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	(2)										

(C. M.) (S. F.)

HEATH, the English form of a name given in most Teutonic dialects to the common ling or heather, but now applied to all species of *Erica*, an extensive genus of monopetalous plants, belonging to the order *Ericaceæ*. The heaths are evergreen shrubs, with small narrow leaves, in whorls usually set rather thickly on the shoots; the persistent flowers have 4 sepals, and a 4-cleft campanulate or tubular corolla, in many species more or less ventricose or inflated; the dry capsule is 4-celled, and opens, in the true *Ericæ*, in 4 segments, to the middle of which the partitions adhere, though in the ling the valves separate at the dissepiments. The plants are mostly of low growth, but several African kinds reach the size of large bushes, and a Spanish variety, *E. arborea*, occasionally attains almost the aspect and dimensions of a tree.

One of the best known and most interesting of the family is the common heath, heather, or ling, *Calluna vulgaris*, placed by most botanists in a separate genus on account of the peculiar dehiscence of the fruit, and from the coloured calyx, which extends beyond the corolla, having a whorl of sepal-like bracts beneath. This shrub derives some economic importance from its forming the chief vegetation on many of those extensive wastes that occupy so large a portion of the more sterile lands of northern and western Europe, the usually desolate appearance of which is enlivened in the latter part of summer by its abundant pink blossoms. When growing erect to the height of a yard or more, as it often does in sheltered places, its purple stems, close-leaved green shoots, and feathery spikes of bell-shaped flowers render it one of the handsomest of the heaths; but on the bleaker elevations and more arid slopes it frequently rises only a few inches above the ground. In all moorland countries the ling is applied to many rural purposes; the larger stems are made into brooms, the shorter tied up into bundles that serve as brushes, while the long trailing shoots are woven into baskets. Pared up with the peat about its roots it forms a good fuel, often the only one obtainable on the drier moors. The shielings of the Scotch Highlanders were formerly constructed of heath stems, cemented together with peat mud, worked into a

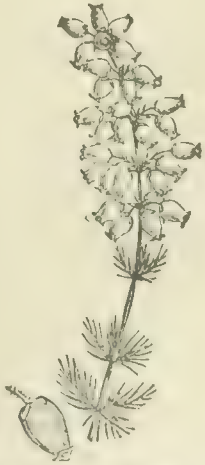


Fig. 1.—*Erica cinerea.*

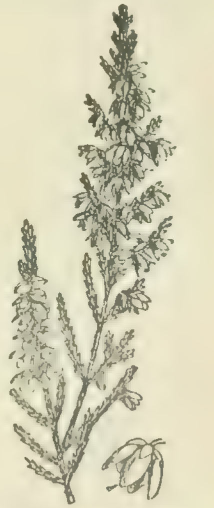


Fig. 2.—*Calluna vulgaris.*

kind of mortar with dry grass or straw; hovels and sheds for temporary purposes are still sometimes built in a similar way, and roofed in with ling. Laid on the ground, with the flowers above, it forms a soft springy bed, the luxurious couch of the ancient Gael, still gladly resorted to at times by the hill shepherd or hardy deer-stalker. The young shoots were in former days employed as a substitute for hops in brewing, while their astringency rendered them valuable as a tanning material in Ireland and the Western Isles. They are said also to have been used by the Highlanders for dyeing woollen yarn yellow, and other colours are asserted to have been obtained from them, but some writers appear to confuse the dyer's-weed, *Genista tinctoria*, with the heather. The young juicy shoots and the seeds, which remain long in the capsules, furnish the red grouse of Scotland with the larger portion of its sustenance; the ripe seeds are eaten by many birds. The tops of the ling afford a considerable part of the winter fodder of the hill flocks, and are popularly supposed to communicate the fine flavour to Welsh and Highland mutton, but sheep seldom crop heather while the mountain grasses and rushes are sweet and accessible. In recent times ling has been suggested as a material for paper, but the stems are hardly sufficiently fibrous for that purpose. The purple or fine-leaved heath, *E. cinerea*, one of the most beautiful of the genus, abounds on the lower moors and commons of Great Britain and western Europe, in such situations being sometimes more prevalent than the ling. The flowers of both these species yield much honey, furnishing a plentiful supply to the bees in moorland districts; from this heath honey the Picts probably brewed the mead said by Boetius to have been made from the flowers themselves.

It was until recently supposed that no species of heath existed in America; but of late years isolated plants of ling have been found in various parts of New England, Nova Scotia, and Cape Breton, while it has been stated to occur in some abundance in several places in Newfoundland; probably in distant ages it may have had a wider range on the American continent. The whole group, as observed by Bentham, is "eminently Atlantic" in its present distribution,—of nearly 500 known species by far the greater part being indigenous to the western districts of South Africa, and nearly all the remainder limited to Europe and its adjacent islands.

The Cape heaths have long been favourite objects of horticulture. In the warmer parts of Britain several will bear exposure to the cold of ordinary winters in a sheltered locality, but most need the protection of the conservatory. They are sometimes raised from seed, but are chiefly multiplied by cuttings "struck" in sand, and afterwards transferred to pots filled with a mixture of black peat and sand; the peat should be dry and free from sourness. Much attention is requisite in watering heaths, as they seldom recover if once allowed to droop, while they will not bear much water about their roots: the heath-house should be light and well ventilated, the plants requiring sun, and soon perishing in a close or permanently damp atmosphere; in England little or no heat is needed in ordinary seasons. The European heaths succeed well in English gardens, only requiring a peaty soil and a sunny situation; [illegible] *E.* [illegible] and the pretty cross-leaved heath of boggy moors, *E. tetralix*, are among those most worthy of cultivation. The beautiful large-flowered St Dabeoc's heath, belonging to the closely allied genus *Menziesia*, is likewise often seen in gardens. (C. P. J.)

HEATHCOAT, John (1783–1861), the author of important inventions for facilitating the manufacture of [illegible] or French lace, was born at Duffield near Derby in 1783. During his apprenticeship to a frame-smith near Loughborough, he made an improvement in the construction of the warp-loom, so as to produce mitts of a lace-like appearance by means of it. He commenced business on his own account at Nottingham, but finding himself subjected to the intrusion of competing inventors he removed to Hathern. There he diligently prosecuted his experiments, and in 1808 constructed a machine capable of producing an exact imitation of real pillow-lace. This was by far the most expensive and complex textile apparatus till then existing; and in describing the process of his invention, Heathcoat said in 1836, "The single difficulty of getting the diagonal threads to twist in the allotted space was so great that, if now to be done, I should probably not attempt its accomplishment." Some time before perfecting his invention, which he patented in 1809, he removed to Loughborough, where he entered into partnership with Mr Lacy, a Nottingham manufacturer; but in 1816 their factory was attacked by the Luddites and the lace frames destroyed. The damages were assessed in the King's Bench at £10,000; but as Heathcoat declined to expend the money in the county of Leicester he never received any part of it. Undaunted by his loss, he began at once to construct new and greatly improved machines in an unoccupied factory at Tiverton, Devonshire, propelling them by water-power and afterwards by steam. His claim to the invention of the twisting and traversing lace machine was disputed, and a patent was taken out by a clever workman for a similar machine, which was decided at a trial in 1816 to be an infringement of Heathcoat's patent. He followed his great invention by others of much ability, as, for instance, contrivances for ornamenting net while in course of manufacture and for making ribbons and platted and twisted net upon his machines, improved yarn spinning-frames, and methods for winding raw silk from cocoons. He also patented an improved process for extracting and purifying salt. An offer of £10,000 was made to him in 1833 for the use of his processes in dressing and finishing silk nets, but he allowed the highly profitable secret to remain undivulged. In 1832 he patented a steam plough, which stood foremost in public estimation until superseded by those of Fowler and others. Heathcoat was elected member of parliament for Tiverton in 1832. Though he seldom spoke in the House he was constantly engaged on committees, where his thorough knowledge of business and sound judgment were highly valued. He retained his seat until 1859, and after two years of declining health he died in January 1861 at Bolham House, near Tiverton.

HEATING. In temperate latitudes the climate is generally such as to necessitate in dwellings, during a great portion of the year, a temperature warmer than that out of doors, and, similarly, tropical plants growing in temperate climates require artificial heat in the house in which they are preserved. Thus heating is required for health and comfort: the object of the application of science is to obtain these with the greatest degree of economy. In its aspect as to health it may be assumed that no system of heating is advisable which does not provide for a constant renewal of the air in the locality warmed. In climates such as that of the United Kingdom, the temperature of living rooms should be maintained at from 54° to 65° Fahr. in the daytime; the night temperature may be lower, but should not fall below 40°; and the humidity of the air as measured by the wet and dry bulb thermometers should show a difference of not less than 4° nor much exceeding 8° between the two thermometers, although with an ample supply of air a greater degree of dryness would probably not be found objectionable.

All heating apparatus depends upon the transference of heat from the fire to the various parts of the building which it is intended to warm, and this transfer may be effected by radiation, by conduction, or by convection. Radiant heat is emitted and absorbed in an accelerating ratio in proportion as the difference of temperature between the radiant and the recipient increases, and, with the same difference of temperature between the recipient and the radiant, the effect of the radiant will be greater according to the increased temperature of the recipient. In other words, the rate of the emission of heat increases with the temperature. It is thus easier to effect the warming of a given space by means of a highly heated surface than by a surface emitting a lower temperature.

An open fire acts by radiation; it warms the air in a room by first warming the walls, floor, ceiling, and articles in the room, and these in their turn warm the air. Therefore in a room with an open fire the air of the room is, as a rule, less heated than the walls. In this case the warming of the air depends on the capacity of the surfaces to absorb or emit heat, except that the heat received by the walls may be divided into two parts, one part heating the air in contact with the wall, and the other passing through the wall to the outer surface, where it is finally dissipated and wasted. Fireplaces are sometimes constructed to assist the warming of the air of a room. For instance, in Sylvester's grate iron bars of which one end terminates under the fire are laid so as to form a projecting radiating hearth. The ventilating fireplace warms the fresh air before its admission into the room by means of gills cast on the back of the grate.

In a close stove, heated to a moderate temperature, the heat, as it passes from the fire, warms the surface of the materials which enclose and are in contact with the fire and with the heated gases. The materials next transfer the heat to the outer surface in contact with the air; and the air is warmed by the agency of this outer surface. If heated to high temperatures a stove gives out radiant heat, which passes through the air to warm the objects on which the rays impinge.

With hot water pipes, the heat from the water heats the inner surface of the pipe, and this surface transfers its heat to the outer surface through the material of the pipes. The rate at which the heat can pass from the inner to the outer surface, and be thus utilized instead of passing away straight into the chimney, depends on the heat evolved by the fire, on the extent of surfaces exposed to the heat and their capacity to absorb and emit heat, and on the quality of the material between the inner and the outer surface as a good or bad conductor of heat. This passage of heat through a body by conduction varies directly with the quality of material, and with the difference between the temperature of the inner surface exposed to the heat and the outer surface exposed to a cooling influence, and inversely as the thickness between the surfaces. Other things being equal, copper is a better material than iron for conveying the heat from the fire to water or air; and coverings of brickwork, wood, or woollen fabrics are better adapted than iron for retaining the heat. The property which appears more than any other to make materials good non-conductors of heat is their porosity to air, and the retention of the air in their pores.

The best warming of the air may be effected by stoves with brick or iron flues, or by hot water or steam pipes. The area of the heating surface for this purpose must be proportioned to the volume of air required to be warmed for ventilation, and the degree of heat to be communicated, the conductivity of the material, and its capacity for absorbing and retaining heat and for transmitting heat from one surface to the other. Where a large volume of air is supplied and removed for ventilation, rapidity in transmitting the heat from the fire to the air is an important consideration. Brick stoves and flues are worse conductors of heat than iron stoves or flues, but the mass of a brick stove permits the heat which reaches it [illegible]. The slow conducting power of the material and the greater thickness of a brick stove prevent alterations which may take place in the temperature being felt so much as with iron stoves or flues; and therefore the brick stove warms the air more equably, without sudden variations, the air so warmed is free from objectionable elements, and where they can be conveniently applied, it is advisable to use brick stoves for warming air for ventilating purposes.

With an iron flue pipe from a stove, almost the whole heat which any fuel is capable of developing may be utilized by using a sufficiently long pipe, horizontal for the greater part of its length, to convey the products of combustion to the outer air. The heat given out by a stove pipe varies with the temperature from end to end, being of course greatest at the end next the stove, where the emission of heat is very rapid; and the amount of heat given out per square foot will vary at each point as the distance from the stove increases. The proportions also into which the heat divides itself between radiation and convection vary greatly with the temperature. Thus, with a stove pipe heated at the end nearest the stove to a dull red heat of 1200° Fahr., and of sufficient length to allow the heat to be diminished to 150° at the further end, it would be found that at the stove end of the flue pipe 92 per cent. of the total heat emitted by the pipe is given out by radiation to the walls and only 8 per cent. to the air; but at the exit end the heat is nearly equally divided, the walls receiving 55 and the air 45 per cent. Taking the whole length of such a pipe, the walls would receive 74 per cent. and the air 26 per cent. of the heat emitted. But with a flue pipe heated to lower temperatures, the air might receive half the heat or even more. When therefore the object is to heat the walls rather than the air, the temperature of the pipes should be high; and for this purpose stove pipes are more effective than hot-water or low-pressure steam pipes. At high temperatures there will be practically little difference of effect between horizontal and vertical flue pipes, because the heat given out is principally that due to radiation, which is independent of the form and position of the radiant. An adequate proportion of flue pipes to the form and size of the stove involves a large surface for the flue pipe, with a careful observance of proportion, as much as 94½ per cent. of the heat in the fuel has been utilized.

There are, however, several serious objections to iron stoves, especially for small rooms: a long flue pipe is unsightly, and on that account often inadmissible; iron stoves heat rapidly, and easily become red hot, and the effect produced therefore is unequal. Carbonic oxide, too, has been found in air warmed by iron stoves very highly heated. It is alleged that highly-heated iron may take oxygen from the carbonic acid in the air in contact with its surface, and thus reduce the acid to carbonic oxide.

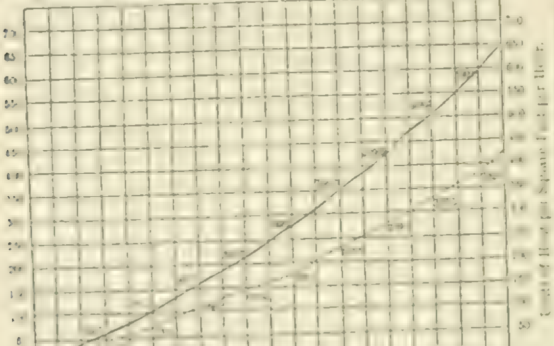
Whenever iron stoves or cockles are used for heating air, care should be taken to prevent the iron from attaining a high temperature, and with this object all iron stoves should have a lining of fire-brick, so as to prevent the fire from coming in direct contact with the iron; such an arrangement preserves greater regularity in the heating of the air. This object may be also attained by giving the stove a large surface in proportion to the fire by means of flanges or gills to carry off the heat as fast as it is generated. Iron coated with a surface of glazed enamel would enable the heat to pass rapidly from the fire to the surface, while the enamel surface would emit the heat more rapidly than the iron surface.

Hot-water pipes for warming air are free from many of the objections arising from the direct application of heat to iron, because the heat can be regulated with exactness.

A high temperature may be obtained from water without generating steam by heating it under pressure. In Perkins's high-pressure system, a continuous iron tube, about 1 inch diameter, is filled with water; about one-sixth of the length of the tube is coiled and placed in a furnace, and the remainder, forming the heating surface, is heated by the circulation of the water. At the highest level to which the tube is carried it is enlarged so as to allow of a space for expansion of the heated water equal to 15 per cent. of the contents of the small tube.

Pipes may be heated by either hot water or by steam. The higher the temperature, the greater is the comparative effect in warming air; therefore, with a small heating surface, steam pipes are more efficient than hot-water pipes, and steam at a high pressure more efficient than low-pressure steam. The efficient action of hot-water pipes depends upon the upward flow of the heated and expanded water as it passes from the boiler, the passage being made as direct as possible, and so protected as to lose little heat between the boiler and the place where the heat is to be utilized. The return pipe, which brings back the water after it has been cooled down by the abstraction of heat in warming the air, should be passed into the bottom of the boiler as directly and in as uniform a line from the place where the heat has been used as possible. The velocity of flow in the pipes will depend upon the temperature at which the water leaves the boiler, the height to which the heated water has to rise, and the temperature at which it passes down the return pipe back into the boiler. The efficiency of a hot-water apparatus will be regulated by these conditions, by the size of the pipe, and by such other conditions as affect the flow of water in pipes. When the boiler or source of heat is very near the level of the pipes for heating the air, the average temperature which can be obtained in the pipes will be lower than when the vertical column is long. The heating surface must be regulated with reference to this difference of level. It may further be observed that with small pipes, the temperature being constant, the velocity of flow in the pipe necessary to furnish a given amount of heat will vary as the ratio of the length of the pipe. When the water circulates through the pipes by virtue of the difference of temperature of the flow and return currents only, it is impossible to count upon a greater mean temperature of the pipes than from 160° to 180°, because above that temperature the water in the boiler begins to boil. To obtain a sufficient velocity of circulation for long distances, or with small differences of level, a forced circulation may be resorted to. This has been done by Messrs Easton and Anderson at the county lunatic asylum at Hanwell, in the following manner. The whole hot-water service is supplied from boilers placed at one end of the asylum buildings, which extend to a distance of several hundred yards. There are two pipes; one of them, which may be called the flow pipe, is connected directly with the boiler, terminating at the point furthest from the boiler in a dead end; the other, which may be termed the return pipe, is parallel to the first, and terminates at one end in a cistern which is placed about [illegible] feet above, and supplies the boiler. At the other end furthest from the cistern the second pipe also terminates in a dead end. At each pavilion or place to which hot water is required to be conveyed, there is a connexion between the two pipes, which can be closed or opened at will; when it is opened, the water can pass from the flow to the return pipe. In the second, or return pipe, near the point where it ascends to the cistern, is placed a rotatory pump or fan wheel, which is always kept revolving. When the openings are all closed between the two pipes, this pump or fan simply slips through the water; but as soon as the return pipe obtains a supply of water from any of the openings between it and the flow pipe, a circulation is established.

The following diagram, resulting from Mr Anderson's experiments, published in the *Journal of the Institution of Civil Engineers* for 1877, shows the total units of heat given out by cast-iron and wrought-iron pipes per square foot of surface per hour for various differences of temperature applicable either to hot-water or steam pipes. Suppose, for example, it is required to know how much heat will be given out by 4-inch cast-iron or 2-inch wrought-iron pipes at 190° in a room, the temperature of which is 60°; the difference of temperature is 130°, and corresponding to this will be found 202·7 units for 4-inch pipes and 356 units for 2-inch wrought-iron pipes per square foot per hour.



[illegible] wrought iron pipe [illegible]

The amount of heating surface to be allowed with hot-water [illegible]

[illegible] is also applicable for heating.

The direct application of steam heating on a large scale has been made at Lockport, New York. About 200 houses in the city are heated from a central supply through about 3 miles of piping, radiating from a boiler-house, which contains two boilers 16 feet by 5 feet, and one boiler 8 feet by 8 feet. These boilers are fired during the winter to a pressure of 35 lb to the inch, with a consumption of [illegible] tons of anthracite coal in twenty-four hours. The [illegible] pressure of 35 lb in winter and 25 lb in summer is maintained through a total length of 3 miles of piping up to the several points of consumption, where there is a valve under the control of the consumers. The first 600 feet of mains from the boilers are 4 inches in diameter. There are 1400 feet of 3-inch pipes, 2500 feet of 2½-inch pipes, and [illegible] feet of 2-inch pipes. The supply pipes from these mains to the houses are 1½ inches in diameter, and within each house ¾-inch pipes are used. In addition to the cut-off tap from the main under the control of the consumer, there is a pressure valve regulated to a 5-lb pressure under the control of the company; and beyond this is an ingeniously contrived meter, which registers not only the total consumption in cubic feet of steam, but also the quantity of steam in each apartment. At each [illegible] feet of main an expansion valve, like an ordinary piston and socket, is inserted, allowing an expansion in each section of [illegible] feet of 1½ inches for the heat at 35 lb pressure. No condensation occurs in the mains. They are covered with a thin layer of asbestos paper next the iron, then a wrapping of Russian felt, and finally manilla paper, and the whole is enclosed in wooden boxes about three-quarters of an inch larger than the covered pipes, and laid along the street like gas-pipes. The distribution of heat in the apartments is by means of radiators consisting of inch pipes, 30 inches long, placed vertically either in a circle or a double row, and connected together at top and bottom, with an outlet pipe for the condensed water, which escapes at a temperature a little below boiling, and is sufficient for all the domestic purposes of the house, or it may be used as a secondary heating power for horticultural and other purposes. The steam has also been applied at a distance of over half a mile from the boilers for motive power, and two steam engines of 10 horse and 14 horse power are worked from the boilers at a distance of half a mile with but a slightly increased consumption of fuel. The laden steam is also used for cooking purposes, for heating, and even for baking. As in the case of gas supply, the steam supply company lay their pipes up to the houses, the consumer paying for all internal pipes, fittings, and radiators. In a moderately-sized eight-roomed house the expense of these amounted to $150, and in larger houses with costlier fittings to $500.

Easton's system of heating with exhaust or waste steam is devised to enable the steam from a steam engine to travel long distances without any back pressure on the engine. It is especially [illegible] to drying rooms in which [illegible] has been [illegible] by a large heating surface, for a low temperature [illegible] heating surface is required. The capacity of heating by exhaust steam is nearly in a ratio with the fuel expended in the boiler. There is [illegible] through the engine, and at the [illegible] along the pipes to the [illegible] the [illegible] and the [illegible] the [illegible] boiler. Thus, if the steam be taken from the [illegible] the [illegible] pipes at the atmosphere, the [illegible] would [illegible] through the [illegible] of steam [illegible] into the pipes [illegible] to [illegible] power, [illegible] but it would [illegible], it would [illegible] in [illegible] back [illegible] to the [illegible], and [illegible] to obtain the same temperature in the room, the heating surface should be increased.

With an engine of 17-inch cylinder and 25 horse power indicated, the exhaust steam has been made to travel 250 yards in a [illegible] 1½-inch pipes [illegible] Mr Easton [illegible] per minute, and 1 for every [illegible] feet of wall, floor, or ceiling, [illegible] 15 per cent. for [illegible]

[illegible] hot-water pipes [illegible] small area. In [illegible] which hot water [illegible] of directly warming the air. (D. G.)

HEAVEN. See ESCHATOLOGY, vol. viii. p. 537.

HEBBEL, Friedrich (1813-1863), a German poet and dramatist, was born of poor parents at Wesselburen, in Schleswig-Holstein, 18th March 1813. In his fourteenth year he obtained a humble clerkship in his native parish, but already his ambition was soaring towards higher things. At an early period he began to practise poetical composition, and several of his poems printed in the Modezeitung at Hamburg awakened such interest that several gentlemen procured him in his twenty-second year the means of preparing himself in Hamburg for the university. He afterwards studied philosophy and history at Heidelberg and Munich. In 1841 he returned to Hamburg, where he published his first tragedy, *Judith*. In a journey which he made to Copenhagen in 1842 he formed the acquaintance of Thorwaldsen and Oehlenschläger, and acquired the more substantial advantage of a travelling bursary from the king of Denmark. He accordingly visited Paris, after which he went to Italy, where he remained several years, staying principally at Rome, Pisa, and Palermo. Having in the spring of 1846 stopped at Vienna on his way home to Germany, he made the acquaintance of the actress Christine Enghaus, whom he married in May of the same year. His marriage led him to take up his permanent residence in Vienna, and probably deepened his interest in dramatic composition, which from that time chiefly occupied his attention. He died in 1863. His principal dramas are *Genoveva*, 1843; *Maria Magdalena*, 1844; *Julia*, 1851; *Agnes Bernauer*, 1855; and *Die Nibelungen*, 1862. They exhibit considerable skill in the portraiture of character, great glow of passion, and a true feeling for dramatic situations, but their poetic effect is marred by frequent extravagances which border on the grotesque, and by the introduction of incidents the unpleasant character of which is not sufficiently relieved. In many of his smaller poems his undoubted poetic gifts found a truer and more artistic utterance.

His collected works appeared at Hamburg in 12 vols. (1865-68). His biography by Emil Kuh was published at Vienna in 1877.

HEBE, in Greek mythology, is a personification of the blooming freshness and youth of nature. Originally she appears almost identical with the pure Greek Aphrodite (as distinguished from the Oriental goddess). Hebe is the daughter of Zeus and Hera, as Aphrodite of Zeus and Dione; but Dione and Hera are only two names for the same goddess. Like Aphrodite, Hebe is called the most beautiful of the gods (Pind., *N.*, 10, 17). In Sicyon and Phlius Hebe is called Dia, a regular epithet of Aphrodite. In Phlius, where Hebe was worshipped on the citadel in a temple where no image of her was allowed and to which right of asylum was attached, a festival called κισσοτόμοι was celebrated to her every year; and ivy was sacred also to Aphrodite. It is in accordance with the close resemblance between Aphrodite and Core that Hebe also has many points of analogy with the latter, to whom she is compared by Gerhard and Welcker (*Gr. Gött.*, i. 369). According to the custom for the unmarried daughters of a family, Hebe acts in the Homeric poems as a sort of attendant to the gods and especially to her own mother Hera. She offers the cup to the gods, just as on earth the women, and especially the youngest daughter, did to guests and to warriors departing or returning. She bathes Ares (*Il.*, v. 905), as Polycaste does Telemachus. She harnesses the horses for Hera (*Il.*, v. 722). She appears very often in connexion with the worship of Hera. A statue of her by Naucydes stood beside the Hera of Polyclitus in the Heræum at Argos. Praxiteles placed statues of her and Athene beside that of Hera in the temple at Mantinea, and Kekulé (*Hebe*) maintains that the artistic conception of Hebe which prevailed in the finest period of Greek art was a slight modification of that of Hera, and he believes that a bust, now in private possession, is the single remaining example of its kind. Welcker's opinion that the so-called Farnese Flora is really a Hebe has not been generally accepted. In later art she is often represented, like Ganymedes, caressing the eagle; and it is possible that the epithet Ganymeda, by which she was called in Phlius, is not really ancient, but arises from the supposed analogy of her office with that of Ganymedes. The meaning of the word Hebe tended to transform the goddess into a mere personification of the eternal youth that belongs to the gods, and this conception is frequently met with. Then she becomes identical with the Roman Juventas, who is simply an abstraction of an attribute of Jupiter Juventus, the god of increase and blessing and youth. By a most transparent allegory it was said that Juventas and Terminus alone of all the gods refused to give way when the temple of Jupiter Capitolinus was being built. Perhaps the most interesting point about Hebe is her connexion with Heracles. When he was received among the gods and reconciled to Hera, Hebe was given him in marriage. This legend appears only in a doubtful line of Homer (*Od.*, xi. 603); but Hesiod (*Th.*, 950) and Pindar (*N.*, 10, 17) also know it. They were worshipped together in the Cynosarges at Athens, and represented side by side on the Amyclæan throne. The apotheosis of Heracles and his marriage with Hebe became a favourite subject with poets and painters. Many instances occur on vases, though several of those enumerated by Kekulé are otherwise explained by other writers on art.

HEBER, Reginald (1783-1826), a distinguished prelate and hymn-writer, was born at Malpas in Cheshire in 1783. He early showed remarkable promise, and was entered in November 1800 at Brasenose College, Oxford, where he proved a distinguished student, carrying off prizes for a Latin poem entitled *Carmen Seculare*, an English poem on *Palestine*, and a prose essay on *The Sense of Honour*. In November 1804 he was elected a fellow of All Souls College; and, after finishing his distinguished university career, he made a long tour on the Continent. He was admitted to holy orders in 1807, and was then presented to the family living of Hodnet in Shropshire. In 1809 Heber married Amelia, daughter of Dr Shipley, dean of St Asaph. He was appointed Bampton lecturer for 1815, prebendary of St Asaph in 1817, preacher at Lincoln's Inn in 1822, and bishop of Calcutta in January 1823. Before sailing for India he received the degree of D.D. from the university of Oxford. In India Bishop Heber laboured indefatigably, not only for the good of his own diocese, but for the spread of Christianity throughout the East. Animated by apostolic zeal, he undertook numerous tours in India, consecrating churches, founding schools, and discharging other Christian duties. Such devotion to his work in a trying climate told severely on his health. At Trichinopoly he was seized with an apoplectic fit when in his bath, and expired on 3d April 1826.

Heber was a man of profound learning, refined literary taste, and great practical energy. His Christian character manifested all the beauty and simplicity of the days of the early church. As a poet he has attained a high place. His *Palestine* is generally considered the best prize poem ever written at Oxford. Heber's fame rests mainly on his hymns, which, as literary compositions, rank among the best in the English language. Those beginning as follows may be instanced:—"Lord of mercy and of might"; "Brightest and best of the sons of the morning"; "By cool Siloam's shady rill"; "God, that madest earth and heaven"; "The Lord of might from Sinai's brow"; "Holy, holy, holy, Lord God Almighty"; "From Greenland's icy mountains"; "The Lord will come, the earth shall quake"; "The Son of God goes forth to war." Heber's hymns and other poems are distinguished by finish of style, pathos, and soaring aspiration; but they lack originality, and are rather rhetorical than poetical in the strict sense.

Heber was a voluminous author, as may be seen from the following works:—*Palestine; a Poem, to which is added the Passage of the Red Sea*, 1809; *Europe: Lines on the Present War*, 1809; *The Personality and Office of the Christian Comforter asserted and explained*, being the Bampton Lectures for 1815; *The Whole Works of Bishop Jeremy Taylor, with a Life of the Author, and a Critical Examination of his Writings*, 1822; *Hymns written and adapted to the Weekly Church Service of the Year, principally by Bishop Heber*, 1827; *A Journey through India*, 1828; *Sermons preached in England*, and *Sermons preached in India*, 1829; *Parish Sermons*, 1837.

For further information about Heber see his *Life*, by his widow, 1830, which also contains a number of Heber's miscellaneous writings; *The Last Days of Bishop Heber*, by Thomas Robinson, A.M., archdeacon of Madras, 1830; and *Memorials of a Quiet Life*, by Augustus J. C. Hare, 1871.

HEBERDEN, William (1710–1801), a practical physician of some celebrity, was born in London in the year 1710. In the end of 1724 he was sent to St John's College, Cambridge, where he obtained a fellowship about 1730, became master of arts in 1732, and took his degree in physic in 1739. He remained at Cambridge about ten years longer as a practitioner of physic, and gave an annual course of lectures on materia medica. In 1746 he became a fellow of the Royal College of Physicians in London; and two years afterwards he left Cambridge to establish himself in London, where he was elected a fellow of the Royal Society in 1769, and was employed in a very extensive medical practice for more than thirty years. Latterly he passed his summers at a house which he had taken at Windsor, but he continued his practice during the winter for some years longer. In 1778 he was made an honorary member of the Royal Society of Medicine at Paris. He died 17th May 1801.

Heberden's first publication seems to have been a short essay on the incongruous composition of the mithridate and theriac, entitled *Antitheriaca* (1745). He also wrote several papers for the Royal Society, which were published in its *Transactions*; and he was one of the principal contributors to the first three volumes of the *Medical Transactions*, published, in a great measure at his suggestion, by the College of Physicians. He is, however, best known by his *Commentaries on the History and Cure of Diseases*, the result of careful notes made in his pocket-book at the bedside of his patients. In accordance with his directions the work was published posthumously in 1802; prefixed to it is a short notice of his life.

HÉBERT, Jacques René (1755–1794), a French revolutionist, surnamed from the newspaper he edited "Le Père Duchesne," was born of obscure parents at Alençon in 1755. He came at an early age to Paris, where he lost more than one situation through malversation, and was in abject poverty when the occurrence of the French Revolution opened up to him a career in which he obtained considerable temporary success and permanent notoriety. Having shown great readiness and proficiency in a style of writing and of oratory which appealed to the worst feelings of the revolutionary mob, he soon acquired great influence in the clubs, and was chosen to oppose the constitutional paper *Le Père Duchesne* by editing a revolutionary paper of the same name. The scurrilous and extravagant language of the new print exactly coincided with the sentiments of the class to whom it was addressed, and it contributed not a little to several of the worst and most violent manifestations of the revolutionary spirit. It had a very beneficial influence on the fortunes of its editor, who after the 10th August 1792 was one of the chief members of the revolutionary committee, and on the 2d September was appointed substitute to the *procureur syndic*. On the 24th May 1793 an order was sent out for his arrest by the more moderate party of the commune on the ground that he was plotting their assassination, but on account of a formidable outbreak of the mob he was set at liberty, and when he appeared again at the commune he was presented with a civic crown. Having been appointed a member of the commission to examine Marie Antoinette, he with unsurpassed moral baseness foully accused her of a crime too scandalous to be mentioned. Along with several of his colleagues he invented the worship of the goddess "Reason," and subsequently he organized a party of ultra-revolutionists known as the Hébertists or *enragés*. The faction were, however, arrested by the committee of public safety, and on the 24th March 1794 were led forth to execution. Hébert behaved with great cowardice at his trial, and died amid the jeers and insults of the mob over whose passions he had at one time exercised such sway and to whom he owed his promotion to power.

He was the author of *Vitres cassées par le véritable Père Duchesne*, 1791; *Vie privée de l'abbé Maury*, 1790; *Petit carême de l'abbé Maury*, 1791; *Nouvelle lanterne magique*, 1792.

HEBREW LANGUAGE AND LITERATURE. The name *Hebrew* (Latin, *Hebræus*; Greek, ἑβραῖος) is a transcription of *'ebrâyâ*, the Aramaic equivalent of the original Old Testament word עברי, *'ibrî*, pl. *'ibrîm*, which is the proper Gentile name of the people who also bore the collective name of Israel or Children of Israel (B'nê Israel). The name of Israel with its sacred associations in the patriarchal history is that by which the Old Testament writers prefer to designate their nation; and this circumstance, combined with the fact that the Sacred Text frequently employs the term Hebrews where foreigners are introduced as speaking or spoken to (*e.g.*, Exod. ii. 6; 1 Sam. iv. 6, 9; Gen. xl. 15; Ex. iii. 18), has led to the conjecture that the name of Hebrews (men from the other side, *scil.* of the Euphrates) was originally given to the descendants of Abraham by their Canaanite neighbours, and continued to be the usual designation of the Israelites among foreigners, just as the Magyars are known to other Europeans as Hungarians (foreigners), as we call the High-Dutch Germans (warriors), or as the Greeks gave the name of Phœnicians to the people that called themselves Canaanites.[1] A closer view of the case does not confirm this conjecture. The name of Israel is often found in the Old Testament in the mouth of foreigners, and the whole *usus loquendi* is explained by the observation that the Gentile noun corresponding to the collective "Israel" is regularly "Hebrew" and not "Israelite," the latter word being rare and apparently of late formation.[2] Nor has the word Hebrew been hitherto found in the early monuments of other Eastern nations; for the identification proposed by Chabas which finds the Hebrews in the hieroglyphic Apuriu is more than doubtful.[3] On the other hand the name of Israel appears on the stone of Mesha king of Moab, and perhaps has been deciphered on Assyrian monuments.[4]

The form *'ibrî* is, in the language of Semitic grammarians, a relative noun, presupposing the word *'Eber* as the name of the tribe, place, or common ancestor, from whom the Hebrews are designated. Accordingly we find Eber as a nation side by side with Assyria in the obscure poetical passage Num. xxiv. 24, and Eber as ancestor of the Hebrews in the genealogical lists of Gen. x., xi. Here we must apparently distinguish two records.[5] According to

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[1] See especially Gesenius, *Geschichte der Hebräischen Sprache und Schrift*, pp. 9 *sq.*, and recently Kautzsch in Riehm's *Handwörterbuch*.

[2] In 2 Sam. xvii. 25 Israelite must be corrected to Ishmaelite, as in the parallel passage 1 Chron. ii. 17.

[3] Chabas, *Mélanges Égyptologiques*, i. 42; Ebers, *Aegypten und die Bücher Mose's*, i. 316; Brugsch, *Geschichte Aegyptens*, 582 (Eng. trans., ii. 128); [illegible]

[4] Schrader, *Keilinschriften und Geschichtsforschung* (Giessen, 1878), pp. [illegible], gives the latest conclusions for this not undisputed reading.

[5] See De Goeje in the *Theol. Tijdschrift*, 1870, p. 243; and Wellhausen in *Jahrb. f. D. Theol.*, 1876, p. 395.

Gen. xi. (and Gen. x. 24) Eber is the great-grandson of Shem through Arphaxad, and ancestor of Terah through Peleg, Reu, Serug, and Nahor. These are not to be taken as the names of individual men. Several of them are designations of places or districts near the upper waters of the Euphrates and Tigris, and among other circumstances the place at the head of the series assigned to the district of Arrapachitis (Arphaxad), through which a migration from Ararat to the lands occupied by the Semites in historical times would first pass, suggests the probability that the genealogy is not even meant to exhibit a table of ethnological affinities, but rather presents a geographical sketch of the early movements of the Hebrews, who are personified under the name of Eber. If this is so we can hardly venture to assert (with some scholars) that the author of the list (the Levitical Elohist) extended the name of Hebrews to all descendants of Terah.[1] The case is different with another and apparently older record of which a fragment seems to be preserved in Gen. x. 21, 25–30. Here there is no intermediate link between Shem and Eber. Sons of Shem and sons of Eber appear to be coextensive ideas, and to the latter are reckoned not only the descendants of Peleg (Aramæans, Israelites, Ishmaelite Arabs, &c.), but the South Arabian tribes of Joktan. We possess no information which casts light on this wide conception of the sons of Eber, and in the ordinary language of the Old Testament Hebrew and Israelite are strictly synonymous.

Compare, however, the interesting conjectures of Sprenger, *Alte Geographie Arabiens* (Bern, 1875), p. 294, who identifies Peleg with Falag in Central Arabia, and finds in the record a witness to the truth of the view that Arabia is the original centre of the Semitic dispersion, a view which is shared by other scholars, as Hitzig (*Gesch. des Volkes Israels*, pp. 26, 59), and Schrader (*Z. D. M. G.*, 1873, pp. 397-424). In this connexion it is perhaps worth while to note the Arabic Gentile name 'Obri, belonging to 'Obra, a minor division of the Joktanite tribe of the Azd (*Lubb al-lubáb*, ed. Veth, p. 175).

When it is recognized that Eber in Genesis is not an actual personage but an ethnological or geographical abstraction, we are thrown back on etymological conjecture as to the origin of the name of Hebrews. 'Eber means the further bank of a river, from a root meaning *to cross*. Hence in Gen. xiv. 13 the Septuagint renders Abram the Hebrew by ὁ περάτης, "the crosser."[2] Grammatically more accurate, while resting on the same etymology, is the rendering of Aquila, ὁ περαίτης, "the man from the other side" of the Euphrates, which is the explanation of Jewish tradition (*Bereshit Rabba*, and Rashi) and still generally adopted. It is, however, far from satisfactory, and almost of necessity depends on the theory that the name was fixed upon the Hebrew immigrants by the earlier inhabitants of Canaan.[3] A modified form of the etymology takes 'eber in the Arabic sense of a river bank, and makes the Hebrews "dwellers in a land of rivers" (Steiner in the *Bibel-Lex.*, ii. 613). This goes well with Peleg (watercourse), as in Arabia we have the district Falag, so named because it is furrowed by waters (Sprenger, *Geog. Arab.*, p. 234).[4]

The name "Hebrew Language."—By the Hebrew language we understand the ancient tongue of the Hebrews in Canaan—the language in which the Old Testament is composed, with the exception of the Aramaic passages (Jer. x. 11; Ezra iv. 8–vi. 18; vii. 12–26; Dan. ii. 4–vii. 28). But we do not find that this language was called Hebrew by those who spoke it. It is the *lip*, *i.e.*, speech *of Canaan*, Isa. xix. 18, or, as spoken in Southern Palestine, יהודית *Jewish* (2 Kings xviii. 26; Neh. xiii. 24). The later Jews call it the *holy tongue* in contrast to the *profane* Aramaic dialect (commonly though improperly enough called Syro-Chaldaic) which long before the time of Christ had superseded the old language as the vernacular of the Jews. This change had already taken place at the time when the expression "in Hebrew" (ἑβραϊστί) first occurs (Prologue to Sirach); and both in the Apocrypha and in the New Testament the ambiguous term, naming the language after those who used it, often denotes the contemporary vernacular, not the obsolete idiom of the Old Testament. But the other sense was admissible (*e.g.*, Rev. ix. 11, and so frequently in Josephus), and naturally became the prevalent one among Christian writers who had little occasion to speak of anything but the Old Testament Hebrew.[5] In modern usage it is incorrect to call the Jewish Aramaic Hebrew; though uneducated Jews apply the name even to the corrupt German and Spanish jargons which they are accustomed to write and print in Hebrew characters.

Character and Philological Relations of Hebrew.—Hebrew is a language of the group which since Eichborn has generally been known as Semitic, and of which Arabic and Ethiopic (Southern Semitic), the various dialects of Aramaic, and the language of the Assyrian and Babylonian cuneiform inscriptions are the other chief representatives. From its geographical position as the language of Palestine between the Aramæans of the north and the Arabs of the south, Hebrew has been called Middle Semitic. Or Aramaic Assyrian and Hebrew may be grouped together as Northern Semitic in contrast to Arabic and Ethiopic. The affinities of the Semitic languages are so close that they may fairly be compared with a sub-group of the Indo-Germanic family—for example, with the Teutonic languages. The fundamental unity of the Semitic vocabulary is easily observed from the absence of compounds (except in proper names) and from the fact that almost all words are derived from their roots in definite patterns (*measures*) as regular as those of grammatical inflexion. The roots regularly consist of three consonants (seldom four or five), the accompanying vowels having no radical value, but shifting according to grammatical rules to express various embodiments of the root idea. The triliteral roots are substantially common to the whole Semitic group, subject to certain consonantal permutations, of which the most important are strikingly analogous to those laid down by Grimm for the Teutonic languages.

There are four sounds in Arabic unknown to Hebrew and Aramaic, and for which the former regularly has a sibilant, the latter a lingual—in one case a deep guttural. This guttural (ע), and the palatal letters which in the following table are represented by ḍ, ṣ, ṭ, ẓ, are peculiar Semitic sounds.

Arabic		Hebrew.		Aramaic.
th ث	=	sh שׁ	=	t ת
dh ذ	=	z ז	=	d ד
ẓ ظ	=	ṣ צ	=	ṭ ט
ḍ ض	=	ṣ צ	=	ע [also ṣ]

On the last equation see Lagarde, *Semitica*, i. 22; Noldeke in *Z. D. M. G.*, xxxii., 405; and on the permutation of consonants in general, Merx, *Gram. Syr.*, § 24; Stade in *Morgenl. Forschungen* (1875), p. 179 *seq.* Whether the Arabic or Aramaic forms are the older is disputed. No one maintains that the Hebrew forms are original.

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[1] The Terahites, according to other testimonies, are Aramæans (Gen. xxv. 20 seq.; Deut. xxvi. 5), but our Elohist, who can hardly have written before the captivity, makes Aram a separate offshoot of Shem, having nothing to do with Eber (Gen. x. 22, 23).

[2] Compare Jerome, *Quæst. Hebr.* on the passage, and Theodoret, Qu. LXI in Gen.

[3] Compare Ewald, *Gesch. Israels* (3d ed.), i. 407 *seq.* (Eng. trans., i. 284), where also other etymologies are noticed.

[4] [illegible] of Hebrew made it possible for early Christian [illegible] to derive the name of the Hebrews from Abraham. See Bochart's *Phaleg*, lib. ii., cap. 14. Other guesses will be found in the *Onomastica*.

[5] The term "Hebrew language" seems to have originated with the Greeks or Hellenists. Philo, however, calls the language of the Old Testament Chaldee (*De Vita Mosis*, ii. 5, 6; *cf.* Jerome on Dan. i.). On the use of the expression "Hebrew language" in the Talmud, see Berliner, *Beiträge zur heb. Gr.* (Berlin, 1879), p. 5.

Derivation from the roots and inflexion proceed partly by the reduplication of root letters and the addition of certain preformatives and afformatives (more rarely by the insertion of formative consonants in the body of the root), partly by modifications of the vowels with which the radicals are pronounced. Almost every root expresses in its origin something that can be grasped by the senses, and the mechanism by which words are formed from the root is adapted to present sensible notions in a variety of *nuances* and in all possible embodiments and connexions, so that there are regular forms to express in a single word the intensity, the repetition, the production of the root idea—the place, the instrument, the time of its occurrence, and so forth. Thus the expression of intellectual ideas is necessarily metaphorical, almost every word being capable of a material sense or at least conveying the distinct suggestion of some sensible notion. For example, the names of passions depict their physiological expression: "to confer honour" means also "to make heavy," and so on. The same concrete character, the same inadequacy to convey purely abstract thoughts without a substratum appealing to the senses, appears in the grammatical structure of the Semitic tongues,—for example, in the absence of the neuter gender, in the extreme paucity of particles, in the scanty provision for the subordination of propositions, which deprives the Semitic style of all involved periods and reduces it to a succession of short sentences linked by the simple copula *and*. The fundamental element of these languages is the noun, and in the fundamental type of sentence the predicate is a noun set down without any copula and therefore without distinction of past, present, or future time. The finite verb is developed from nominal forms (participial or infinitive), and is equally without distinction of time. Instead of tenses we find two forms, the perfect and the imperfect, which are used according as the speaker contemplates the verbal action as a thing complete or as conditional, imperfect, or in process. It lies in the nature of this distinction that the imperfect alone has moods. In their later stages the languages seek to supply the lack of tenses by circumlocutions with a substantive verb and participles. Other notable features common to the Semitic tongues are the use of appended suffixes to denote the possessive pronouns with a substantive, or the accusative of a personal pronoun with a verb, and the expression of the genitive relation by what is called construction or annexation, the governing noun being placed immediately before the genitive, and if possible slightly shortened in pronunciation so that the two words may run together as one idea. A characteristic of the later stages of the languages is the resolution of this relation into a prepositional clause.

These and other peculiarities are sufficient to establish the original unity of the group, and entitle us to postulate an original language from which all the Semitic dialects have sprung. Of the relation of this language to other linguistic stems, especially to the Indo-Germanic on the east and the North African languages on the west, we cannot yet speak with certainty; but it appears that the present system of triliteral roots has grown out of an earlier biliteral system which, so far as it can be reconstructed, must form the basis of scientific inquiry into the ultimate affinities of the Semitic group.[1]

Before the rise of comparative philology it was a familiar opinion that Hebrew is the original speech of mankind. Taken from the Jews, and as already expressed in the Palestinian Targum on Gen. xi. 1, this opinion drew its main support from etymologies and other data in the earlier chapters of Genesis, which, however, were as plausibly turned by Syriac writers in favour of their own tongue.[2] Till quite recently many excellent scholars (including Ewald) have claimed for Hebrew the greatest relative antiquity among Semitic tongues. But though Hebrew has by far the oldest literature, this does not prove that its structure comes nearest to the original Semitic language. And it is now generally recognized that in grammatical structure the Arabic, shut up within its native deserts till the epoch of Islam, preserved much more of the original Semitic forms than either Hebrew or Aramaic. In its richer vocalization, in the possession of distinct case-endings, in the use for feminine nouns of the afformative *t*, which in the northern dialect has passed through *h* (originally audible as in Egyptian Arabic) into a mere vowel, in the more extensive range of passive and modal forms, and in other refinements of inflexion, Arabic represents no later development, but the original wealth and primitive subtlety of Semitic speech, as appears not only from fragmentary survivals in the other dialects but from an examination of the process of decay which has brought the spoken Arabic of the present day into a grammatical condition closely parallel to the Old Testament Hebrew. But while Arabic is in many respects the elder brother, it is not the parent of Hebrew or Aramaic. Each member of the group had an independent development from a stage prior to any existing language, though it would seem that Hebrew did not branch off from Aramaic so soon as from Arabic, whilst in its later stages it came under direct Aramaic influence.

Among the points in which Hebrew differs both from Arabic and Aramaic may be mentioned the consonantal relations already spoken of, the system of tone-long vowels, the use of Waw consecutive, the ה of the causative and reflexive stems and of the article, and the compensation for omitting the reduplication of gutturals and *r* by lengthening a preceding vowel.[3] Again, Hebrew agrees with Arabic against Aramaic in possessing a prefixed article, in the use of the Nifal (Arab. VII.), and in other minor points. But in more notable features Hebrew and Aramaic agree against Arabic, as in the absence of broken plurals, the place of the accent, the aspiration of certain letters whenever they are preceded by a vowel sound, and the substitution of *y* for *w* as the first radical of roots. To give further details would carry us too far into comparative grammar. Speaking generally, it may be said that Hebrew is less copious in vocabulary than Arabic (in which tongue, however, the abundance of synonyms is largely due to an eventual combination of several dialects), and less rich in subtle distinctions of grammatical form and refinements of syntax. On the other hand, Hebrew is much superior to Aramaic in the vivacity of structure, in fulness of vowels, and in all the qualities which adapt a language for poetical expression.

Geographical Sphere and History of Hebrew as a Spoken Language.—The Hebrew spoken by the Israelites in Canaan was separated only by very minor differences (like those of our provincial dialects) from the speech of neighbouring tribes. We know this for the Moabite language from the stone of Mesha, and the indications furnished by proper names, as well as the acknowledged affinity of Israel with these tribes, make the same thing probable for Ammon and Edom. More remarkable is the fact that the Phœnicians and Canaanites, with whom the Israelites acknowledged no brotherhood, spoke a language which, at least as written, differs but little from Biblical Hebrew. This observation has been used in support of the very old idea that the Hebrews originally spoke Aramaic, and changed their language in Canaan. But an exacter study of the Phœnician inscriptions shows differences from Hebrew which suffice to constitute a distinct dialect, and combine with other indications to favour the view that the descendants of Abraham brought their Hebrew idiom with them from Haran. And in this connexion it is important to observe that the old Assyrian, which preceded Aramaic in regions with which the book of Genesis connects the origins of Abraham, is in many respects closely akin to Hebrew.[1] As the origin of Hebrew is lost in the obscurity that hangs over the early movements of the Semitic tribes, so we know very little of the changes which the language underwent in Canaan. The existence of local differences of speech is proved by Judges xii. 6; but the attempt to make out in the Old Testament records a northern and a Judæan dialect, or even besides these a third dialect for the Simeonites of the extreme south,[2] has led to no certain results. In general it may be said that the Biblical text supplies inadequate data for studying the history of the language. Semitic writing, especially a purely consonantal text such as the Old Testament originally was, gives an imperfect picture of the very grammatical and phonetic details most likely to vary dialectically or in course of time. The later punctuation (including the notation of vowels), and even many things in the present consonantal text, represent the formal pronunciation of the Synagogue as it took shape after Hebrew became a dead language—for even the Septuagint has often a more primitive pronunciation of proper names. This modern system being applied to all parts of the Old Testament alike, many archaisms were obliterated or disguised, and the earlier and later writings present in the received text a grammatical uniformity which is certainly not original. It is true that occasional consonantal forms inconsistent with the accompanying vowels have survived—especially in the books least read by the Jews—and appear in the light of comparative grammar as indications of more primitive forms. These sporadic survivals show that the correction of obsolete forms was not carried through with perfect consistency; but we are never safe to argue as if we possessed the original form of the texts.

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[1] [illegible] the history of [illegible] p. [illegible]

[2] [illegible] Assemani, *Bib. Or.*, [illegible] 314. [illegible]

[3] [illegible] LXX [illegible]

In the Pentateuch, for example, the form הוא stands not only for הוּא (3d personal pron. masc.) but for הִיא (the feminine). And hence a favourite argument was drawn for the superior antiquity of this part of the Old Testament. But the same thing is found elsewhere (Frensdorff, *Mass. Wörterb.*, p. 233), especially in Babylonian codices of the prophets (Geiger, *Urschrift*, p. 236; *Z. D. M. G.*, xxviii. 676). The feminine can never by any possibility have been pronounced *hu*, but the old orthography was probably הא for *hu* and *hi* alike (Nöldeke in *Bibel-Lexikon*, *ut supra*, after Levy).

The chief historical changes in the Hebrew language which we can still trace are due to Aramaic influence. The Northern Israelites were in immediate contact with Aramæan populations and some Aramaic loan-words were used, at least in Northern Israel, from a very early date. At the time of Hezekiah Aramaic seems to have been the usual language of diplomacy spoken by the statesmen of Judah and Assyria alike (2 Kings xviii. 26). After the fall of Samaria the Hebrew population of Northern Israel was partly deported, their place being taken by new colonists most of whom probably had Aramaic as their mother-tongue. It is not therefore surprising that even in the language of Judea increasing signs of Aramaic influence appear before the Exile.[3] The fall of the Jewish kingdom accelerated the decay of Hebrew as a spoken language. Not indeed that the captives forgot their own tongue in Babylon, as older scholars supposed on the basis of Jewish tradition. The Exilic and post-Exile prophets do not write in a lifeless tongue, and Hebrew was still the language of Jerusalem in the time of Nehemiah (ch. xiii.) in the middle of the 5th century B.C.[4] But after the Exile the petty people of the Jews were in daily intercourse with a surrounding Aramæan population, and the Aramaic tongue, which was the official language of the western provinces of the Persian empire, began to take rank as the recognized medium of polite intercourse and letters even among tribes of Arabic blood—the Nabatæans whose inscriptions in the Hauran are written in Aramaic. Thus Hebrew as a spoken language gradually yielded to its more powerful neighbour, and the style of the latest Old Testament writers is not only full of Aramaic words and forms but largely coloured with Aramaic idioms, while their Hebrew has lost the force and freedom of a living tongue (Ecclesiastes, Esther, some Psalms, Daniel). The Chronicler no longer thoroughly understood the Old Hebrew sources from which he worked, while for the latest part of his history he used a Jewish Aramaic document, part of which he incorporated in the book of Ezra. Long before the time of Christ Hebrew was the exclusive property of scholars, and its further history is that of a merely literary language.

The Literary Development of Hebrew.[5]—The Semitic peoples possessed the art of writing and an alphabetical character from a date so remote as to be lost in the mists of antiquity. This character was formerly known as Phœnician, its invention being ascribed to that people (Tac., *Ann.*, xi. 14). In reality it was the common property of all Semitic nations between Assyria and Egypt—an alphabetic character in contact on the east and on the west with more complicated syllabic or hieroglyphic systems, from one or other of which it may possibly have been derived.

De Rougé's theory that the alphabet was derived by the Phœnicians from the Egyptian hieratic writing obtained much currency a few years ago (see ALPHABET), but has rather lost ground since the appearance in 1874 of the long expected *Memoire sur l'origine Egyptienne de l'alphabet Phénicien*. See the criticism in Lagarde's *Symmicta*, p. 113 *seq.* A newer theory by Deecke (*Z. D. M. G.*, xxxi. 102 *seq.*) derives the alphabet from the cuneiform characters, and makes the Aramæans its authors, for which there is ancient tradition in Pliny, Diodorus, and Clemens Alexandrinus. Deecke dates the invention from the 9th century B.C., when the Assyrians first established themselves in Aram. This is certainly wrong, for, apart from other arguments, the stone of Mesha is not a product of the first days of alphabetic writing. Against the derivation of the Semitic alphabet from any hieroglyphic system, see Levy, *Phönizische Studien*, i. 49 *seq.* The best comparative table of Semitic alphabets is that by Euting in the English translation of Bickell's *Outlines of Heb. Gram.* (Leipsic, 1877). On the history of Hebrew writing, especially in its bearing on the history of the Biblical text, see Wellhausen in Bleek's *Einleitung*, 4th ed. (1878), with Nöldeke's remarks, *Z. D. M. G.*, xxxii. 591 *seq.*

This ancient alphabet consists of twenty-two consonants, of which one at least (ע) stood in Hebrew for two distinct sounds, still separated in the Septuagint pronunciation. The vowels were supplied by the reader—which is not so difficult in Semitic languages, where vocalization constitutes no difference of root. In certain cases the weaker consonants served as *matres lectionis* to indicate cognate vowel sounds and preclude ambiguity of pronunciation; but in the old writing this usage was far less extensive than in our Hebrew MSS., and hardly applied except to diphthongs and to a,—or less often î, û—at the end of words.[1] This old character with its scanty indications of vowels continued to be used by the Hebrews throughout the flourishing period of their literature and for some time after the Exile, till at length they gradually adopted a newer form of letters (the square or, as the Talmud calls it, the Assyrian character) which was developed among the Aramæans and spread with the increase of Aramaic influence. Jewish tradition ascribes the introduction of the square character to Ezra (*Sanh.* 21b 22a; Jerome, *Prol. Gal.*); but the Samaritans, who did not receive the Pentateuch from the Jews till about 400 B.C., must have got it in the old letter which they still retain in a corrupted form. The square letter probably did not prevail till a good deal later, the earliest Jewish inscription in which it appears being of the date 176 B.C. (published by De Vogüé, *Rev. Arch.*, 1864), while the coins of Judea retain the old character still later. The transformation was complete before the time of Christ, for Mat. v. 18 alludes to the new form of *Yod* (jot).[2] By this time too the use of *matres lectionis* must have become more ample. The later introduction of vowel points and accents belongs to the history of the study of Hebrew as a dead language. The forms of the old Semitic alphabet are most suitable to be cut on stone, and indicate a special adaptation for monumental inscriptions (*cf.* the two tables of the Decalogue). Between the beginnings of such inscriptions and the general use of writing for literary purposes a considerable period might intervene. The earliest products of Hebrew authorship seem to have been lyrics and laws, which would circulate in the first instance from mouth to mouth without the use of written copies. We have notice of early written collections of lyrics prior to our present historical books—the *Book of the Wars of Jehovah* (Num. xxi. 14) and the *Book of Jashar* (Josh. x., 2 Sam. i). We have no clue to the age of the former book, but the lines quoted from it are plainly of great antiquity. The *Book of Jashar* is not earlier than the time of Solomon; for a fragment from it referring to the building of the temple has been recovered from the Septuagint of 1 Kings viii. (Wellhausen in Bleek, *ut supra*, p. 236). The earliest date of written law books is uncertain. It may fairly be made a question whether Moses left in writing any other laws than the commandments on the tables of stone. Even Ex. xxiv. 4 and xxxiv. 27 may in the original context have referred to the ten words alone. And it is certain that ancient law was handed down by oral tradition and local custom to a much later date. The prophets frequently allude to the oral decisions of the priests as a source of law, and the practice of appealing to the local customs of certain towns is alluded to in 2 Sam. xx. 18 (as restored by Ewald from the LXX.)—"Ask at Abel and at Dan whether the genuine old statutes of Israel have lost their force." In like manner the story of the early fortunes of the nation down to the time of David often presents characteristics which point to oral tradition as its original source. Yet written history began comparatively early. A scribe was attached to the royal court from the reign of David downwards; and the older parts of the books of Samuel, which must have been written not long after the time of that king (see David), are framed in a masterly style, which shows that the art of composition in prose was already thoroughly understood. So too the best written and most brilliant part of the narrative of the Pentateuch—the combined history of the Jehovist and the non-Levitical Elohist—appears to be unquestionably earlier than the rise of prophetic literature in the 8th century B.C. In this narrative—itself the product of more than one writer—are included several collections of old laws, so that we have between the time of David and the age of Amos and Hosea a flourishing historical and legal literature, in which and in lyrical collections like the *Book of Jashar* were embodied many poems, legends, and other remains, transmitted, whether orally or by writing, from a much earlier date. To the same period may be assigned the most interesting and graphic histories in the book of Kings, the splendid episode of Elijah, and other remains of Ephraitic history; and to these must probably be added the main stock of the Song of Solomon, though this lyric drama has suffered much from interpolation, and presumably was not written down till a comparatively late date and from imperfect recollection, so that its original shape is very much lost. It is mainly from the admirable prose narratives, to which nothing in later books can be compared, that we must judge of the first bloom of Hebrew literature under the ancient kingdoms of Judah and Ephraim, before the convulsions that accompanied the advance of Assyria and prior to the influence of written prophecy. It is a literature eminently fresh and vivacious, full of exact observation of nature and of men, always drawing directly from life, and working on the reader not by elaborate description but by dramatic presentation of character and action. The authors are too intent upon the story to interpose their own comments or point a moral, but they tell their tale with sympathy and often with an undercurrent of dry humour. It can hardly be said that the writings of this period have a specifically religious purpose. Reflecting with admirable veracity the actual life of the nation they are full of the relation between Israel and Jehovah, because that relation was constantly present to the people as a very real fact without which the history could not be told. It is to this circumstance that we owe the preservation of so large a mass of early prose, which was taken over and incorporated in their works by later historians who wrote with a distinctly religious purpose; while on the other hand the early lyric collections have disappeared, all but a few fragments, presumably because their tone was prevailingly secular. That the Hebrews once possessed a poetry of high merit drawn from the themes of ordinary life appears, not only from the book of Canticles and such relics as the Song of the Well (Num. xxi. 17, 18), but from the names of popular airs preserved in the titles of the Psalms. Thus we learn from Isa. lxv. 8 that the title *Al Tashith* (Ps. lvii.) is taken from a vintage song of which the first line was "Destroy it not, for a blessing is in it." These popular songs, then, survived the Exile and long continued to live in the mouths of the people. But they were without interest to the later guardians of Israel's literature, and fell into oblivion when Hebrew ceased to be the vernacular of the nation. A last echo of the festal songs of the Jewish maidens in the Talmud (*Mishna Taanith*, iv. 8, and the corresponding Gemara) shows only the total decay of the popular taste.

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[1] See Stade's essay on the relation of Phœnician and Hebrew, *Morgenländische Forschungen* (1875), with Nöldeke's criticism, *Z. D. M. G.*, xxix. 325; also the latter's article, "Sprache, hebräische," in *Bibel-Lexikon*, v. 362 *seq.*

[2] Böttcher, *Lehrb. d. Hebr. Sprache* (1866), i. 13 *seq.*

[3] Details in Ryssel, *De Elohistæ Pentateuchi Sermone*, (Leipsic, 1878), the most important collection of materials since Gesenius, *Geschichte der hebr. Spr. und Schrift* (1815).

[4] An argument to the contrary drawn by Jewish interpreters from Neh. viii. 8 rests on false exegesis.

[5] As we possess no books in classical Hebrew except the Old Testament, the reader is referred for several aspects of this topic to the sketch of the Old Testament literature in the article BIBLE.

In this earliest period—the age of popular literature, as we may call it, modelled upon the songs and histories that circulated orally through the country—there is a remarkable preponderance of writings connected with the northern kingdom, and these include the narratives that are fullest of human interest and the poetry richest in colour and imagination, such as the loves of Jacob and Rachel, the history of Joseph, the life of Elijah, the pictures of nature in the Canticles. The political and social superiority of Ephraim before the conflict with Assyria is reflected in the literature. A new epoch begins with the rise of written prophecy in the 8th century. By this time writing and literary knowledge were widely diffused (Isa. viii. 1; xxx. 8; x. 19).[1] Amos, himself an excellent stylist, in whose book only perverse ingenuity can trace marks of rusticity ("imperitum sermone," says Jerome), was a simple herdsman in the wilderness of Judah. Yet it appears that the origin of written prophecy was due less to the spread of education than to the rise of a new school of men whose whole method and aims were in conflict with the official prophetic societies, the unworthy successors of Samuel and Elijah.

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[1] The stone of Mesha is the earliest evidence. [illegible] *Lettres de* [illegible], p. 4, [illegible] the LXX. [illegible] from a Hebrew [illegible]. [illegible] *Text der BB. Samuelis* (1871), [illegible] (1873), p. 120; [illegible] *Transactions de la 3me session du Congrès* [illegible]

[2] A papyrus of the British Museum, showing the square letter as it was written in Egypt a little before the time of Christ, has been facsimiled by the Palæographical Society (*Or. Ser.*, 1877).

In the terrible struggle with Nineveh, when the kingdom of Ephraim perished and Judea seemed lost beyond hope, the new prophecy, clear of vision when all were blinded, calm in its unshaken faith of ultimate victory, and pursuing with unfaltering steadfastness a great purpose of righteousness, established a spiritual and intellectual ascendency which is stamped on the whole literature of the Assyrian and Chaldean periods. In the book of Deuteronomy the ancient ordinances of Israel were rewritten in the prophetic spirit, and the reformation carried out by Josiah on the basis of this book is the decisive proof of the influence of the written word as the organ of prophetic ideas. The same influence can be traced in other directions,—in psalms that express the type of individual faith, and in the historical books as they were finally shaped after the fall of Jerusalem, when the old popular narrative was filled out and continued in a spirit of prophetic pragmatism, and with the direct object of enforcing prophetic teaching. The Exile, which robbed Israel of every other inheritance, gave increased value and authority to the written word, and in the author of Isa. xl.–lxvi. we find a prophet who no longer appears in person before his audience but does his whole work by the pen. There are other short prophecies of the Babylonian age, as Isa. xiii., xiv., which seem to have been first published as anonymous broadsides—a characteristic change from the method of the former prophets, who wrote only what they had first spoken to the people. The earliest written prophecy is nervous rhetoric of the old pregnant Hebrew style interspersed with bursts of song. Even before the Exile this style had undergone a change; the prophecies of Jeremiah have lost something of the old force, while they display a subtler habit of reflexion and a pathos which has its origin in the conflict of a sensitive and shrinking temperament with the overpowering sense of prophetic duty. Jeremiah was much occupied with the dark problems of providence and the meaning of the sufferings of the faithful in Israel, a topic which goes beyond the sphere of the earlier prophecy, but forms a chief theme of Isa. xl.–lxvi., and from a different point of view is taken up and discussed in the book of Job. The last-named book is the highest utterance of another characteristic form of Hebrew literature, the Chokma, that is, wisdom or practical philosophy in parabolic, epigrammatic, and poetic form. The earliest distinct trace of literary cultivation of this philosophy, which from its nature must at first have passed unwritten from mouth to mouth, is the collection of ancient proverbs by scholars in the service of Hezekiah (Prov. xxv. 1). Along with the simple epigrammatic proverbs which continued to be a favourite vehicle of Jewish thought long after Hebrew had given way to Aramaic, the earliest form of Hebrew wisdom seems to have been the fable about plants and trees (Jud. xi., 2 Kings xiv. 9, *cf.* 1 Kings iv. 33), so different from the animal fables of Kalilag and Damnag or Sindbân, which the later Semitic literature borrowed from India. The further development of the Chokma ran parallel with the progress of prophecy, and though it is generally maintained that Jeremiah quotes the book of Job it is perhaps more likely that the contrary is the case, and that the latest and most meditative phase of prophecy was absorbed into the poetry of the Chokma. The brief revival of spoken prophecy after the Exile lacks the old fire, and presents no notable literary feature except the use of somewhat fantastic symbolic imagery, the prototype of the later apocalyptic literature.

The decadence of prophecy and the synchronous systematization of the ceremonial law on lines first drawn by Ezekiel, mark the commencement of the third and last period of Hebrew literature. The age of religious productivity was past, and the narrow limits and political nullity of the new Jewish settlement under the Persians presented no favourable conditions for a fresh development of truly national literature. The scribes took the place of the prophets, and the growth of traditionalism imposed increasing restrictions on original thought. The freshest and best products of this period are the post-Exile psalms, the hymns of the second temple, which occupy a large part of the Psalter, and, though generally inferior to the older lyrics in the highest poetical qualities, are often full of the charm of genuine feeling and sweet utterance, and sometimes rise to a sublime energy of devotion and faith. With these psalms the graceful prose idyll of Ruth has a natural affinity. The other writings of the last age are on the whole much inferior. As the language decayed, the graces of the older prose style were lost. The memoirs of Ezra and Nehemiah, the colourless narrative of the Chronicles, and even the book of Esther, are singularly destitute of literary merit.

Yet letters were sedulously cultivated. The *Midrash*, or sermonizing treatment of the old history which holds so large a place in later Jewish literature, had come in before the time of the Chronicler, who quotes a work of the kind by name—the Midrash of the Book of Kings (2 Chron. xxiv. 27, *cf.* xiii. 22). Along with this came the beginnings of Haggada, the formation of parables and tales attached to historical names, of which the book of Jonah is generally taken as an early example, and which attains much greater dimensions in the apocryphal additions to the Hagiographa. And so at the close of the Old Testament period the author of Ecclesiastes could speak of the weariness of much study and the endless sterility of bookmaking. His judgment was confirmed by posterity, for of these many books scarcely a trace remains.

The Cultivation of Hebrew as a Dead Language.[2]—We have seen that when the latest books of the Old Testament were written Aramaic had already supplanted Hebrew as the language of common life. But the knowledge of the ancient idiom was kept alive not merely by the study of the sacred books but by the continued use of Hebrew for literary purposes. Several books of the Apocrypha appear to be translated from Hebrew originals—Sirach, Judith, 1 Mac.—the last according to the express testimony of Jerome. It is even probable that the Old Testament canon contains elements as late as the epoch of national revival under the Maccabees (Daniel, certain Psalms), for Hebrew was the language of religion as well as of scholarship. As for the scholars, they affected not only to write but to speak in Hebrew; but they could not resist the influence of the Aramaic vernacular, and indeed made no attempt to imitate the classical models of the Old Testament, which neither furnished the necessary terminology for the new ideas with which they operated, nor offered in its forms and constructions a suitable vehicle for their favourite processes of legal dialectic. Thus was developed a new scholastic Hebrew, "the language of the wise" (לשון חכמים), preserving some genuine old Hebrew words which happen not to be in the Bible, and supplying some new necessities of expression by legitimate developments of germs that lay in the classical idiom, but thoroughly interpenetrated with foreign elements and as little fit for higher literary purposes as the Latin of the mediæval schoolmen. The chief monument of this dialect is the body of traditional law called the Mishna, which is formed of materials of various dates, but was collected in its present form about the close of the 2d Christian century. The doctors of the subsequent period still retained some fluency in the use of Hebrew, but the mass of their teaching preserved in the Gemara is Aramaic.[1] The language of the Mishna has been described by Geiger, *Lehr- und Lesebuch zur Sprache der Mischnah* (Breslau, 1845), L. Dukes, *Die Sprache der Mischna* (Esslingen, 1846), and *Zur rabbinischen Sprachkunde* (Vienna, 1851), J. H. Weiss, *Mishpat Leshon ha-Mishna* (Vienna, 1867).

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[1] In the 7th century written instruments were used in sales of property (Jer. xxxii. 10), and in divorce cases they are recognized in Deut. xxiv. 1.

[2] On this topic compare in general Wolfii *Bibliotheca Hebræa*, 1715–1733; Bartolocci *Bibliotheca Magna Rabbinica*, 1675–1693; Imbonati *Bibliotheca Latino-Hebraica*, 1694; Diestel, *Geschichte des A. T. in der Christlichen Kirche*, 1869; R. Simon, *Histoire Critique du V. T.*, 1678.

During the Talmudic period nothing was done for the grammatical study of the old language, but there was a traditional pronunciation for the synagogue, and a traditional interpretation of the sacred text. The earliest monument of Jewish interpretation is the Septuagint, but the final form of traditional exegesis is embodied in the Targums or Aramaic paraphrases, especially in the more literal Targums of Onkelos and Jonathan, which are often cited by the Talmudic doctors. Many things in the language of the Old Testament were already obscure, and the meaning of words was discussed in the schools, sometimes by the aid of legitimate analogies from living dialects,[2] but more often by fantastic etymological devices such as the *Notarikon*, or use of analogies from shorthand.

The real service rendered to Hebrew philology by the Talmudic doctors consists not in what they produced but in the knowledge which they preserved from the time when the idiom of the Old Testament was a living tongue. The exaggerated value which their casuistic exegesis attached to every syllable and every letter of the sacred books resulted in a finical preservation, not indeed of the original text, but of the text which had become authoritative, and which is hardly later than the 1st Christian century. And fortunately for later scholarship the period immediately subsequent to the close of the Talmud (about 600 A.D.) devised in the vowel points and accents a means for preserving not merely the consonants of this text but the exact pronunciation and intonation of the synagogue. The idea of this system of punctuation appears to have been taken from a similar usage adopted in Syriac MSS., the complete development of the idea as we find it in our present Hebrew Bibles must have been reached by successive steps which we cannot now trace. The current punctuation is the work of the Palestinian schools; another system, resting on the same foundations, was developed in Babylonia, and is known from the MSS. of the Petersburg library collected by Firkowitsch, and also from copies brought from Yemen. The difference between the two systems lies more in the notation than in the pronunciation, and neither punctuation can claim absolute priority. The work of the punctuators was perhaps completed in the 7th century. After a time the vowel signs came to be thought as old as the text, but a juster view was revived by Elias Levita (1472-1549),[4] and, after the great controversy in the 16th century between Cappellus and Buxtorf, finally gained universal recognition.[5] With the work of the punctuators is associated the collection by the Massorets of a great mass of notes designed to preserve and illustrate by statistics exceptional phenomena of the Old Testament text,[6] a work which may be viewed as the first step towards scientific study of Hebrew philology.

With all this the old traditional scholarship continued to decline till the 10th century, when a revival of Hebrew study under the influence of Mahometan learning took place among the Arabic-speaking Jews (Saadia of the Fayyum, Menahem ben Saruq, &c.).[7] Then, early in the 11th century, came the acknowledged fathers of mediæval Jewish philology,—the grammarian Judah surnamed Hayyug, discoverer of the system of triliteral roots,[8] and the lexicographer Abulwalid Merwan ibn Ganâh (Rabbi Jonah), who made excellent use of Arabic analogies as well as of the traditional material.[9] A succession of able scholars continued their work, of whom the most famous are Abraham ben Meir of Toledo, surnamed Ibn Ezra (1092-1167), a man of great originality and freedom of view; Solomon Isaaki of Troyes, called Rashi and sometimes by error Jarchi, *i.e.*, of Lunel (died 1105), whose writings are a storehouse of traditional lore; and David Kimchi of Narbonne, called Radak (*circ.* 1200), whose commentaries, grammar, and lexicon exercised an enormous and lasting influence, and were the chief fountain of knowledge for the Christian Hebraists of the 16th century. Our own authorized version, for example, bears the stamp of Kimchi on every page.

On the Jewish scholars and their works consult Wolf and Bartolocci, also De Rossi, *Dizionario Storico degli Autori Ebrei*, Parma, 1802; on Ibn Ezra in particular, the *Introduction* to Friedländer's translation of his *Comm. on Isaiah* (London, 1873), and the same writer's *Essays on the Writings of Ibn Ezra* (London, 1877); on the French Rabbins, *Histoire Litt. de la France*, vol. xvi., but especially vol. xxvii. (1877); on Rashi, Zunz's *Gesammelte Schriften*, iii. 100, and a biography by the same scholar, translated into German by Bloch (1840). In the later Middle Ages Jewish learning was cramped by a narrow Talmudical orthodoxy, but a succession of sound scholars held their ground till Elias Levita and others of his age transmitted the torch to the Christian universities.

Up to the revival of letters there was no productive Hebrew scholarship among Christians. In the Greek and Latin Church the few fathers who, like Origen and Jerome, knew something of the language were wholly dependent on their Jewish teachers, and have value for us only as depositaries of Hebrew tradition. Nor was it otherwise in the East. The Syriac version of the Old Testament is permeated by the influence of the synagogue where it is not guided by the Septuagint, and the homilies of Aphraates are a mine of Jewish tradition. In the Middle Ages some knowledge of Hebrew was preserved in the church by converted Jews and even by Christian scholars, of whom the most notable were the Dominican controversialist Raymundus Martini and the Franciscan Nicolaus de Lyra, through whose popular commentaries the exegesis of Rashi was conveyed to Luther and largely influenced his interpretation of Scripture.[1] But there was no continuous tradition of Hebrew study apart from the Jews, and in the 15th century, when the revival of independent scholarship kindled the desire to add a third learned tongue to Latin and Greek, only the most ardent zeal could conquer the obstacles that lay in the way. Orthodox Jews refused to teach those who were not of their faith, and on the other hand the bigotry of ignorant churchmen desired nothing better than the entire suppression of Jewish learning. Even books were to be had with the greatest difficulty, at least north of the Alps. In Italy things were somewhat better. Jews expelled from Spain received favour from the popes. Study was facilitated by the use of the Hebrew printing press, which was at work at Reggio as early as 1475, while the whole Hebrew Bible appeared at Soncino in 1488.[2] The cause of learning found its champion among the northern humanists in John Reuchlin (1455–1522), whose *Rudimenta* (Pforzheim, 1506) opened the door to students, while his victorious contest with Pfefferkorn and the Cologne obscurantists established the claim of Hebrew studies on scholarship and the church.

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[1] [illegible]

[2] [illegible]

[3] The Babylonian punctuation [illegible] which is replaced by ι or α. See also Pinsker's *Einl. in d. Babyl.-Hebr. Punctationssystem* (Vienna, 1863), and for other literature, Wellhausen-Bleek, p. 634, to which add Derenbourg, *Revue Critique*, June 21, 1879.

[4] See his *Massoreth ha-Massoreth*, translated by Dr Ginsburg, 1867.

[5] The history of the controversy has been written by G. Schnedermann, *Die Controverse des Ludovicus Cappellus mit den Buxtorfen* (Leipsic, 1879).

[6] [illegible]

[7] [illegible]

[8] See his *Two Treatises*, edited by Nutt (London, 1870).

[9] His *Book of Roots*, in Arabic, edited by Neubauer (Oxford, 1875).

The new learning spread fast. Sebastian Münster in Heidelberg, and Paul Buchlein (Fagius) at Isny, Strasburg, and Cambridge, were worthy pupils of the famous and liberal Jewish scholar Levita. France drew teachers from Italy. Santes Pagninus of Lucca was at Lyons; and the trilingual college of Francis I. at Paris, of which Vatablus and Le Mercier soon became the ornaments, attracted among other foreigners Giustiniani, bishop of Nebbio, the editor of the Genoa Psalter of 1516. In Rome the Jewish convert Felix Pratensis taught by invitation of Leo X., whose name and that of the more famous convert J. b. Hayyim live mainly in connexion with the great Rabbinical Bibles that issued from the Bomberg press at Venice. In Spain, the old home of Jewish scholarship, Hebrew learning was promoted by Cardinal Ximenes, the patron of the Complutensian Polyglot. Printing presses were multiplied, and the great humanist printers, as Froben at Basel and Etienne at Paris, competed with Italy in the production of Hebrew books. In brief, before the middle of the 16th century the place of Hebrew studies was secure throughout learned Europe, while in Protestant countries opposition to the authority of the Vulgate combined with scholarly interest to make the study of the original text of Scripture appear indispensable. Thus in Scotland the establishment of a trilingual course in the universities is contemplated in the first *Book of Discipline*.[3]

For a time the best Christian scholars leaned mainly on the Rabbins. But in the larger air of humanism a more independent type of learning soon arose, of which Le Mercier in the 16th and Drusius in the beginning of the 17th century may be taken as representatives. The importance of the ancient versions was recognized, and their study was fostered by the publication of the Polyglots.

In the 17th century the cognate dialects were cultivated with great vigour and success by men like Selden, Castell, and Pococke in England, De Dieu in Holland, Bochart in France, Ludolf and Hottinger in Germany; and these studies bore fruit both for the Hebrew grammar and for the lexicon. Rabbinic learning was not forgotten, and found its chief ornament in the elder Buxtorf at Basel, who was also the author of grammars and a handy lexicon which long remained favourite manuals in England and on the Continent.[4]

At the same time a critical spirit arose, which involved Hebrew philology in the meshes of theological controversy. The battle as to the age of the vowel points has already been referred to. It was part of a larger question as to the integrity of the received Hebrew text, and the legitimacy of text criticism, which received dogmatic importance from the prevalence of extreme theories of verbal inspiration in the Protestant Church. Thus the Protestant Cappellus found his main support in the Catholic Church (Morinus, R. Simon), while the authority of the Massoretic text and punctuation was elevated to a dogma in the *Formula Consensus Helvetica* (1675), not without protest from the wiser Protestantism of France. The critical school had also its extravagances, and an undue depreciation of tradition was one of several false principles that it would be tedious to enumerate, which came into vogue in the latter part of the 17th century, and long continued to impede the progress of scientific Hebrew philology. In the beginning of the 18th century Semitic studies had their chief seat in Holland, where Albert Schultens took up the comparative method with fresh energy, and applied it to Hebrew on a scale which gave a new shape to the study of the language.[5] Schultens laid emphasis on the limited extent of the Old Testament literature, which makes it an inadequate record of the phenomena of the Hebrew language, and proposed to supply these defects by a large use of the dialects, mainly of the Arabic, in which he had wide and accurate reading. His *Institutiones ad fundamenta Linguæ Hebrææ* (1737) mark an advance on previous grammars, and in his commentaries is accumulated an enormous mass of material of the highest value for the lexicographer. Schultens founded an influential school, of which Schroeder was the chief ornament; but his method was easily abused, and fell into discredit in the hands of arbitrary expositors like Venema. After Holland, Germany became the chief seat of Hebrew studies. In Halle, where the influence of Francke directed special attention to Biblical learning, there sprang up contemporaneously with the Dutch school a school of Hebraists,—earnest, laborious, and thorough, but somewhat jejune and deficient in æsthetic sympathy,—of which the Michaelis family were the chief representatives. J. D. Michaelis (1717–1791) exercised a sort of sovereignty in Hebrew letters, and the stamp of Halle has left a permanent impress on the German schools, though a more sympathetic and emotional type of scholarship, beginning with Herder and Eichhorn, became dominant under the influence of Ewald.

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[1] See Siegfried's essay in Merx's *Archiv*, i. 428, ii. 38.

[2] De Rossi, *Annales Hebræo-Typographici Sec. XV.*, Parma, 1795. A lively picture of the difficulties that lay in the way of Hebrew study is found in the *Autobiography* (ed. Riggenbach, 1877) of Conrad Pellican, who contributed to Reisch's *Margaritha Philosophica* the first imperfect Hebrew grammar composed by a Christian (Strasburg, 1504, reprinted in facsimile by Nestle, Tübingen, 1877). See also Geiger's *Johann Reuchlin* (Leipsic, 1871). Reference may also be made to the same author's *Studium der Heb. Spr. in Deutschl. vom Ende des 15ten bis zur Mitte des 16ten Jahrhunderts* (Breslau, 1870), and Jourdain's *De l'enseignement de l'hébreu dans l'université de Paris* (1863).

[3] The first Hebrew grammar published in Scotland is that of John Row, moderator of the school of Perth, and afterwards minister at Aberdeen, (Glasgow, 1644). The preface bears date 1637. With the grammar appeared a *Χιλιάς Hebraica*.

[4] To obtain an idea of the way in which Hebrew was taught in the 17th century one may read the *Diatriba* of Caspar Scioppius, in *H. Grotii et aliorum dissertationes de studiis instituendis* (Amst., 1645).

[5] On Schultens, his method and school, see C. Sepp, *Johannes Stinstra en zijn Tijd* (Amst., 1865). The Dutch schools of the 16th and 17th centuries are well described by the same author, *Het godgeleerd Onderwijs in Nederland gedurende de 16de en 17de Eeuw* (Leyden, 1873–74).

By the epoch-making labours of Silvestre de Sacy (1758–1838), which first placed Oriental learning and especially Semitic grammar on a broad and thoroughly scientific footing, a new impulse was given to Hebrew philology, which since that time has moved with the advance of general Semitic studies, and can hardly again fall into devious paths. The great teachers of Hebrew in the present century have been two Germans, Gesenius and Ewald,—the former excelling in method and lucidity of exposition, the latter in range of view and creative fertility of ideas. Among the direct or indirect disciples of these great scholars may be reckoned almost every Hebraist in Europe, and to them is mainly due the revival in England of a branch of learning which had almost become extinct through the prevailing dilettantism of last century.

Helps to the Study of Hebrew.—*Grammars.*—The principal modern methods are those of Gesenius, Ewald, and Olshausen. Gesenius's larger work, his *Lehrgebäude der hebräischen Sprache* (Leipsic, 1817), is still useful for occasional reference. His smaller grammar has passed through innumerable editions, and in its most recent shape, as recast by Rödiger and finally by Kautzsch (1878), holds its ground as one of the best books for learners. Davies's version of Rödiger's Gesenius is the best of several English translations (1869–1876). The method of Gesenius is mainly empirical. Much more philosophic, but less simple and sometimes arbitrary in its refinements, is the *Ausführliches Lehrbuch* of Ewald (8th ed., Gottingen, 1870), of which the "Syntax" has been translated into English by Kennedy (1879). The shorter *Sprachlehre für Anfänger* (4th ed., 1874; Eng. trans. by Smith, 1870) is valuable but too difficult for ordinary beginners. Olshausen's *Lehrbuch* (Brunswick, 1861) is incomplete, the syntax having never appeared; but it is, on the whole, the best and most scientific exposition of the Hebrew grammatical forms. Two elementary grammars on Olshausen's system have been translated into English,—Bickell's *Grundriss* (Leipsic, 1869–1870; English by Curtiss, 1877) and Land's *Hebreeuwsche Grammatica* (Amsterdam, 1869; English by Poole, 1876). The latter work has some peculiarities which detract from its utility, and neither Bickell nor Land supplies a proper syntax. Muller's *Schulgrammatik* (Halle, 1878) is also mainly on Olshausen's method with the addition of an excellent syntax. In English A. B. Davidson's *Introductory Hebrew Grammar* (3d ed., Edin., 1878) may be commended to beginners as a good practical method and easy introduction to the larger scientific grammars. Of other more extensive works may be named Böttcher's *Ausführliches Lehrbuch*, posthumously edited by Mühlau (Leipsic, 1866–68), a huge book serving as a sort of grammatical concordance to the Old Testament; Luzzatto's Italian *Grammatica* (Padua, 1853–69), which is valuable from the thorough Jewish scholarship of the author, the Latin grammar of Roorda, and in English the works of Kalisch (1862–63) and Green (New York, 1861). Among useful monographs on special points of grammar may be named Philippi, *Wesen und Ursprung des Status Constructus* (Weimar, 1871); S. R. Driver, *The Use of the Tenses in Hebrew* (Oxford, 1874); Giesebrecht, *Die Hebräische Präposition Lamed* (Halle, 1876); Davidson, *Outlines of Hebrew Accentuation* (1861). For comparative purposes, in the absence of a comparative system of the Semitic languages, which is hoped for from Renan, the hints in Wright's *Arabic Grammar* will be found most valuable.

Lexicons.—Far superior to all other lexicons is the *Thesaurus* of Gesenius, completed by Rödiger (Leipsic, 1829–1858). Gesenius published also a *Handwörterbuch*,—of which the 8th ed. by Mühlau and Volck (Leipsic, 1877–78) contains a good deal of new matter not always an improvement,—and a *Lexicon Manuale* in Latin (2d ed. by Hoffmann, 1847), of which there is an English translation. The *Handwörterbuch* of Fürst (3d ed., 1863; Eng. trans. by S. Davidson, 1871; 3d ed. by Ryssel, 1876) proceeds on very faulty etymological principles and must be used with great caution. On Hebrew synonyms Pappenheim's *Yeriôth Shelomoh* ([illegible] 1811) is the principal work.

Concordances.—The *Concordantiæ* of Buxtorf (1632) were reprinted by Baer (1862). Fürst's *Concordance* (1840) contains a good deal of supplementary matter, part of which is of little use. For the particles the more complete concordance of Noldius (1679; ed. Tympe, 1734) is useful.

In addition to modern books the advanced student will [illegible] find it useful to refer to older works, especially to the Jewish grammarians and lexicographers, but these need not be detailed here.

For the later Hebrew of the period of the Mishna, and for the new words and technical terms in the scholastic Hebrew of the Middle Ages, the best lexicon is Buxtorf's *Lexicon Chaldaicum Talmudicum et Rabbinicum* (1640). The recent reprint is not so good. A new lexicon by Levy has been in the course of publication since 1875 (*Neuhebräisches und Chaldäisches Wörterbuch*). The beginner will find the *Lexicon breve Rabbinico-philosophicum* appended to Buxtorf's small *Lexicon Hebraicum* very useful, and may also consult the treatises in Reland's *Analecta Rabbinica* (1702). In reading Rabbinical Hebrew it is well to have Selig's *Compendia Vocum Hebraico-Rabbinicarum* (1780). The similar work of Buxtorf is less full.

On the whole subject of this article consult Gesenius, *Geschichte der hebräischen Sprache und Schrift* (Leipsic, 1817); Renan, *Histoire générale des langues Semitiques* (4th ed., Paris, 1864).

(W. R. S.)

HEBREWS, Epistle to the. The New Testament writing usually known under this name, or less correctly as the Epistle of Paul the Apostle to the Hebrews, bears in the oldest MSS. no other title than the words Πρὸς Ἑβραίους, "To the Hebrews." This brief heading embraces the whole information as to the origin of the epistle on which Christian tradition is unanimous. Everything else—the authorship, the address, the date—was unknown or disputed in the early church, and continues to form matter of dispute in the present day. But as far back as the latter part of the 2d century the destination of the epistle "to the Hebrews" was acknowledged alike in Alexandria, where it was ascribed to Paul, and in Carthage, where it passed by the name of Barnabas, and no indication exists that it ever circulated under another title.[1] At the same time we must not suppose, as has sometimes been done, that the author prefixed these words to his original manuscript. The title says no more than that the readers addressed were Christians of Jewish extraction, and this would be no sufficient address for an epistolary writing (xiii. 22) directed to a definite circle of readers, a local church or group of churches to whose history repeated reference is made, and to which the author had personal relations (xiii. 19, 23). The original address, which according to custom must have stood on the outside of the folded letter, was probably never copied, and the early and universal prevalence of the present title, which tells no more than can be readily gathered from the epistle itself, seems to indicate that when the book first passed from local into general circulation its history had already been forgotten. With this it agrees that the early Roman Church, where the epistle was known about the end of the 1st century, and where indeed the first traces of the use of it occur (Clement, and *Shepherd of Hermas*), had nothing to contribute to the question of authorship and origin except the negative opinion that the book is not by Paul. Caius and the Muratorian fragment reckon but thirteen epistles of Paul; Hippolytus (like his master Irenæus of Lyons) knew our book and declared that it was not Pauline. These facts can hardly be explained by supposing that at Rome during the 2d century the book had dropped out of notice, and its history had been forgotten. Clement, Hermas, Hippolytus form a tolerably continuous chain, and the central Church of Rome was in constant connexion with provincial churches where, as we shall presently see, the epistle had currency and reputation. Under these circumstances an original trustworthy tradition could hardly have been lost, and it must appear highly questionable whether the author and address of the book were known at Rome even in the time of Clement. The earliest positive traditions of authorship to which we can point belong to Africa and Egypt, where, as we have already seen, divergent views were current by the end of the 2d century. The African tradition preserved by Tertullian (*De Pudicitia*, c. 20), but certainly not invented by him, ascribes the epistle to Barnabas. Direct apostolic authority is not therefore claimed for it; but it has the weight due to one who "learned from and taught with the apostles," and we are told that it had more currency among the churches than

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[1] See the full refutation of supposed exceptions to the uniformity of this tradition in Zahn's article "Hebräerbrief" (Herzog-Plitt, *R. E.*, vol. v. p. 657).

"that apocryphal shepherd of the adulterers" (the Shepherd of Hermas). This tradition of the African Church holds a singularly isolated position. Later writers appear to know it only from Tertullian, and it soon became obsolete, to be revived for a moment after the Reformation by the Scottish theologian Cameron, and then again in our own century by the German critics, among whom at present it is the favourite view. Very different is the history of the Egyptian tradition, which can be traced back as far as a teacher of the Alexandrian Clement, presumably Pantænus (Euseb., *Hist. Eccl.*, vi. 14). This "blessed presbyter," as Clement calls him, sought to explain why Paul did not name himself as usual at the head of the epistle, and found the reason in the modesty of the author, who, in addressing the Hebrews, was going beyond his commission as apostle to the Gentiles. Clement himself takes it for granted that an epistle to the Hebrews must have been written in Hebrew, and supposes that Luke translated it for the Greeks. Thus far there is no sign that the Pauline authorship was ever questioned in Alexandria. Origen rests on the same tradition, which he refers to "the ancient men." But he knows that the tradition is not common to all churches. He feels that the language is un-Pauline, though the admirable thoughts are not second to those of the unquestioned apostolic writings. And thus he is led to the view that the ideas were orally set forth by Paul, but that the language, arrangement, and some features of the exposition are the work of a disciple. According to some this disciple was Clement of Rome; others named Luke; but the truth, says Origen, is known to God alone (Euseb., vi. 25, *cf.* iii. 38). It is not surprising that these limitations of the tradition had less influence than the broad fact that Origen accepted the book as of Pauline authority. From the time of Origen the opinion that Paul wrote the epistle became more and more prevalent in the East. In the West this view was still far from established in the 4th century. But it gained ground steadily; even those who, like Jerome and Augustine, knew the variations of tradition were unwilling to press an opposite view; and in the 5th century the Pauline authorship was accepted at Rome, and practically throughout Christendom, not to be again disputed till the revival of letters and the rise of a more critical spirit.

That the received view called for revision could not indeed be questioned when men began to look at the facts of the case. The vacillation of tradition and the dissimilarity of the epistle from the style and thoughts of Paul were brought out with great force by Erasmus in his concluding annotation on the book, where he ventures the conjecture based on a passage of his favourite Jerome, that Clement of Rome was the real author. Luther (who suggests Apollos) and Calvin (who thinks of Luke or Clement) followed with the decisive argument that Paul, who lays such stress on the fact that his gospel was not taught to him by man but by direct revelation (Gal. i.), could not have written Heb. ii. 3, 4, where the author classes himself among those who received the message of salvation from the personal disciples of the Lord on the evidence of the miracles with which God confirmed their word. The force of tradition seemed already broken, but the wave of reaction which so soon overwhelmed the freer tendencies of the first reformers brought back the old view. Protestant orthodoxy again accepted Paul as the author, and dissentient voices were seldom heard till the revival of free Biblical criticism in last century. As criticism strengthened its arguments, theologians began to learn that the denial of tradition involves no danger to faith, and at the present moment, in spite of the ingenious special pleading of Hofmann (*Die Heilige Schrift N. Ts.*, vol. v., Nordlingen, 1873), scarcely any sound scholar will be found to accept Paul as the direct author of the epistle, though such a modified view as was suggested by Origen still claims adherents among the lovers of compromise with tradition.

The arguments against the Alexandrian tradition are in fact conclusive. It is probably unfair to hamper that tradition with Clement's notion that the book is a translation from the Hebrew, a monstrous hypothesis which has received its *reductio ad absurdum* in the recent attempt of J. H. R. Biesenthal to reconstruct the Hebrew text (*Das Trostschreiben des Apostels Paulus an die Hebräer, kritisch wiederhergestellt*, &c., Leipsic, 1878). But just as little can the Greek be from Paul's pen. The un-Pauline character of the style, alike in the words used and in the structure of the sentences, strikes every scholar as it struck Origen and Erasmus. The type of thought is quite unique. The theological ideas are cast in a different mould; and the leading conception of the high priesthood of Christ, which is no mere occasional thought but a central point in the author's conception of Christianity, finds its nearest analogy not in the Pauline epistles but in John xvii. 19. The Old Testament is cited after the Alexandrian translation more exactly and exclusively than is the custom of Paul, and that even where the Hebrew original is divergent. Nor is this an accidental circumstance. There is every appearance that the author was a Hellenist whose learning did not embrace a knowledge of the Hebrew text, and who derived his metaphysic and allegorical method from the Alexandrian rather than the Palestinian schools.[1]

The force of these arguments can be brought out only by the accumulation of a multitude of details too tedious for this place, but the evidence from the few personal indications contained in the epistle is easily grasped and not less powerful. The argument from ii. 3, 4, which appeared decisive to Luther and Calvin, has already been referred to. Again, we read in xiii. 19 that the writer is absent from the church which he addresses, but hopes to be speedily restored to them. This expression is not to be understood as implying that the epistle was written in prison, for xiii. 23 shows that the author is master of his own movements.[2] The plain sense is that his home is with them, but that he is at present absent, and begs their prayers for a speedy return. But Paul, if he could say that he had a home at all, had it not in a community of Jewish Christians. The external authority of the Alexandrian tradition can have no weight against such difficulties. If that tradition was original and continuous, the long ignorance of the Roman Church and the opposite tradition of Africa are inexplicable. But no tradition was more likely to arise in circles where the epistle was valued and its origin forgotten. In spite of its divergencies from the standard of Pauline authorship, the book has manifest Pauline affinities, and can hardly have originated beyond the Pauline circle, to which it is referred, not only by the author's friendship with Timothy (xiii. 23), but by many unquestionable echoes of the Pauline theology, and even by distinct allusions to passages in Paul's epistles.[3]

In an uncritical age these features might easily suggest Paul as the author of a book which was read in MSS.

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[1] For the Alexandrian elements in the epistle consult the list of passages in Hilgenfeld's *Einleitung* (Leipsic, 1875), p. 384, note. A large mass of valuable material is collected in J. B. Carpzov's *Sacræ Exercitationes in Ep. ad Heb. ex Philone Alexandrino* (Helmstadt, 1750).

[2] In x. 34 the true reading is not "of me in my bonds," but "on them that were in bonds," *τοῖς δεσμίοις συνεπαθήσατε*. The false reading, which was that of Clement of Alexandria, is probably connected with the tradition that Paul is author.

[3] An unambiguous proof that our author had read the epistle to the Romans seems to lie in x. 30. This is the one Old Testament citation of the epistle which does not follow the Septuagint (Deut. xxxii. 35); but it is word for word from Rom. xii. 19. Further signs of dependence on Romans and Corinthians (which require sifting) have been collected by Holtzmann in Schenkel's *Bibel-Lexikon*, ii. 620, and Hilgenfeld's *Zeitschrift*, ix. 4 *sq.*

immediately after the recognized epistles of that apostle, and which contained nothing in its title to distinguish it from the preceding books with similar headings, "To the Romans," "To the Corinthians," and the like.[1] A similar history, as Zahn has pointed out, attaches to the so-called second epistle of Clement to the Corinthians.

When we see that the tradition which names Paul as author does not possess an authentic historical basis, we are necessarily carried on to deny historical authority to the subsidiary conjectures or traditions which speak of Luke and Clement of Rome. The history of the Alexandrian tradition shows that these names were brought in merely to lessen the difficulties attaching to the view that Paul wrote the book exactly as we have it. The name of Luke seems to be a conjecture of the Alexandrian Clement, for it has no place in the tradition received from his master. And Origen attaches no importance to either name. Some had mentioned one, and some the other, but God alone knows the truth. We have no reason to think more highly of these suggestions than Origen did. Indeed, no Protestant scholar now proposes the name of Clement, whose extant epistle to the Corinthians shows his familiarity with the epistle to the Hebrews, and at the same time excludes the idea that he composed it. The name of Luke has still partisans—most notably Delitzsch, who has carefully collected linguistic parallels between our epistle and the Lucan writings (*Commentar zum Hebräerbrief*, Leipsic, 1857; English translation, Edinburgh, 1868–70). The arguments of Delitzsch are generally met with the objection that our author must have been a born Jew, which from his standpoint and culture is in the highest degree probable, though not perhaps absolutely certain. In any case we cannot suppose that Luke wrote the epistle on Paul's commission, or that the work is substantially the apostle's; for such a theory takes no account of the strongly marked individuality of the book in thought and method as well as expression. And the theory that Luke was the independent author of the epistle (Grotius and others) has no right to appeal to antiquity, and must stand entirely on the very inadequate grounds of internal probability afforded by language and style.

If Alexandria fails us, can we suppose that Africa preserved the original tradition? This is a difficult question. The intrinsic objections to authorship by Barnabas are not important. The so-called Epistle to Barnabas was not written by our author, but then it is admittedly not by Barnabas. The superior elegance of the style of our epistle as compared with that of Paul is not inconsistent with Acts xiv. 12; nor is there, as we shall see presently, any real force in the once favourite objection that the ordinances of the temple are described with less accuracy than might be looked for in Barnabas, a Levite and one who had resided in Jerusalem. On the other hand it is hard to believe that the correct account of the authorship of our book was preserved only in Africa, and in a tradition so isolated that Tertullian seems to be its only independent witness. How could Africa know this thing and Rome be ignorant? Zahn, who is the latest exponent of the Barnabas hypothesis, argues that in the West, where the so-called epistle of Barnabas was long unknown, there was nothing to suggest the idea of Barnabas as an author; that the true tradition might perish the more readily in other parts of the church after the name of Barnabas had been falsely attached to another epistle dealing with the typology of the ceremonial law; and finally, that the false epistle of Barnabas, which was first so named in Alexandria, may there have carried off the true title of the epistle to the Hebrews after the latter was ascribed to Paul. That is not plausible, and it is more likely that an epistle which calls itself λόγος παρακλήσεως (Heb. xiii. 22) was ascribed to the υἱὸς παρακλήσεως (Acts iv. 36) in the same way as Ps. cxxvii. was ascribed to Solomon, "the beloved of the Lord" (2 Sam. xii. 24. 25), from the allusion cxxvii. 2, than that this coincidence of expression affords a confirmation of the Barnabas hypothesis. In short, the whole tradition as to the epistle is too uncertain to offer much support to any theory of authorship, and if the name of Barnabas is accepted it must stand mainly on internal evidence.

Being thus thrown back on what the epistle itself can tell us, we must look at the first readers, with whom, as we have already seen, the author stood in very close relations. It is generally agreed that the church addressed was composed of Hebrews or Christians of Jewish birth. We are not entitled to take this simply on the authority of the title, which is hardly more than a reflexion of the impression produced on an early copyist. But it is plain that the writer is at one with his readers in approaching all Christian truth through the Old Testament. He and they alike are accustomed to regard Christianity as a continuous development of Judaism, in which the benefits of Christ's death belong to the ancient people of God and supply the shortcomings of the old dispensation (iv. 9; ix. 15; xiii. 12). With all the weight that is laid on the superiority of Christianity, the religion of finality, over Mosaism, the dispensation which brought nothing to its goal, the sphere of the two dispensations is throughout treated as identical, without any allusion, such as could hardly have been avoided in addressing a Gentile church, to the way in which strangers and foreigners (Eph. ii. 19) had been incorporated with the people of God. Schurer indeed (*Stud. u. Krit.*, 1876, p. 776) has sought such an allusion in vi. 1, 2, where faith in God and belief in the resurrection and the judgment, points common to Judaism and Christianity, are reckoned to the elementary doctrine of Christ; and he concludes that the readers addressed were Gentile converts of a Judaizing type. But taken with the context these verses imply only that the Hebrews required to be warned against losing hold even of these first principles of revealed truth which lie in the Old Testament (v. 12). From all this we are not perhaps entitled to conclude that the church addressed contained no Gentile members, but it is plain that they were not sufficiently numerous and independent in their way of thought to affect the general type of Christianity in the community. To some writers the emphatic "all" in xiii. 24, the admonitions x. 25, xiii. 17, have suggested the possibility that the Hebrews addressed were but part, and a somewhat discontented part, of a larger community in which Gentile elements has a considerable place. But this appears a strained conclusion (Phil. iv. 21; 1 Th. v. 26) distinctly contrary to the general tone of the epistle, which moves altogether outside of the antithesis between Jewish and Gentile Christianity. We must think not of a party but of a church, and such a church can be sought only in Palestine or in one of the great centres of the Jewish dispersion. That the epistle was addressed to Palestine, or more specifically to Jerusalem, has been a prevalent opinion from the time of Clement of Alexandria, mainly because it was assumed that the word Hebrews must naturally mean Jews, whose mother tongue was Aramaic. But the term has this restricted sense only when put in contrast to Hellenists. In itself, according to ordinary usage, it simply denotes Jews by race, and in Christian writings especially Jewish Christians. And there are several things in the epistle that seem to exclude Palestine, and above all Jerusalem. The Hellenistic cul ture of the writer and the language in which he writes furnish one argument. Then the most marked proof of Christian love and zeal in the church addressed was that they had ever been assiduous in ministering to the saints (vi. 10). This expression may conceivably have a general sense (1 Cor. xvi. 15 ?), but it is far more likely that it has the specific meaning which it generally bears in the New Testament, viz., the collection of alms for the church in Jerusalem. At any rate it was clearly understood in the first age of Christianity that the Judæan Church took alms and did not give them, receiving in temporal things an acknowledgment for the spiritual things they had imparted (Rom. xv. 27). In fact the great weight laid in the epistles of Paul on this—the only manifestation of the catholicity of the church then possible (Gal. ii. 10)—alone explains the emphasis with which our author cites this one proof of Christian feeling. Again, the expressions in ii. 3 already referred to imply that the readers did not include in their number direct disciples of Jesus, but had been brought to Christ by the words and miracles of apostolic missionaries now dead (xiii. 7). This conversion, as it appears from x. 32, was a thing of precise date immediately followed by persecution (note the aorists φωτισθέντες—ὑπεμείνατε); so that we cannot think of a second generation in the Palestinian Church, but are referred to some part of the Diaspora. Against these difficulties, which have led some of the latest defenders of the Palestinian address, as Grimm (who, in Hilgenfeld's *Zeitschr.* 1870, proposes Jamnia) and Moulton (*New Testament Commentary for English Readers*, vol. iii., 1879), to give up Jerusalem altogether, while others, as Riehm, suppose that the Hellenists of Jerusalem (Acts vi. 1) are primarily addressed, it is commonly urged that the readers are exposed to peculiar danger from the persecutions and solicitations of unbelieving Jews, that they are in danger of relapsing into participation in the Jewish sacrifices, or even that they appear to have never ceased to follow the ceremonial observances that had their centre in the temple ritual. The capital argument for this is drawn from xiii. 13, where the exhortation to go forth to Jesus without the camp is taken as an injunction to renounce fellowship with the synagogue and with the ceremonies and ritual of Judaism. But this exegesis rests on a false view of the context, which does not include verse 9, and expresses by a figure that Christians (as the priests of the new covenant) have no temporal advantage to expect by their participation in the sacrifice of Christ, but must be content to share his reproach, renouncing this earthly country for the heavenly kingdom (*cf.* xi. 16, 25–27 with xiii. 14; Phil. iii. 20). Altogether, this view of the situation of the first readers of the epistle appears distorted or exaggerated. It is obvious that our Hebrews were familiar with the law, and had a high regard for the ordinances of temple worship. In particular it appears that they had not fully understood how the mediatorial functions of the Old Testament were superseded by the mediatorship of Christ. But their ritualism seems to have been rather theoretical than practical. Had they been actually entangled in the daily practice of superseded ordinances, the author, whose insight into the true worth of these ordinances is clear, and whose personal relations to the Pauline circle are obvious, could hardly have been so nearly one of themselves as appears in xiii. 19, and at any rate could not have failed to give an express precept on the subject. But, on the contrary, he is in thorough sympathy with the type of doctrine on which their church was formed (xiii. 7); the easy way in which he touches on the "meats and drinks and divers washings" of Judaism seems to show that on this head he could count on carrying his readers along with him; and xiii. 9 hardly refers to sacrifices or to Levitical laws of clean and unclean, but rather to some such form of asceticism (*cf.* ver. 4) as is spoken of in Rom. xiv. Nowhere does our author speak a warning against participation in sacrifices; nowhere does he touch on the burning questions that divided the Pharisaic Christians of Jerusalem from the converts of Paul. The practical lesson which he draws from his doctrine is that his readers ought to use with diligence the specifically Christian way of access to God (x. 19 *seq.*); and the only positive fault which he mentions in this connexion is a disposition to neglect the privilege of social worship (x. 25). This again is plainly connected, not with an inclination to return to the synagogue, but with a relaxation of the zeal and patience of the first days of their Christian profession (vi. 4 *seq.*; x. 32 *seq.*; xii. 1 *seq.*), associated with a less firm hold than they once had of the essentials of Christian faith, a less clear vision of the heavenly hope of their calling (iii. 12; iv. 11; v. 12). The apostle fears lest they fall away not merely from the higher standpoint of Christianity into Judaizing practices, but from all faith in God and judgment and immortality (iii. 12; vi. 1 *seq.*).[1]

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[1] The place of the epistle in MSS. varies. The order of our Bible is that of the Latin Church, the usual Greek order placing it before the pastoral epistles; but the Latin order, which expresses the original uncertainty of the Pauline tradition, was formerly current even in the East.

For the solution of the problem of the epistle it is of the highest importance to form an exacter conception of the causes and nature of this unhealthy condition of the church. Their first conversion had been followed by direct persecution, which their faith had triumphantly overcome. But these days were long gone by (x. 32). It does not appear that a like severity of trial had again fallen upon them. But there were persecutions at least in other parts of the church (xiii. 3, 23). The times were troubled, and from day to day there were many trials and many reproaches to sustain. The dull and long-continued strain of conflict with surrounding wickedness was harder to bear than a sharp onslaught of the enemy (ch. xii.). They were weary of enduring, weary of hope deferred, and so the bonds of their Christian unity were loosened, their brotherly love weakened (xiii. 1 *seq.*), and they began to doubt the verity of those heavenly good things which their first faith had so vividly realized. In such circumstances it was natural that the writer should lay stress on the contrast between the eternal and the transitory, the things of faith and the things of sight, the heavenly Zion and the earthly pilgrimage. But the remarkable feature of the epistle is that this contrast is drawn out in the form of a threefold argument to show the superiority of Christianity over the old dispensation, inasmuch as Christ is superior (1) to the angels, (2) to Moses, (3) and chiefly to the Levitical priesthood and its mediatorship. In each of these relations, it is argued, the old covenant, which is earthly, temporal, and without finality, contains within itself the evidence of its own imperfection, and points to the time when it shall be superseded by a new covenant in which every reality and every hope is heavenly, eternal, or, as we should say, ideal. It is the form of this argument which mainly gives force to the common impression that the Hebrews addressed were in danger of seeking access to God by the superseded methods of the old dispensation—in short, that the epistle is a warning against an Ebionite tendency to Christian Pharisaism. But to such a tendency, as we have seen, the practical admonitions of the epistle by no means point. To some scholars accordingly, and particularly to Reuss (*Histoire de la Théologie Chrétienne*, liv. vi. chap. 1; *Les Épîtres Catholiques*, Paris, 1878), the theoretical part of the book has seemed disproportionate to the practical and personal conclusion, and it has been proposed to regard the whole as a theological system with an epistolary appendix. Doubtless this view contains an element of truth. In a far higher measure than the Pauline epistles, and in a sense which thoroughly well agrees with the position of the author as no apostle but an apostolic convert, the book presents the marks of theological reflexion on the established data of the faith. Yet it is impossible to ignore the fact that a special and practical motive runs through the whole book. The author never loses sight of a definite circle of readers, and the vast scope of his argument, which is at once felt in the dignity of the opening verses, so unlike the commencement of an ordinary letter, appears to be directly suggested by some historical circumstance affecting his readers and himself, but nowhere explicitly set forth in the epistle, which brought the trial of their faith into close connexion with the question of the permanence of the temple and its ritual. Now we have seen reason to believe that these Jewish Christians were not Palestinians of an Ebionite type but men of the Hellenistic dispersion, with a possible tendency to ascetic mysticism, and almost certainly of such a habit of thought as enabled them readily to sympathize with the typological method of our author. Among men of this type there was no great danger of a relapse into practical ceremonialism. They would rather be akin to the school of Judaism characterized by Philo (*De Migr. Abr.*, c. xvi.; ed. Mangey, i. 450), who neglected the observance of the ceremonial laws because they took them as symbols of ideal things. Occupying this position before their conversion, their adoption of the Christian faith would not have forced upon them any close examination of the relation of the new dispensation to the old law. But it appears from Philo that the men who spiritualized away the Sabbath, the great feasts, even circumcision itself, were not prepared to think lightly of the sacred ritual of the temple. The holy hill of God, the meeting-place of heaven and earth, with its stately service and its ancient memories, had too central a place in the religion of the old covenant to seem indifferent to the freest thinker. And so our Hebrews, whose acceptance of Christ had not shaken their sense of the continuity of the people of God and their Old Testament privileges, might readily retain the feeling that the ritual of the temple was still what it was of old—a visible and necessary pledge of God's approach to His people and His acceptance of their worship. So long as things ran their old course such a feeling would hardly affect the even tenor of their Christian life. But when the death struggle of Judea against Rome drew the sympathy of every Hebrew heart, when the abomination of desolation stood in the holy place, when the holy and beautiful house was burned up with fire, and when, with all this, terror and distress filled the whole Roman empire and still the Lord delayed His coming, it was not strange that something like despair of God's help should assail our Hebrews, and that all the hopes of the people of God should seem threatened in the overthrow of the ancient pledge of Jehovah's nearness to Israel.

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[1] The statement of Renan, *L'Antechrist*, pp. xiv., 215, 219, that some had already fallen away and that the question of their readmission was being agitated, seems to be part of the ingenious historical romance in which he has enveloped the whole origin of the epistle.

Now it has generally been argued that the epistle to the Hebrews, which describes the temple services in the present tense, must necessarily have been written before they ceased to be performed. But it has been shown in the most conclusive manner, from the use of similar presents in Rabbinical writers as well as in Josephus and elsewhere, that this argument goes for nothing; and the most recent writers, since Holtzmann's discussion of the subject in Schenkel's *Bibel-Lexikon*, ii. 623 *seq.*, generally admit that the epistle may have been written after the fall of the temple. And if this be so it can hardly be questioned that the most natural view of the apostle's argument, as it comes to a point in such passages as viii. 13, ix. 9, is that the disappearance of the obsolete ritual of the old covenant is no blow to Christian faith, because in Christ ascended into glory the church possesses in heavenly verity all that the old ritual presented in mere earthly symbol. It was the ruin of the Jewish state and worship which compelled Christianity to find what is offered in our epistle—a theory of the disappearance of the old dispensation in the new.

Many attempts have been made to determine which of the centres of the Diaspora was the seat of our Hebrews. Hofmann suggests Antioch; Ewald, Ravenna;[1] but Rome and Alexandria are the places for and against which most has been said. One argument for Alexandria on which great stress has been laid must certainly be dismissed. Wieseler (*Untersuchung über den Hebräerbrief*, iite Hälfte, Kiel, 1861), combining the arguments against a Palestinian address with the impression, which we have seen to be without sufficient foundation, that the readers lived in the neighbourhood of a Jewish temple, seeks them among the Egyptian Jews who frequented the schismatical temple of Leontopolis (Tel-el-Yahûdia) in the upper Delta. And he tries to show that in his description of the temple and the functions of the high priests our author diverges from the Judæan pattern and follows peculiarities of the Egyptian temple. But this argument rests on a series of improbable assumptions. The supposed peculiarities of Onias's temple are proved by arbitrary exegesis from passages of Philo, who apparently never thought of that temple at all. Nor can it be shown that it had ever such a reputation as to play the part which Wieseler assigns to it. And our author's supposed ignorance of the Jerusalem ritual is not made out. In the true text of x. 11 the high priest is not mentioned, and in vii. 27 what is asserted of the high priest is, not that he offered daily sacrifice, but that he was in daily need of atonement. It is more difficult to understand why in ix. 4 the golden θυμιατήριον, that is, the censer or incense-altar,—for the usage of the word does not determine which is meant,—is assigned to the Holy of Holies. But a passage from the almost contemporary *Apocalypse of Baruch*, to which Harnack has directed attention (*Stud. u. Krit.*, 1876, p. 572 *seq.*), similarly connects the censer with the Holy of Holies, and seems to show that our author here proceeds on a current opinion and has not simply made a slip.[2] Apart from Wieseler's arguments, there is still something to be said for Alexandria. The use in ch. xi. of 2 Maccabees, an Egyptian Apocryphon,[3] the general sympathy of the argument with Alexandrian thought, the apparent analogy between our Hebrews and the free-thinking Jews of whom Philo speaks, are all in favour of this address, though we do not know enough about the early history of the Egyptian Church to speak with positiveness either for or against this view of the epistle. Among Continental scholars the disposition at present is to favour the Roman address; upon which view, since that church was a mixed one, we must suppose that the letter was originally directed to a Jewish section of the Roman Christians. This is not quite plausible, especially since we find in the epistle no trace of the division of parties alluded to by Paul in his epistle from Rome to the Philippians. It is argued, however, that there is an analogy between the way of thinking of our Hebrews and the disposition of the majority of the Roman Church as it appears in Rom. ix. *seq.* The persecution x. 32 is supposed to be that of Nero, in which case θεατριζόμενοι may literally mean "exposed as a public spectacle"; and xiii. 7 is taken as an allusion to the martyrdom of Peter and Paul. In working out this view there is great divergence of opinion; thus Renan will have it that the epistle was written from Ephesus in the year 65, while Hausrath (Ntl. Zg., I. p. [illegible]) thinks he finds traces of two distinct persecutions (?), and dates the book from the time of Domitian. The early currency of the epistle at Rome is urged in favour of the Roman address, but the ignorance of the Roman Church as to the author's name seems to go rather in the opposite direction. Ch. xiii. 24 gives us no help, for they of Italy (οἱ ἀπὸ τῆς Ἰταλίας) may in the epistolary style be Italians either at home or abroad. It is most natural to infer from x. 32 *seq.*, compared with xii. 4, that the church spoken of had not yet produced martyrs, but had suffered only by bonds and the loss of goods. This would exclude Rome, but perhaps the inference is not quite stringent.

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[1] *Das Sendschreiben an die Hebräer und Jakobos' Rundschreiben, übersetzt und erklärt von H. Ewald*, Gött., 1870.

[2] The Syriac word in Baruch is Pirmâ. To the passages cited by Harnack to establish for this word the sense of censer, not incense altar, may be added Bar Ali ed. Hoffmann, No. 2578; Barhebr., *Chron. Eccl.*, p. 507; Ezek. viii. 11 Pesh. and Syr. Hex.)

[3] Professor Plumptre, in the *Expositor*, vol. i., has also traced analogies with the book of Wisdom.

Returning from this survey we bring little with us that can throw light on the authorship of the epistle. We can only say that the writer was a man of the first intellectual mark and of Alexandrian culture, whose home and work lay mainly among Jewish Christians, but who was at the same time associated with the Pauline circle. Of the names offered to us in other New Testament writings, Barnabas and Apollos seem the most likely, and Barnabas will claim the preference if we are entitled to give any weight to tradition. Either name would go well with the Alexandrian address. Apollos was an Alexandrian Jew. Barnabas was of Cyprus, always closely connected with Egypt, and the tradition which connects his relative and associate Mark with the Church of Alexandria is as old as the 2d century.

Literature.—A full account of the older literature will be found in Delitzsch's *Commentary*, and in the great work of Bleek (*Der Brief an die Hebräer erläutert durch Einleitung, Uebersetzung, und fortlaufenden Commentar*, Abth. I., *Versuch einer vollständigen Einleitung*, Berlin, 1828; Abth. II., *Uebersetzung und Commentar*, 1836, 1840), which has formed the basis for all subsequent work on the epistle, and is an indispensable storehouse of material for the student. Bleek's ultimate views on the exposition of the book may be gathered from the briefer posthumous work edited by Windrath (Elberfeld, 1868). To the recent commentaries cited in the course of the article may be added those of Ebrard (1850, Eng. Trans., Edinburgh, 1853), Tholuck, (3d ed. 1850, Eng. Trans., Edinburgh, 1842), Lünemann (3d ed., Göttingen, 1867). For the doctrine of the epistle the most elaborate work is Riehm's very useful *Lehrbegriff des Hebräerbriefs*, Ludwigsburg, 1858-59; with which, in addition to the general works on New Testament theology by Weiss, Reuss, and others, the reader may compare Ritschl's *Entstehung der Altkatholischen Kirche*, 2d ed., p. 159 *seq.* (Bonn, 1857), and Pfleiderer's *Paulinismus*, chap. ix. (Leipsic, 1873). An excellent summary of the present state of the critical questions bearing on the epistle is given by Zahn in the article "Hebraerbrief" in the new edition of Herzog's *Encyklopädie*. (W. R. S.)

HEBRIDES, THE, or WESTERN ISLES OF SCOTLAND, is a name sometimes applied collectively to all the islands on the west coast of Scotland, but seldom including Bute, Arran, and the other islands situated in the Firth of Clyde. The group is usually divided into the Outer Hebrides, or Long Island, and the Inner Hebrides. The former division embraces the Lewis, Harris, North and South Uist, Benbecula, Barra, and a number of small islands, the whole length of this group from Barra-Head to the Butt of Lewis being about 130 miles. The Inner Hebrides include Islay, Skye, Mull, Jura, Coll, Colonsay, Rum, Eigg, Tiree, Lismore, and Ulva. The number of inhabited islands is over 100, and the population is nearly 100,000. The principal islands are noticed under separate headings. The outer range consists almost exclusively of gneiss rocks, with poor soil and large proportions of peat and moor. The inner range is composed chiefly of trap and slate. The scenery of the islands may be generally described as partaking of the wild and sublime. Large masses of mountains of all forms tower up in the interior; and the coasts, indented by arms of the sea, are rugged and varied in outline. Spots of great beauty—green pastoral glens, sheltered bays and lakes—are intermingled with the wildest scenes. The climate, though mild, is humid and unsuitable for corn crops. Only a very small portion of the surface is arable, the greater part being mountains, and the valleys intersecting them narrow and frequently covered with peat moss. Much of the land has, however, been converted into sheep walks, and the moors and desolate tracts are often let at high rents to sportsmen. The development of the prosperity of the islands has been greatly aided by the construction of excellent roads, and by the establishment of various lines of steamers in connexion with Glasgow, thus rendering the fine and in some respects unique scenery fully and easily accessible to tourists. One of the principal sources of wealth is that of the fisheries, Stornoway in the island of Lewis being the headquarters of that industry on the western coast.

The Hebrides are mentioned by Ptolemy under the name of Ἔβουδαι and by Pliny under that of *Hebudes*, the modern spelling having, it is said, originated in an accidental misprint. By the Norwegians they were called *Sudreyjar* or Southern Islands. The Latinized form was Sodorenses, preserved to modern times in the title of the bishop of Sodor and Man. The original inhabitants of the Hebrides seem to have been of the same Celtic race as those settled on the mainland—the Scoto-Irish whom Columba about the middle of the 6th century converted to Christianity. Scandinavian hordes then poured in with their northern idolatry and lust of plunder but in time they adopted the language and faith of the islanders. Mention is made of incursions of the vikings on their shores as early as 793, but the principal emigration took place towards the end of the 9th century in the early part of the reign of Harold Haarfager, and consisted of persons driven thither, as well as to Orkney and Shetland, to escape from his tyrannous rule. Soon afterwards they began to make incursions against their mother-country, and on this account King Harold fitted out an expedition against them, and placed Orkney, Shetland, the Hebrides, and the Isle of Man under Norwegian government. The chief seat of the Norwegian sovereignty was Colonsay. About the year 1095 Godred Crovan, king of Dublin, of Man, and of the Hebrides, died in Islay. His third son, Olaus or Olave, succeeded to the government about 1103, and the daughter of Olaus was married to Somerled or Sorlet of Argyle, who became the founder of the dynasty known as Lords of the Isles. Many efforts were made by the Scottish monarchs to displace the Norwegians. Alexander II. led a fleet and army to the shores of Argyllshire in 1249, but he died in the island of Kerrera. On the other hand King Haco, at once to restrain the independence of his jarls and to keep in check the ambition of the Scottish kings, set sail in 1263 on a great expedition, which, however, ended disastrously. Magnus, son of Haco, concluded in 1266 a peace with the Scots, renouncing all claim to the Hebrides and other islands except Orkney and Shetland, and King Alexander agreed to give him a sum of 4000 merks in four yearly payments. It was also stipulated that Margaret, daughter of Alexander, should be betrothed to Eric, the son of Magnus, a connexion long remembered and lamented in Scottish song and story.

The race of Somerled continued to rule the islands, and from a younger son of the same potentate sprang the lords of Lorn, who took the patronymic of Macdougall. John Macdonald of Isle of Islay, who died about 1386, was the first to adopt the title of "Lord of the Isles." He was one of the most potent of the island princes, and was married to a daughter of the Earl of Strathern, steward of Scotland. His son, Donald of the Isles, was memorable for his rebellion in support of his claim to the earldom of Ross, in which, however, he was unsuccessful. Alexander, son of Donald, resumed the hereditary warfare against the Scottish crown; and in 1462 a treaty was concluded between Alexander's son and successor John and King Edward IV. of England, by which John, his son Donald Balloch, and his grandson John, became bound to assist King Edward and James, earl of Douglas, in subduing the kingdom of Scotland. The alliance seems to have led to no active operations, and the island king was adjudged to be a traitor to his liege sovereign of Scotland. In the reign of James V. another John of Islay resumed the title of "Lord of the Isles," but was compelled to surrender the dignity. The glory of the lordship of the isles—the insular sovereignty—had departed. From the time of Bruce the Campbells had been gaining the ascendency in Argyll. The Macleans, Macnaughtons, Maclachlans, Lamonts, and other ancient races had sunk before this favourite family. The lordship of Lorn was wrested from the Macdougalls by Bruce, and their extensive possessions, with Dunstaffnage Castle, bestowed on the king's relative, Stewart, and his descendants, afterwards lords of Lorn. The Macdonalds of Sleat, the direct representatives of Somerled, though driven from Islay and deprived of supreme power by

James V., still kept a sort of insular state in Skye. There were also the Macdonalds of Clanranald and Glengarry descendants of Somerled, with the powerful houses of Macleod of Dunvegan and Macleod of Harris, M'Neill of Barra and Maclean of Mull. Fierce sanguinary feuds continued throughout the 16th and 17th centuries among these rival clans and their dependent tribes, and the turbulent spirit was not subdued till a comparatively recent period. James VI. made an abortive endeavour to colonize Lewis. William III. and Queen Anne attempted to subsidize the chiefs in order to preserve tranquillity, but the wars of Montrose and Dundee, and the Jacobite insurrections of 1715 and 1745, showed how futile were all such efforts. It was not till 1748, when a decisive blow was struck at the power of the chiefs by the abolition of heritable jurisdictions, and the appointment of sheriffs in the different districts, that the arts of peace and social improvement made way in these remote regions.

The change was great, and at first not unmixed with evil. A new system of management and high rents were imposed, in consequence of which numbers of the tacksmen, or large tenants, emigrated to America. The exodus continued for many years. Sheep-farming on a large scale was next introduced, and the crofters were thrust into villages or barren corners of the land. The consequence was that, despite the numbers who entered the army or emigrated to Canada, the standard of civilization sank lower, and the population multiplied in the islands. The people came to subsist almost entirely on potatoes and herrings; and in 1846, when the potato blight commenced its ravages, a scene of nearly universal destitution ensued,—embracing, over the islands generally, 70 per cent. of the population. Temporary relief was administered in the shape of employment on roads and other works; and an emigration fund being raised, from 4000 to 5000 of the people in the most crowded districts were removed to Australia.

The principal books on the Hebrides are Martin's *Description of the Western Islands of Scotland*, 1703; Pennant's *Tour in Scotland and Voyage to the Hebrides*, 1774; Sir Joseph Bank's *Contributions to Pennant's Tour*; Boswell's *Tour to the Hebrides with Samuel Johnson, LL D*; Macculloch's *Geological Account of the Hebrides*, 1819; Hugh Miller's *Cruise of the Betsy*; W. A. Smith's *Lewsiana, or Life in the Outer Hebrides*, 1874. Their history under Norwegian rule is given in the *Chronicon Regum Manniæ et Insularum*, edited, with learned notes, from the MS in the British Museum by Professor P. A. Munch of Christiania, 1860.

HEBRON, the most southern of the three cities of refuge west of Jordan (Josh. xx. 7), built "seven years before Zoan (Tanis) in Egypt" (Num. xiii. 22). Tanis, according to Brugsch, was standing at least 2400 years B.C. Hebron was originally called Mamre and Kirjath Arba, after Arba, one of the Anakim (Josh. xiv. 15). It is frequently mentioned in the Old Testament (Gen. xiii. 18 and xxiii. 19; 2 Sam. iii. 20 and v. 5). The present town encloses the *Haram* or sanctuary built over the supposed site of Machpelah; but if this site be (as seems probable) genuine, the ancient Hebron must have faced the cave, as is remarked by many ancient writers (Gen. xxiii. 17). The name Machpelah signifies "place of division," and the cave was therefore called as early as the 6th century *Spelunca Duplex*. In the 12th century an iron door (still visible) is mentioned as leading from the Haram wall to the cavern. In 1167 A.D. Hebron became the see of a Latin bishop, and it was taken in 1187 by Saladin. In 1834 it joined the rebellion against Ibrahim Pasha, who took the town and pillaged it. Modern Hebron rises on the east slope of a shallow valley—a long narrow town of stone houses, the flat roofs having small stone domes. The main quarter is about 700 yards long, and two smaller groups of houses exist north and south of this. The hill behind is terraced, and luxuriant vineyards surround the place, which is well watered on the north by three principal springs, including the Well Sirah, now *'Ain Sârah* (2 Sam. iii. 26). Three conspicuous minarets rise, two from the Haram the other in the north quarter. The population includes 17,000 Moslems and 600 Jews. The Bedawin bring wool and camel's hair to the market; and glass bracelets, lamps, and leather water-skins are manufactured in the town. The modern name of Hebron is *El Khalil*, "the friend," in allusion to Abraham the friend of God. The most conspicuous building is the *Haram*, an enclosure measuring 112 feet east and west by 198 north and south, surrounded with high rampart walls of masonry similar in size and dressing to that of the Jerusalem Haram walls. These ramparts are ascribed by architectural authorities to the Herodian period. The interior area is partly occupied by a 12th century Gothic church, and contains six modern cenotaphs of Abraham, Isaac, Jacob, Sarah, Rebecca, and Leah. The cave beneath the platform has probably not been entered for at least 600 years. The numerous traditional sites now shown round Hebron are traceable generally to mediæval legendary topography, including the tombs of Adam, Esau, Judah, Abner, and Jesse, the Field of Damascus, the Vale of Tears, and the Oak of Mamre ("plain" in A.V., Gen. xiii. 18), which has at various times been shown in different positions from ⅔ mile to 2 miles from the town.

HECATÆUS, son of Hegesander, was sprung from an ancient and noble family of Miletus. His life seems to fall between the years 550 and 475 B.C. His earlier years were spent in travelling. He lived some time in Egypt (Herod., ii. 143); he was well acquainted with the resources and power of the Persian empire (Herod., v. 34); and the extant fragments of his writings seem to imply personal acquaintance with Libya, Spain, and Italy, as well as with the countries bordering on the Ægean and Euxine seas. After middle life he seems to have settled in Miletus, where he occupied a position of great honour, and to have devoted his time to the composition of geographical and historical works. When Aristagoras held a council of the leading Ionians at Miletus, to organize a revolt against the Persian rule, Hecatæus tried to dissuade his countrymen from the undertaking. Being overruled, he then advised them to equip a strong fleet, using for the emergency the treasures of the temple at Branchidæ, which might be repaid after the war. But both then and at a later period of the war (Herod., v. 124) his skilful and prudent advice was given in vain. When the remainder of the revolted Ionians sued for terms, he was one of the ambassadors sent to the Persian satrap Artaphernes. He wrote a work on geography entitled Περίπλους or Περιήγησις τῆς Γῆς, in which he went over the countries of the known world, told their inhabitants, enumerated the towns, and described their situation and history. He improved the map of the world which Anaximander had made. He also wrote a work called Γενεαλογίαι or Ἱστορίαι, describing systematically the traditions and mythology of the Greeks. According to Arrian, he was the first to employ critical method to distinguish myth from historical fact; though he accepts Homer and the other poets as trustworthy authority. Herodotus, though obviously regarding him with respect, often controverts his statements.

HECATÆUS, of Abdera, sometimes confounded with Hecatæus of Miletus, was a Greek historian and philosopher of the 4th century B.C. He was a disciple of Pyrrho and a contemporary of Alexander the Great and Ptolemy Soter. He accompanied the latter in an expedition to Syria, and during the reign of the same prince sailed up the Nile as far as Thebes. Some fragments of works by him on Egypt and on the Hyperboreans still exist. According to Suidas, he also wrote a treatise on the poetry of Hesiod and Homer. Regarding his authorship of a work on the Jews, of which some fragments remain, there is some disagreement among critics, but in all probability he is not the author of it.

The *Hecataei Abderitae Fragmenta* were collected by P. Zorn, and published at Altona in 1730. See C. Muller, *Histor. Græcor. Frag.*, and Vossius, *De Historicis Græcis*.

HECATE, a Greek goddess who is never mentioned in Homer, but is of great importance in other parts of the literature as well as in religious observance. The name Hecatus, the masculine corresponding form, is a frequent epithet of Apollo; and though the word ἑκάτη is never used exactly as an epithet of Artemis, yet this suggests a close relationship between the two goddesses, which an examination of their functions fully confirms. Their character and attributes stamp both as moon goddesses. In fact, though often distinguished from Artemis, yet at other times Hecate is identified with her. The worship of Hecate seems to have flourished especially among the wilder tribes of Greek nationality, in Samothrace, Thessaly, and elsewhere; she has, however, been received into the Pantheon of the more civilized Greek races, probably on account of her close resemblance to Artemis; and this is doubtless the meaning of Hesiod's statement (*Theog.*, 423) that she alone of all the Titanic powers was left undisturbed in her honours by Zeus. The parentage of Hecate is variously given. Hesiod names her father Perses (a word connected with Perseus, Persephone, &c., all of which denote powers of light) and her mother Asteria, the starry sky of night. Zeus and Demeter, Zeus and Hera, &c., are also named as her parents. Her chief prerogatives or functions are the following.

(1) She is the chief goddess who presides over magic arts and spells, for all incantations naturally were performed by the light of the moon. Medea is in this respect closely associated with her worship. See her prayer in Sophocles, *Rhizot. fr.* In Theocr., *Id.* ii., where a woman's incantation to bring back her faithless lover is given, Hecate is constantly invoked. (2) She is a Chthonian power, and is worshipped at the Samothracian mysteries. She is then closely connected with Demeter. Alone of the gods besides Helios, she witnessed the abduction of Persephone, and, torch in hand (a natural symbol for the moon's light), she assisted Demeter in the search for her daughter (*Hym. Dem.*, 45 *ff.*). She is obviously a by-form of Persephone, who as queen of the lower world is also the moon, the bride of the sun, when at setting he has gone to the lower world. She rules as a terrible power, Krataiis, among the shades (*Orph.*, 48, &c.). (3) As δᾳδοῦχος, φωσφόρος, ὑπολάμπτειρα, she lights wanderers on their way by night, and is therefore, along with Hermes, worshipped as patron of roads under the name ἐνοδία. At cross-roads she was the director, hence her name τριοδῖτις, and probably also τρίμορφος, τριπρόσωπος, &c. Pillars called Hecataea, like the Hermae, stood, especially in Athens, at cross-roads and door-ways. (4) She is the goddess of fertility, and, like Artemis, presides especially over the birth and the youth of wild animals. As the moon measures the months, the moon-goddess in all forms, as Artemis, Helena, &c., presides over birth. (5) It follows easily from the last that she should be the goddess who gives wealth and power. Thus she is celebrated by Hesiod (*l. c.*). On the Acropolis at Athens Hecate Epipyrgidia, as protectress of the citadel, had a shrine beside the temple of Victory. To Hecate dogs were offered, also honey and black she-lambs, as black victims were offered to other Chthonian deities. She was represented generally as a triple form, holding in the six hands torches, with sometimes a snake, a key, a whip, or a dagger, often with dogs standing beside her. The three heads support a basket, "kalathos," such as often adorns the statues of Artemis and Hera. The Hecataea also generally represent her with three heads; occasionally, however, a single formed Hecate is found, still with torch or key in hand, and sometimes with crescent moon on head.

HECKMONDWYKE, a town of England, in the West Riding of Yorkshire, on the Huddersfield and Bradford Railway, 2 miles N.W. of Dewsbury and 10 miles S.W. of Leeds. It occupies a gradually sloping site, and is somewhat irregularly built, although latterly it has assumed a more town-like appearance. It possesses a church dedicated to St James erected in 1831, a market house erected in 1868, a working men's club established in 1868, a mechanics' institute founded in 1873, a chamber of commerce dating from the same year, and a literary institute established in 1878. There are three board schools, a national school, and a Roman Catholic school, the whole affording accommodation for 1600 scholars. Much has been done for the improvement of the town by draining, and under the provisions of the Dewsbury and Heckmondwyke Waterworks Act of 1876 an ample supply of water has been obtained for domestic and manufacturing purposes. A cemetery with chapels for churchmen and dissenters was formed in 1860. The chief manufacture is blankets, and there are also carpet factories, machine shops, dye works, and iron foundries. Coal is extensively wrought in the vicinity. The town is under the government of a local board of health established in 1853. The area of the township is about 700 acres. The population of the town, which in 1801 was only 1742, had in 1871 reached 8300, and is now estimated at 10,000.

HECLA. See ICELAND.

HECTOR, son of Priam and Hecuba, the champion of the Trojans and the mainstay of their city. Like Paris and other Trojans, he had an Oriental name, Darius, as well as a Greek one, an interesting fact on which many fanciful theories have been founded. He was married to Andromache, daughter of Eetion, king in the Cilician Thebe. By Homer his character is drawn in most favourable colours as a good son, a loving husband and father, and a trusty friend,—religious without superstition, tenderhearted yet courageous. The one blemish apparent in some parts of the *Iliad* (see Geddes's *Homeric Problem*) is a tendency to presumptuous and boastful confidence. He is an especial favourite of Apollo; and later poets even describe him as son of that god. When Achilles, enraged with Agamemnon, deserted the Greeks, Hector drove them back to their ships, which he almost succeeded in burning. Patroclus, the friend of Achilles, who came to the help of the Greeks, was slain by Hector with the help of Apollo. Then Achilles, to revenge his friend's death, returned to the war, slew Hector, dragged his body behind his chariot to the camp, and afterwards dragged it round the tomb of Patroclus. Priam, guarded by Hermes, went to Achilles and prevailed on him to give back the dead body, which was buried with great honour (*Il.*, xxiv.). Hector was worshipped in the Troad by the Bœotian tribe Gephyræi; and he is, like other heroes, probably an ancient god. It would require an inquiry into the whole Trojan legend to determine the conception involved: it is impossible to do more in this place than refer to Ruckert's essay in this direction.

Scenes from the life of Hector are favourite subjects in vase paintings. A very ancient pinax from Camirus represents his fight with Menelaus over the dead Euphorbus; and on an amphora, also from Camirus, of not later date than 450 B.C., he is represented starting for battle, standing beside the quadriga into which his charioteer Cebriones has already mounted. Both vases are now in the British Museum. Though many of the subjects in which he was supposed to appear have now been assigned to other heroes,—for example, the frequently occurring Parting of Hector and Andromache is by a more searching criticism generally transformed into a scene from the life of Amphiaraus,—yet many undoubted examples remain. We find such scenes as the parting cup given by Hecuba to her son as he departs to the battle, his battle with Achilles in presence of Apollo and Athene, or the dragging of his corpse round the tomb of Patroclus.

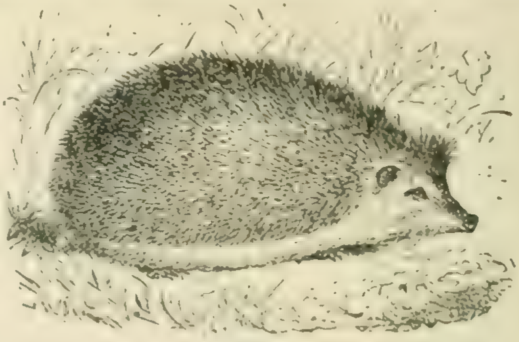
HECUBA (the Latin form of the Greek *Hekabe*), wife of Priam, is in Homer daughter of the Phrygian king Dymas, who dwelt on the bank of the Sangarius; but according to Euripides, Virgil, &c., her father was named Cisseus. According to Homer she was mother of nineteen of Priam's fifty sons. When Troy was captured and Priam slain, she was made prisoner by the Greeks. Her fate is told in various ways, most of which connect her with the promontory Cynossema, on the Thracian shore of the Hellespont. According to Euripides (*Hecuba*), her youngest son Polydorus was placed during the siege under the care of Polymestor, king of Thrace. When the Greeks came to the Thracian Chersonese on their way home Hecuba discovered that her son Polydorus had been murdered, and in revenge she contrived to put out the eyes of Polymestor and murder his two sons. She was acquitted by Agamemnon; but, as Polymestor foretold, she was turned into a dog, and her grave became a mark for ships. Other tales about her may be found in Ovid (*Met.*, xiii. 423 *ff.*) and Dictys. It is obvious from the tales of Hecuba's transformation and death that she is a form of some goddess to whom dogs were sacred; and the analogy with Scylla is striking.

HEDA, Willem Claasz, Dutch painter, born at Haarlem it is said in 1594, and still living there in 1668, was one of the earliest Dutchmen who devoted himself exclusively to the painting of still life. He was the contemporary and comrade of Dirk Hals, with whom he had in common pictorial touch and technical execution. But Heda was more careful and finished than Hals, and showed considerable skill and not a little taste in arranging and colouring chased cups and beakers and tankards of precious and inferior metals. Nothing is so appetizing as his "luncheon," with rare comestibles set out upon rich plate, oysters,—seldom without the cut lemon,—bread, champagne, olives, and pastry. Even the commoner "refection" is also not without charm, as it comprises a cut ham, bread, walnuts, and beer. One of Heda's early masterpieces, dated 1623, in the Munich Pinakothek is as homely as a later one of 1651 in the Lichtenstein Gallery at Vienna. A more luxurious repast is a Luncheon in the Augsburg Gallery, dated 1644. Most of Heda's pictures are on the Continent, notably in the galleries of Paris, Parma, Ghent, Darmstadt, Gotha, Munich, and Vienna. He was a man of repute in his native city, and filled all the offices of dignity and trust in the guild of Haarlem. He seems to have had considerable influence in forming the younger Frans Hals.

HEDGEHOG (*Erinaceus europæus*, Linn.), the Common Urchin of Pennant, *Hérisson* of the French, *Riccio* of the Italians, *Igel* of the Germans, is the best known, and from an anatomical point of view perhaps the most characteristic, of the *Insectivora*. The genus is remarkable for its dentition, its armature of spines, and its short tail, while the ordinary species is characterized by not having the spines longer than the head or the ears more than half that length. The upper jaw is longer than the lower one, and the whole snout, which is long and flexible, has somewhat the appearance of that of the hog; the nostrils are narrow; and the claws are long but weak. The animal is about 10 inches long, its eyes are small, and the integument of the ventral surface is covered with hairs of the ordinary character. The brain is remarkable for its low degree of development, the cerebral hemispheres being extremely small, and marked with but one groove, and that a shallow one, on each side, while the more special characters of this region call to mind the organization of the same parts in the very lowest of mammals.

The most remarkable point in its external appearance is the possession of spines, and the power possessed by it of rolling itself up into a ball, from which these spines stand out in every direction. The spines, which are modified hairs, are sharp, hard, and elastic, and form so efficient a defence that there are but few animals that are able, and even they rarely, to effect a successful attack on the curious creature. The moment it is touched, or even hears the sound of so slight a noise as the report of a gun, it rolls itself up by the action of the powerful muscles which lie just beneath the skin, while this same contraction effects the erection of the spines. The most important muscle is the *orbicularis panniculi*, which extends over the anterior region of the skull, as far down the body as the ventral or purely hairy region, and on to the tail; three other muscles are connected with this, and aid in the contraction of the integument, passing as they do from the breast bone to the face and lower jaw, from the fore-arm to the sides of the ventral region, and from the fore-arm to the dorsal surface.

Though insectivorous, the hedgehog is reported to have a great liking for mice, while frogs and toads, as well as plants and fruits, all seem to be acceptable; its ingestion of snakes has been detailed by Buckland and Broderip, and its fondness for eggs has caused it to meet with the enmity of game-preservers. Pennant reports that "it lies under the undeserved reproach of sucking cattle, and hurting their udders, but the smallness of its mouth renders that impossible," nor does it seem that any well-authenticated report of such an occurrence has ever been made. It makes a not rare domestic pet. In a state of nature it does not emerge from its retreat during full daylight, unless urged out by hunger or by the necessities of its young. During the cold of winter it passes into a state of complete hibernation, and its temperature falls very considerably; having provided itself with a nest of dry leaves, it is well protected from the influences of the rain, and rolling itself up it remains undisturbed till distinctly warmer weather returns. In July or August the female brings forth four to eight young, or, according to others (Bell), two to four at a somewhat earlier period; at birth the spines, which in the adult are black in the middle, are white and soft, but soon harden, though they do not attain their full size until the succeeding spring. It is commonly found in woods and gardens, and extends over nearly the whole of Europe; it has been found at 6000 to 8000 feet above the level of the sea. The witch in *Macbeth* who heard the "hedge-pig" *whine* thrice and once gave not an incorrect account of the character of its voice, rarely as this is heard. The adult is provided with thirty-six, and the young with twenty-four teeth; in both cases canines appear to be absent; the median incisors are very long, and project; there are two more false grinders in the upper than in the lower jaw, while the true molars of the upper jaw are remarkable for the presence of four cusps, of which the anterior inner and the posterior outer are connected by an obliquely set ridge. This is the same arrangement as is seen in man. In the lower jaw the corresponding teeth are, as in the lemurs (or half-apes), provided with two transverse ridges.



Hedgehog.

Sixteen species of the genus have been recognized by some zoologists. The tenrec (*Centetes*) of Madagascar has very many points in common with it.

HEDGE-SPARROW. See SPARROW.

HEEM, JAN DAVIDSZ VAN (or JOHANNES DE), was born according to Houbraken and Sandrart in 1604, according to Descamps in 1600, at Utrecht, and died at Antwerp in 1683 or 1684. Thoré has said of Heda, but it is only true of De Heem, that "he glorified insects, butterflies, and all the minute beings that swarm in vegetation, and made the earth drink in cups of chased gold." He was, if not the first, certainly the greatest painter of still life in Holland; no artist of his class combined more successfully perfect reality of form and colour with brilliancy and harmony of tints. No object of stone or silver, no flower humble or gorgeous, no fruit of Europe or the tropics, no twig or leaf, with which he was not familiar. Sometimes he merely represented a festoon or a nosegay. More frequently he worked with a purpose to point a moral or illustrate a motto. Here the snake lies coiled under the grass, there a skull rests on blooming plants. Gold and silver tankards or cups suggest the vanity of earthly possessions; salvation is allegorized in a chalice amidst blossoms, death as a crucifix inside a wreath. Sometimes De Heem painted alone, sometimes in company with men of his school, Madonnas or portraits surrounded by festoons of fruit or flowers. At one time he signed with initials, at others with Johannes, at others again with the name of his father joined to his own. At rare intervals he condescended to a date, and when he did the work was certainly of the best. De Heem entered the guild of Antwerp in 1635-6, and became a burgher of that city in 1637. He steadily maintained his residence till 1667, when he moved to Utrecht, where traces of his presence are preserved in records of 1668, 1669, and 1670. It is not known when he finally returned to Antwerp, but his death is recorded in the guild books of that place. A very early picture, dated 1628, in the gallery of Gotha, bearing the signature of Johannes in full, shows that De Heem at that time was familiar with the technical habits of execution peculiar to the youth of Albert Cuyp. In later years he completely shook off dependence, and appears in all the vigour of his own originality.

Out of 100 pictures or more to be met with in European galleries scarcely eighteen are dated. The earliest after that of Gotha is a chased tankard, with a bottle, a silver cup, and a lemon on a marble table, dated 1640, in the museum of Amsterdam. A similar work of 1645, with the addition of fruit and flowers and a distant landscape, is in Lord Radnor's collection at Longford. A chalice in a wreath, with the radiant host amidst wheatsheaves, grapes, and flowers, is a masterpiece of 1648 in the Belvedere of Vienna. A wreath round a Madonna of life size, dated 1650, in the museum of Berlin, shows that De Heem could paint brightly and harmoniously on a large scale. In the Pinakothek at Munich is the celebrated composition of 1653, in which creepers, beautifully commingled with gourds and blackberries, twigs of orange, myrtle, and peach, are enlivened by butterflies, moths, and beetles. A landscape with a blooming rose tree, a jug of strawberries, a selection of fruit, and a marble bust of Pan, dated 1655, is in the Hermitage at St Petersburg; an allegory of abundance in a medallion wreathed with fruit and flowers, in the gallery of Brussels, is inscribed with De Heem's monogram, the date of 1668, and the name of an obscure artist called Lambrechts. All these pieces exhibit the master in full possession of his artistic faculties.

CORNELIS DE HEEM, the son of Johannes, was in practice as a flower painter at Utrecht in 1658, and was still active in his profession in 1671 at the Hague. His pictures are not equal to those of his sire, but they are all well authenticated, and most of them in the galleries of the Hague, Dresden, Cassel, Vienna, and Berlin. In the Staedel at Frankfort is a fruit piece, with pot-herbs and a porcelain jug, dated 1658; another, dated 1671, is in the museum of Brussels. DAVID DE HEEM, another member of the family, entered the guild of Utrecht in 1668 and that of Antwerp in 1693. The best piece assigned to him is a table with a lobster, fruit, and glasses, in the gallery of Amsterdam; others bear his signature in the museums of Florence, St Petersburg, and Brunswick. It is well to guard against the fallacy that David de Heem above mentioned is the father of Jan de Heem. We should also be careful not to make two persons of the artist who sometimes signs Johannes, sometimes Jan Davidsz or J. D. Heem.

HEEMSKERK, JOHAN VAN (1597–1656), Dutch poet, was born at Amsterdam in 1597. He was educated as a child at Bayonne, and entered the university of Leyden in 1617. In 1621 he went abroad on the grand tour, leaving behind him his first volume of poems, *Minnekunst* (The Art of Love), which appeared in 1622. He was absent from Holland four years. He was made master of arts at Bourges in 1623, and in 1624 visited Hugo Grotius in Paris. On his return in 1625 he published *Minnepligt* (The Duty of Love), and began to practise as an advocate in the Hague. In 1628 he was sent to England in his legal capacity by the Dutch East India Company, to settle the dispute respecting Amboyna. In the same year he published the poem entitled *Minnekunde*, or the Science of Love. He proceeded to Amsterdam in 1640, where he married Alida, sister of the eminent statesman Van Beuningen. In 1642 he published *The Cid*, a tragicomedy, and in 1647 his most famous work, the pastoral romance of *Batavische Arcadia*, which he had written ten years before. During the last twelve years of his life Heemskerk sat in the upper chamber of the states-general. His last poetical work was *The Inconstant Hylas*. He died at Amsterdam on the 27th of February 1656.

The poetry of Heemskirk, which fell into oblivion during the 18th century, is now once more read and valued. He takes a prominent place among writers of the second rank in the great age of Dutch literature. But his famous pastoral, the *Batavian Arcadia*, which was founded on the *Astrée* of Honoré d'Urfé, enjoyed a great popularity for more than a century, and passed through twelve editions. It provoked a host of more or less able imitations, of which the most distinguished were the *Doortsche Arcadia* (1662) of Lambertus Bos, the *Zaanlandsche Arcadia* (1658) of Hendrik Zooteboom, and the *Rotterdamsche Arcadia* (1703) of Willem den Elger. But the original work of Heemskerk, in which a party of nymphs and shepherds go out from the Hague to Katwijk, and there indulge in polite and pastoral discourse, surpasses all these in brightness and versatility.

HEEMSKERK, MARTIN JACOBSZ (1498–1574), sometimes called Van Veen, was born at Heemskerk in Holland in 1498, and apprenticed by his father, a small farmer, to Cornelisz Willemsz, a painter at Haarlem. Recalled after a time to the paternal homestead and put to the plough or the milking of cows, young Heemskerk took the first opportunity that offered to run away, and demonstrated his wish to leave home for ever by walking in a single day the 50 miles which separate his native hamlet from the town of Delft. There he studied under a local master whom he soon deserted for John Schoreel of Haarlem. At Haarlem he formed what is known as his first manner, which is but a quaint and *gauche* imitation of the florid style brought from Italy by Mabuse and others. He then started on a wandering tour, during which he visited the whole of northern and central Italy, stopping at Rome, where he had letters for a cardinal. It is evidence of the facility with which he acquired the rapid execution of a scene-painter that he was selected to co-operate with Antonio da San Gallo, Battista Franco, and Francesco Salviati to decorate the triumphal arches erected at Rome in April 1536 in honour of Charles V. Vasari, who saw the battle-pieces which Heemskerk then produced, says they were well composed and boldly executed. On his return to the Netherlands he settled at Haarlem, where he soon (1540) became president of his guild, married twice, and secured a large and lucrative practice. In 1572 he left Haarlem for Amsterdam, to avoid the siege which the Spaniards laid to the place, and there he made a will which has been preserved, and shows that he had lived long enough and prosperously enough to make a fortune. At his death, which took place on the 1st of October 1574, he left money and land in trust to the orphanage of Haarlem, with interest to be paid yearly to any couple which should be willing to perform the marriage ceremony on the slab of his tomb in the cathedral of Haarlem. It was a superstition which still exists in Catholic Holland that a marriage so celebrated would secure the peace of the dead within the tomb.

The works of Heemskerk are still very numerous, but by no means in the same demand as they were in the master's own time. Adam and Eve, and St Luke painting the likeness of the Virgin and Child, in presence of a poet crowned with ivy leaves, and a parrot in a cage—an altar-piece in the gallery of Haarlem, and the Ecce Homo in the museum of Ghent, are characteristic works of the period preceding Heemskerk's visit to Italy. An altar-piece executed for St Laurence of Alkmaar in 1538-41, and composed of at least a dozen large panels, would, if preserved, have given us a clue to his style after his return from the south. In its absence we have a Crucifixion executed for the Riches Claires at Ghent (now in the Ghent Museum) in 1543, and the altar-piece of the Drapers' Company at Haarlem, now in the gallery of the Hague, and finished in 1546. In these we observe that Heemskerk studied and repeated the forms which he had seen at Rome in the works of Michelangelo and Raphael, and in Lombardy in the frescoes of Mantegna and Giulio Romano. But he never forgot the while his Dutch origin or the models first presented to him by Schoreel and Mabuse. As late as 1551 his memory still served him to produce a copy from Raphael's Madonna di Loretto (gallery of Haarlem). A Judgment of Momus, dated 1561, in the Berlin Museum, proves him to have been well acquainted with anatomy, but incapable of selection and insensible of grace, bold of hand and prone to daring though tawdry contrasts of colour, and fond of florid architecture. Two altar-pieces which he finished for churches at Delft in 1551 and 1559, one complete, the other a fragment, in the museum of Haarlem, a third of 1551 in the Brussels Museum, representing Golgotha, the Crucifixion, the Flight into Egypt, Christ on the Mount, and scenes from the lives of St Bernard and St Benedict, are all fairly representative of his style. Besides these we have the Crucifixion in the Hermitage of St Petersburg, and two Triumphs of Silenus in the gallery of Vienna, in which the same relation to Giulio Romano may be noted as we mark in the canvases of Rinaldo of Mantua. Other pieces of varying importance are in the galleries of Rotterdam, Munich, Cassel, Brunswick, Carlsruhe, Mainz, and Copenhagen. In England the master is but known by his drawings. A comparatively feeble picture by him is the Last Judgment in the palace of Hampton Court.

HEEREN, Arnold Hermann Ludwig (1760-1842), an eminent German historian, was born 25th October 1760 at Arbergen near Bremen. He studied philosophy, theology, and history at Gottingen, and thereafter travelled in Italy, France, and the Netherlands. In 1787 he was appointed one of the professors of philosophy at Gottingen, and he afterwards was chosen aulic councillor, privy councillor, &c., received in short those rewards which are the lot of successful German scholars. He died 7th March 1842. Heeren's great merit as an historian was that he regarded the states of antiquity from an altogether fresh point of view. He examined their economic relations, their constitutions, their financial systems, and thus was enabled to throw quite a new light on the development of the old world. He possessed vast and varied learning, perfect calmness and impartiality, and great power of historical insight. A French critic has thus briefly summed up his merits—"He had all the qualities of the historians of his nation without their defects, and there is not a French historian superior to him in clearness of thought and method of composition."

Heeren's chief works were *Ideen über die Politik, den Verkehr, und den Handel der vornehmsten Völker der alten Welt* [illegible] edition of Heeren's *Historische Werke* was published in 15 vols., 1821-26.

HEGEL, Georg Wilhelm Friedrich (1770-1831), was born at Stuttgart on the 27th August 1770. His father, an official in the fiscal service of Wurtemberg, is not otherwise known to fame; and of his mother, who died when her eldest son, the future philosopher, was in his fourteenth year, we only hear that she had scholarship enough to teach him the elements of Latin. He had one sister, Christiana, who died unmarried, and a brother Ludwig, who served in the campaigns of Napoleon.

At the gymnasium or grammar school of Stuttgart, where Hegel was educated between the ages of seven and eighteen, he was not remarkable. His main feat was a diary kept in German and to a less extent in Latin, at intervals during eighteen months (1785-7), to record and comment on incidents of the class-room, the street, and the parlour. His private industry was shown by written translations of the *Antigone*, the *Manual* of Epictetus, &c. But the characteristic feature of his studies was the copious extracts which from this time onward he unremittingly made and preserved. Alphabetically arranged under suitable heads, this strange congeries, forming his intimate library, comprised annotations on classical authors, passages from newspapers, whole treatises on morals and mathematics from the standard works of the period. It is the palpable exhibition of the marvellous receptivity by which he saturated himself with the thoughts of others, and absorbed in their integrity the raw materials for elaboration. Yet as evidence that he was not merely receptive we have essays already breathing that admiration of the classical world which he never lost. Even then too his chief amusement was cards, and even then he began the habit of taking snuff.

In the autumn of 1788 he entered at Tubingen as a student of theology; but though an exhibitioner and on the foundation, if we may so call the "Stift," he showed no interest in the theology or philosophy of the place: his sermons were a failure; and, instead of seeking after academical distinction, he found more congenial reading in the classics, on the advantages of studying which his first essay was written. After two years he took the customary degree of Ph.D., and in the autumn of 1793 received his theological certificate, stating him to be of good abilities, but of middling industry and knowledge, and especially deficient in philosophy.

His university career, unlike that of Schelling, who, five years younger, came to Tubingen in 1790, was not brilliant. Hegel was quietly making himself at home in the Greek and Roman world, and gathering stores of miscellaneous information. Amongst his comrades he went by the title of "old man," such, it is said, being his withered aspect. He took part, however, in the usual walks and beer-drinking, and even it seems love-making, of the student. But he gained most from intellectual intercourse with his contemporaries. Several of these are mentioned, but the two best known to fame were Hölderlin and Schelling. The former, who was of the same age as Hegel, left for Jena about the time that Schelling arrived. With him Hegel learned to feel for the old Greeks a love which grew stronger as the semi-Kantianized theology of his teachers more and more failed to interest him. With Schelling like sympathies bound him. They both protested against the pedantic and ecclesiastical inertia of their native state, and adopted with fervour the revolutionary doctrines of freedom and reason. The myth which tells how the two went out one morning to dance round a tree of liberty in a meadow is antedated, as the incident happened after they had left; still it is in keeping with their opinions, if unsuited to their character.

Like many a German student, Hegel was glad of a tutorship in 1793, when his university course ended. For three years he taught the children of a M. Steiger of

Tschugg. Tschugg was the summer residence of the family, near Erlach on the lake of Biel; in winter they lived in Bern. Little happened in these years. Hegel had a few acquaintances in Bern; but, on the whole, intellectually he lived in isolation. He was, however, far from inactive. Local influences may explain a systematic account of the fiscal system of the canton Bern which he made for himself. But the main factor in Hegel's mental growth came from his study of Christianity. Under the impulse given by Lessing and Kant he turned to the original records of Christianity, and attempted to construe for himself the real significance of Christ. He wrote a life of Jesus, in which Jesus was simply the son of Joseph and Mary. He did not stop to criticize as a philologist, and simply ignored the miraculous. He asked for the secret contained in the conduct and sayings of this man which made him the hope of the human race. To Hegel Jesus appeared as revealing the unity with God in which the Greeks in their best days unwittingly rejoiced, and as lifting the eyes of the Jews from a lawgiver who metes out punishment on the transgressor, to the destiny which in the Greek conception falls on the just no less than on the unjust.

The interest of these lucubrations is in general twofold. In Jesus Hegel finds the expression for something higher than mere morality: he finds a noble spirit which rises above the contrasts of virtue and vice into the concrete life, seeing the infinite always embracing our finitude, and proclaiming the divine which is in man and cannot be overcome by error and evil, unless the man close his eyes and ears to the godlike presence within him. In religious life, in short, he finds the principle which reconciles the oppositions of the temporal and ordinary mind. But, secondly, the general source of the doctrine that life is higher than all its incidents and codes is of interest. He does not free himself from the current theology either by rational moralizing like Kant, or by bold speculative synthesis like Fichte and Schelling. He finds his panacea in the concrete life of humanity: he turns to history, and not to abstract speculation. But although he goes to the Scriptures, and tastes the mystical spirit of the mediæval saints, the Christ of his conception has traits that seem borrowed from Socrates and from the heroes of Attic tragedy, who suffer much and yet smile gently on a destiny to which they were reconciled. Instead of the Hebraic doctrine of a Jesus punished for our sins, we have the Hellenic idea of a man who is calmly tranquil in the consciousness of his unity with God.

During these years of arduous wrestling with the problems of religion, Hegel kept up a slack correspondence with Schelling and Hölderlin. Schelling was already on the way to fame. He was trying (to quote his own words) to find the premises to the results of Kant. Meanwhile he kept Hegel abreast with German speculation. Both of them were intent on forcing the theologians from their holes into the daylight, and grudged them any aid they might expect from Kant's postulation of God and immortality to crown the edifice of ethics. After lamenting his want of books, Hegel concludes a letter of 1795 with the words, "Let reason and freedom remain our watchword, and our point of union the church invisible." Great is their animus against the pietistic hypocrisy of Würtemberg. Meanwhile Holderlin in Jena had been following Fichte's career with an enthusiasm with which he infected Hegel.

After these vehement struggles of thought, it is pleasing to turn to a short tour which Hegel in company with three other tutors made through the Bernese Oberland in July and August 1796. Of this tour he has left a minute diary. It embraced Lauterbrunnen, Grindelwald, the Grimsel, and the valley of the Reuss to the lake of Lucerne. The popular passion for natural scenery had scarcely begun, and the days of hotels and tourists were distant. Our four tutors carried little luggage, save a pack of cards to while away the hours of rest. Hegel was particularly delighted with the varied play of the waterfalls. Still no glamour blinds him to the squalor of Swiss peasant life. The glaciers and the rocks call forth no raptures. "The spectacle of these eternally dead masses gave me nothing but the monotonous and at last tedious idea, 'Es ist so.'" Again, speaking of the upper parts of the Haslithal: "I doubt if the most orthodox theologian would be bold enough in these regions to credit nature with the purpose of being useful to man, who with difficulty must wrest from her the scanty pittance of which he can make use,—who is uncertain whether rocks or avalanches may not crush him to pieces even as he steals a poor handful of grass, and destroy his miserable hut and cow-stall, the wretched work of his hands."

Towards the close of his engagement at Bern, Hegel had received hopes from Schelling of a post at Jena. Tired of isolation, he was anxious to get away from Bern. Fortunately his friend Holderlin, who was now tutor in Frankfort, secured a similar situation there for Hegel in the family of a Herr Gogol, a merchant. Hegel entered upon his new post in January 1797. It was apparently more agreeable, and left more time for study. At the same time he was nearer the centre of public interest. But above all it renewed the much-missed intellectual society. Holderlin was still, as formerly, enamoured of the ideal of ancient Greece. And another friend called Sinclair, a Fichtean, the author of several forgotten philosophical works, helped to animate Hegel's interest in philosophy.

It may have been the political position of Frankfort that made Hegel about this time turn to questions of economics and government. He had studied Gibbon, Hume, and Montesquieu in Switzerland. We now find him making copious extracts from the English newspapers on the Poor-Law Bill of 1796; criticizing the Prussian land laws, promulgated about the same time; and writing a commentary on Sir James Steuart's *Inquiry into the Principles of Political Economy*, as a means of defining his own views on economics. Here, as in contemporaneous criticisms of Kant's ethical writings, Hegel aims at correcting the abstract discussion of a topic by treating it in its systematic interconnexions. Church and state, law and morality, commerce and art, are reduced to factors in the totality of human life, from which the specialists had isolated them.

But the best evidence of Hegel's attention to contemporary politics is two unpublished essays—one of them written in 1798, "On the Internal Condition of Würtemberg in Recent Times, particularly on the Defects in the Magistracy," the other a criticism on the constitution of Germany, written, it is probable, not long after the peace of Lunéville (1801). Both essays show more vigour in pointing out the inadequacies of the present than in suggesting a remedy. Criticism, not construction, is their forte. In the first Hegel showed how the supineness of the committee of estates in Würtemberg had favoured the usurpations of the superior officials in whom the court had found compliant servants. And though he perceived the advantages of change in the constitution of the estates, he still doubted if an improved system could work in the actual conditions of his native province. The main feature in the pamphlet is the recognition that a spirit of reform is abroad. If Würtemberg suffered from a bureaucracy tempered by despotism, the Fatherland in general suffered no less. "Germany," so begins the second of these unpublished papers, "is no longer a state." Referring the collapse of the empire to the retention of feudal forms and to the action of religious animosities, Hegel looked forward to reorganization by a central power (Austria) wielding the imperial army, and by a representative body elected by the geographical districts of the empire. But such an issue, he saw well, could only be the outcome of violence—of "blood and iron." The philosopher did not pose as a practical statesman. He only described the German empire in its nullity as a conception without existence in fact. In such a state of things it was the business of the philosopher to set forth the outlines of the coming epoch, as they were already moulding themselves into shape, amidst what the ordinary eye saw only as the disintegration of the old forms of social life.

His old interest in the religious question reappears, but in a more philosophical form. Starting with the contrast between a natural and a positive religion, he regards a positive religion as one imposed upon the mind from without, not a natural growth crowning the round of human life. A natural religion, on the other hand, was not, he thought, the one universal religion of every clime and age, but rather the spontaneous development of the national conscience varying in varying circumstances. A people's religion completes and consecrates their whole activity: in it the people rises above its finite life in limited spheres to an infinite life where it feels itself all at one. Even philosophy with Hegel at this epoch was subordinate to religion; for philosophy must never abandon the finite in the search for the infinite. Soon, however, Hegel adopted a view according to which philosophy is a higher mode of apprehending the infinite than even religion.

At Frankfort, meanwhile, the philosophic ideas of Hegel first assumed the proper philosophic form. "In my scientific training," he says (in a letter to Schelling of November 2, 1800), "which started from more subordinate wants of man, I could not but be forced onwards to science, and at the same time the ideal of youth had to transform itself into the reflective form of a system." In a MS. of 102 quarto sheets, of which the three first and the seventh are wanting, there is preserved the original sketch of the Hegelian system, so far at least as the logic and metaphysics and part of the philosophy of nature are concerned. The third part of the system—the ethical theory—seems to have been composed afterwards; it is contained in its first draught in another MS. of thirty sheets. Even these had been preceded by earlier Pythagorean constructions envisaging the divine life in divine triangles.

Circumstances soon put Hegel in the way to complete these outlines. His father died in January 1799; and the slender sum which Hegel received as his inheritance, 3154 gulden (about £260), enabled him to think once more of a studious life. At the close of 1800 we find him asking Schelling for letters of introduction to Bamberg, where with cheap living and good beer he hoped to prepare himself for the intellectual excitement of Jena. The upshot was that Hegel arrived at Jena in January 1801. An end had already come to the brilliant epoch at Jena, when the romantic poets, Tieck, Novalis, and the Schlegels made it the headquarters of their fantastic mysticism, and Fichte turned the results of Kant into the banner of revolutionary ideas. Schelling was the most philosophical lion of the day; and in some quarters Hegel was spoken of as a new champion summoned from Swabia by Schelling to help him in his struggle with the more prosaic continuators of Kant. Hegel's first performance seemed to justify the rumour. It was an essay on the difference between the philosophical systems of Fichte and Schelling, tending in the whole to support the latter. Still more striking was the agreement shown in the *Critical Journal of Philosophy*, which Schelling and Hegel wrote conjointly during the years 1802-3. So latent was the difference between them at this epoch that it, in one or two cases, is not with certainty possible to determine by whom the essay was written. Even at a later period foreign critics like Cousin saw much that was alike in the two doctrines, and did not hesitate to regard Hegel as a disciple of Schelling. The dissertation by which Hegel qualified for the position of privat-docent—an essay, *De orbitis planetarum*—was probably chosen under the influence of Schelling's philosophy of nature. It was an unfortunate subject. For while Hegel, depending on a numerical proportion suggested by Plato, hinted in a single sentence that it might be a mistake to look for a planet in the interval between Mars and Jupiter, Professor Piazzi had already discovered the first of the asteroids on 1st January 1801. Apparently in August, when Hegel qualified, the news of the discovery had not yet reached him, but critics have made this luckless suggestion the ground of attack on *a priori* philosophy. The theses attached to this dissertation contained some characteristic paradoxes, *e.g.*, that the syllogism is the principle of idealism, that a square is the law of nature, and a triangle of mind, &c.

Hegel's earliest lectures, in the winter of 1801-2, on logic and metaphysics were attended by about eleven students. At a later period, in 1804, we find him with a class of about thirty, lecturing on his whole system; but his average attendance was rather less. Besides philosophy, he once at least lectured on mathematics. As he taught, he was led to modify his original system, and notice after notice of his lectures promised a text-book of philosophy—which, however, failed to appear. Meanwhile, after the departure of Schelling from Jena in the middle of 1803, Hegel was left to work out his own views. Besides philosophical studies, where he now added Aristotle to Plato, he read Homer and the Greek tragedians, made extracts from books, attended lectures on physiology, and dabbled in other sciences. On his own representation at Weimar, he was in February 1805 made a professor extraordinarius, and in July 1806 drew his first and only stipend—100 thalers. At Jena, though some of his hearers became devotedly attached to him, Hegel was not a popular lecturer any more than Krause. The ordinary student found Fries more intelligible.

Of the lectures of that period there still remain considerable notes. The language often had a theological tinge (never entirely absent), as when the "idea" was spoken of, or "the night of the divine mystery," or the dialectic of the absolute called the "course of the divine life." Still his view was growing clearer, and his difference from Schelling more palpable. Both Schelling and Hegel stand in a relation to art, but while the æsthetic model of Schelling was found in the contemporary world, where art was a special sphere and the artist a separate profession in no intimate connexion with the age and nation, the model of Hegel was found rather in those works of national art in which art is not a part of the common life but an aspect of it, and the artist is not a mere individual but a concentration of the passion and power of beauty in the whole community. "Such art," says Hegel, "is the common good and the work of all. Each generation hands it on beautified to the next; each has done something to give utterance to the universal thought. Those who are said to have genius have acquired some special aptitude by which they render the general shapes of the nation their own work, one in one point, another in another. What they produce is not their invention, but the invention of the whole nation; or rather, what they find is that the whole nation has found its true nature. Each, as it were, piles up his stone. So too does the artist. Somehow he has the good fortune to come last, and when he places his stone the arch stands self-supported." Hegel, as we have already seen, was fully aware of the change that was coming over the world. "A new epoch," he says, "has arisen. It seems as if the world-spirit had now succeeded in freeing itself from all foreign objective existence, and finally apprehending itself as absolute mind."

These words come from lectures on the history of philosophy, which laid the foundation for his "Phenomenology of the Mind." The printing of this work (*Phänomenologie des Geistes*) began in 1806 at Bamberg, and the sheets were distributed, as they appeared, to a class where he treated the phenomenology as an introduction to logic. That course he closed on the 18th September 1806, as follows:—"This, gentlemen, is speculative philosophy, so far as I have worked it out. We stand in a momentous time,—a seething mass, in which the mind has made a sudden bound, left its old shape behind, and is gaining a new. The whole bulk of our old ideas, the very bands of the world, are rent asunder, and collapse like a dream. Mind is preparing a new start. Philosophy, above all things, has to own and welcome such a start. While some in powerless resistance cling to the past, and the majority help, but unconsciously, to swell the numbers of its cortege, philosophy, recognizing it as the eternal, has to show it due honour."

Less than a month after, on the 14th October 1806, Napoleon was at Jena. But Hegel, like Goethe, felt no patriotic shudder at the victory, and in Prussia he saw only a corrupt and conceited bureaucracy. Writing to his friend Niethammer on the day before the battle, he speaks only with admiration of the "world-soul," the emperor, and only with satisfaction of the probable overthrow of the badly-generalled and inefficient Prussians. The scholar's wish was to see the clouds of war pass away, and leave thinkers to their peaceful work. His manuscripts were his main care; and doubtful of the safety of his last despatch to Bamberg, and disturbed by the French soldiers in his lodgings, he hurried off, with the last pages of the *Phenomenology* in his pocket, to take refuge in the pro-rector's house. Hegel's fortunes were now at the lowest ebb. Without means, and obliged to borrow from his friend Niethammer, he had no further hopes from the impoverished university. He had already tried to get away from Jena. In 1805, when several lecturers left in consequence of diminished classes, he had written to Voss suggesting that his philosophy might find more congenial soil in Heidelberg; but the application bore no fruit. Now, however, it was necessary to do something. And so, when the proprietor of the *Bamberger Zeitung* was in want of an editor, Hegel, who had been named by Niethammer, at once accepted the offer, which involved a certain partnership in the concern. Early in 1807 he came to Bamberg, and stayed for about eighteen months. Of his editorial work there is little to tell; no leading articles appeared in his columns. Patriotic indignation against Napoleon, or interest in the fortunes of Prussia, were not wanted, and probably would not have been allowed. The editor was only expected to give his constituency news, and he did so with proper neutrality and from the best sources available. It was not a lofty or suitable vocation; and when a nomination to the rectorship of the Aegidien gymnasium in Nuremberg was procured for Hegel, again by the agency of Niethammer, who was now in the education office at Munich, he was glad to go.

From December 1808 to August 1816 Hegel was schoolmaster. Bavaria, at this time under the direction of Montgelas, was modernizing her institutions. The school system was reorganized by new regulations, which, *inter alia*, prescribed a training in philosophy as part of the gymnasial course. To this regulation (with which Hegel, however, was not agreed) we owe a series of lessons in the outlines of philosophy—ethical, logical, and psychological—which Hegel drew up with great care and many revisions. They were published in 1840 by Rosenkranz from Hegel's papers. Deviating somewhat from the official order, he began with the outlines of moral and religious doctrine; he then proceeded to psychology and a combined system of logic and metaphysics, and ended with a general summary of the whole of philosophy.

As a teacher and master Hegel seems to have been fairly successful. He inspired confidence in his pupils, and maintained discipline without pedantic interference in their associations and sports. On the prize-days at the close of the session, his addresses summing up the history of the school year discussed some topic of general interest. Five of these addresses are preserved. The first is an exposition of the advantages of a classical training, when it is not confined to mere points of grammar. "The perfection and grandeur of the master-works of Greek and Roman literature must be the intellectual bath, the secular baptism, which gives the first and unfading tone and tincture of taste and science." The school was mainly classical; yet at least one half of the time was given to arithmetic, history and geography, mathematics, physics, and preliminary philosophy. In another address, speaking of the introduction of military exercises at school, he says:—"These exercises, while not intended to withdraw the students from their more immediate duty, so far as they have any calling to it, still remind them of the possibility that every one, whatever rank in society he may belong to, may one day have to defend his country and his king, or help to that end. This duty, which is natural to all, was formerly recognized by every citizen, though whole ranks in the state have become strangers to the very idea of it."

On the 16th September 1811, in the summer vacation, Hegel married Marie von Tucher. The young lady (twenty-two years younger than her bridegroom) belonged to Nuremberg, and seems to have been all that could be wished for in a wife. She brought her husband no fortune, but a cheerful heart. They seem to have had a happy if a frugal home; and a short excursion now and then was their chief dissipation. The husband kept a careful record of income and expenditure. That income at Nuremberg amounted to 1500 gulden (£130) and a house; at Heidelberg, as professor, he received about the same sum; but at Berlin his regular stipend was about 3000 thalers (£300). Two sons were born to them; the eldest, Karl, born 7th June 1813, has since become eminent as a historian. The younger was named Immanuel, born on the 24th September 1816. Hegel's letters to his wife, written during his solitary holiday tours to Vienna, the Netherlands, and Paris, breathe of kindly and happy affection. Hegel, the tourist, recalling happy days spent together; confessing that, were it not because of his sense of duty as a traveller, he would rather be at home, dividing his time between his books and his wife; commenting on the shop windows at Vienna; describing the straw hats of the Parisian ladies,—is a contrast to the professor of a profound philosophical system. But it shows that the enthusiasm which in his days of courtship moved him to verse had blossomed into a later age of domestic bliss.

The year after his marriage appeared the first two volumes of his *Wissenschaft der Logik*, and the work was completed by a third in 1816. This work, in which his system was for the first time presented in what, if we except a few minor alterations, was its ultimate shape, found some audience in the world, and from here and there came voices of encouragement. Sinclair, who in 1811 brought out three volumes on *Truth and Certainty*; Windischmann, subsequently professor at Bonn; Thaden, a Danish peasant farmer and votary of free thought; Berger, another Dane and philosopher; Van Ghert, an old pupil, now a Government official at Amsterdam,—these, as well as Knebel and Niethammer, corresponded with him during this period. Towards the close of his eighth session three professorships were almost simultaneously put within his reach,—at Erlangen, Berlin, and Heidelberg. The Prussian offer expressed a doubt that his long absence from university teaching might have made him rusty, so he accepted the post at Heidelberg, whence Fries had just gone to Jena. He came to Heidelberg in October 1816. Though charmed with the neighbourhood, and pleased with the people, he was a little disappointed when only four hearers turned up for one of his courses. Others, however, on the encyclopædia of philosophy and the history of philosophy drew classes of twenty to thirty. While he was there, Cousin first made his acquaintance, but a more intimate relation dates from Berlin. Among his pupils was Hinrichs, who, originally a law student, became a philosophical disciple and wrote several works, to one of which, *Religion in its Inward Relation to Science*, Hegel wrote a rather important preface in 1822. The strangest of his hearers was an Esthonian baron, Boris d'Yrkull, who after serving in the Russian army came to Heidelberg to hear the wisdom of Hegel. But his books and his lectures were alike obscure to the baron, who betook himself by Hegel's advice to some simpler fare, in the shape of rudimentary knowledge, before he returned to the Hegelian system. The logic of his master, with whom he became intimate, was afterwards his constant companion in his travels.

At Heidelberg Hegel was also active in a literary way. In 1817 he brought out the *Encyclopædie of the Philosophical Sciences*, in outline, for use at his lectures. In its first form it was a small treatise of about 300 octavo pages; but in the second of 1827, and the third of 1830, it rapidly grew to twice the original bulk. It is the only exposition of the Hegelian system as a whole which we have direct from Hegel's own hand. Besides this work he wrote two reviews for the Heidelberg *Jahrbücher*—the first on Jacobi, the other a political pamphlet which called forth violent criticism. It was entitled a *Criticism on the Transactions of the Estates of Wurtemberg in 1815–16*. On the 15th March 1815 King Frederick of Wurtemberg, at a meeting of the estates of his kingdom, laid before them the draft of a new constitution, in accordance with the resolutions of the congress of Vienna. Though an improvement on the old constitution, it was unacceptable to the estates, jealous of their old privileges and suspicious of the king's intentions. A decided majority demanded the restitution of their old laws, though the kingdom now included a large population to which the old rights were strange. Hegel in his essay, which was republished at Stuttgart, strongly supported the royal proposals, and severely animadverted on the backwardness of the bureaucracy and the landed interests. In the main he was right; but he forgot too much the provocation they had received, the usurpations and selfishness of the governing family, and the unpatriotic character of the king.

After two years at Heidelberg Hegel accepted the renewed offer of the chair of philosophy at Berlin, which had been kept vacant since the death of Fichte. The hopes which this offer raised of a position less precarious than that of a university teacher of philosophy were in one sense disappointed; for more than a professor Hegel never became. But his influence upon his pupils, and his solidarity with the Prussian Government, gave him a position such as few professors have held.

On the 22d October 1818 Hegel began his lectures at Berlin. "Our business and vocation," he said to his young hearers, "is to cherish the philosophical development of the substantial foundation (*i.e.*, the state) which has renewed its youth and increased its strength." But Prussia had already proved false to the spirit of freedom which had armed the peoples against Napoleon. The enthusiasm which in the hands of Stein, Humboldt, and Scharnhorst had reformed the social, intellectual, and military organization of Prussia still smouldered; but hot-headed youthful politicians made it burst into fitful flames. Sober men were disgusted by the absurdities perpetrated at the Wartburg to celebrate the tricentenary of the Reformation. And though professors like Fries and Oken shared the behaviour of the students in this demonstration, and the assassination of Kotzebue in 1819 found admirers—such as the theological professor De Wette, who spoke of it as a "beautiful sign of the time"—Stein spoke of the two professors as a pair of fools, and Niebuhr grew sad over the extravagances of the younger generation. Secret societies were formed or believed to be forming; and the Governments grew alarmed. In Prussia the reaction triumphed by the withdrawal of Humboldt in the last days of 1819; and the death of Hardenberg in 1822 was followed by a period of bureaucracy and conservatism.

It was in such an atmosphere that Hegel published the "Philosophy of Right" (*Grundlinien der Philosophie des Rechts*) in 1821. It is a combined system of moral and political philosophy, or a sociology dominated by the idea of the state. It turns away contemptuously and fiercely from the sentimental aspirations of reformers possessed by the democratic doctrine of the rights of the omnipotent nation. Fries is stigmatized as one of the "ringleaders of shallowness" who were bent on substituting a fancied tie of enthusiasm and friendship for the established order of the state. The disciplined philosopher, who had devoted himself to the task of comprehending the organism of the state, had no patience with feebler or more mercurial minds who recklessly laid hands on established ordinances, and set them aside where they contravened humanitarian sentiments. With the principle that whatever is real is rational, and whatever is rational is real, Hegel fancied that he had stopped the mouths of political critics and constitution-mongers. His theory was not a mere formulation of the Prussian state. Much that he construed as necessary to a state was wanting in Prussia; and some of the reforms already introduced did not find their place in his system. Yet, on the whole, he had taken his side with the Government. Altenstein even expressed his satisfaction with the book. In his disgust at the crude conceptions of the enthusiasts, who had hoped that the war of liberation might end in a realm of internal liberty, Hegel had forgotten his own youthful vows recorded in verse to Hölderlin, "never, never to live in peace with the ordinance which regulates feeling and opinion." And yet if we look deeper we see that this is no worship of existing powers. It is rather due to an overpowering sense of the value of organization,—a sense that liberty can never be dissevered from order, that a vital interconnexion between all the parts of the body politic is the source of all good, so that while he can find nothing but brute weight in an organized public, he can compare the royal person in his ideal form of constitutional monarchy to the dot upon the letter *i*. A keen sense of how much is at stake in any alteration breeds suspicion of every reform.

During his thirteen years at Berlin Hegel's whole soul seems to have been in his lectures. Between 1823 and 1827 his activity reached its maximum. His notes were subjected to perpetual revisions and additions. We can form an idea of them from the shape in which they appear in his published writings. Those on *Æsthetics*, on the *Philosophy of Religion*, on the *Philosophy of History*, and on the *History of Philosophy*, have been published by his editors, mainly from the notes of his students, under their separate heads; while those on logic, psychology, and the philosophy of nature are appended in the form of illustrative and explanatory notes to the sections of his *Encyclopædie*. During these years hundreds of hearers from all parts of Germany, and from beyond the Fatherland, came under his influence. His fame was carried abroad by eager or intelligent disciples. At Berlin Henning served to prepare the intending disciple for fuller initiation by the master himself. Gans and Hotho carried the method into special spheres of inquiry. At Halle Hinrichs maintained the standard of Hegelianism amid the opposition or indifference of his colleagues.

Hegel himself in his class room was neither imposing nor fascinating. You saw a plain, old fashioned face, without life or lustre—a figure which had never looked young, and was now bent and prematurely aged; the furrowed face bore witness to concentrated thought. Sitting with his snuff-box before him, and his head bent down, he looked ill at ease, and while still speaking kept turning the folios of his notes. His utterance was interrupted by frequent hemming and coughing; every word and every sentence came out with a struggle; and if, when the right word seemed as if it would never come and no progress appeared to be making, the listener for a moment ceased to listen, he found when attention returned that the lecture had reached a new stage, and the connexion was lost. And the style of these utterances was no less irregular. Sometimes in the plainest narrative the lecturer would be specially awkward, while in the abtrusest passages he seemed specially at home, rose into a natural eloquence, and carried away the hearer by the grandeur of his diction.

Three courses of lectures are especially the product of his Berlin period: those on æsthetics, the philosophy of religion, and the philosophy of history. In the years preceding the revolution of 1830, public interest, excluded from political life, turned to theatres, concert-rooms, and picture galleries. At these Hegel became a frequent and appreciative visitor. He even made extracts from the art-notes in the newspapers. In his holiday excursions, the interest in the fine arts is prominent, and more than once takes him out of his way to see some old painting. His letters to his wife are full of such topics. A visit to Vienna in 1824 presents him spending every moment at the Italian opera, the ballet, and the picture galleries. In Paris, in 1827, curiously enough, he heard Charles Kemble and an English company play Shakespeare. This familiarity with the actual facts of art, though neither very deep nor very historical, gave an unusual freshness to his lectures on æsthetics, which, as put together from the notes of 1820, 1823, 1826, are in many ways the most successful of his efforts.

The lectures on the philosophy of religion are another application of his method to an important sphere of human interest. Shortly before his death he had prepared for the press a course of lectures on the proofs for the existence of God. In his lectures on religion he dealt with Christianity, as in his philosophy of morals he had regarded the state. On one hand he turned his weapons against the rationalistic school, who reduced religion to the modicum compatible with an ordinary worldly mind. On the other hand he criticized the school of Schleiermacher, who elevated feeling to a place in religion above systematic theology. His middle way attempts to show that the dogmatic creed is the rational development of what was implicit in religious feeling. To do so, of course, philosophy becomes the interpreter and the superior. To the new school of Hengstenberg, which regarded Revelation itself as supreme, such interpretation was an abomination.

A Hegelian school began to gather. The flock included intelligent pupils who applied the method in different provinces of speculation, empty-headed imitators who repeated the catchwords of the new dialectic, and romantic natures who turned philosophy into lyric measures. Opposition and criticism, which were not wanting, only served to define more precisely the adherents of the new doctrine. The master himself grew more and more into a belief in his own doctrine as the one truth for the world. The system had grown gradually with him, and had assimilated intellectual nutriment from every hand so as to make all history and all knowledge bear witness to its truth. He was in harmony with the Government, and his followers were on the winning side. Though he had soon resigned all direct official connexion with the schools of Brandenburg, his real influence in Prussia was considerable, and as usual was largely exaggerated in popular estimate. In the narrower circle of his friends his birthdays were the signal for congratulatory verses. In 1826 a formal festival was got up by some of his admirers, one of whom, Herder, spoke of his categories as new gods; and he was presented with much poetry and a silver mug. In 1830 the students struck a medal in his honour, and in 1831 he was decorated by an order from the king. In 1830 he was rector of the university; and on the tricentenary of the Augsburg Confession in that year, he took the opportunity in his speech on the occasion to charge the Catholic Church with regarding the virtues of the pagan world as brilliant vices, and giving the crown of perfection to poverty, continence, and obedience.

One of the last literary undertakings in which he took part was to give his support to Gans and Varnhagen von Ense in the establishment of the Berlin *Jahrbücher für Wissenschaftliche Kritik*. The aim of this review was to give a critical account, certified by the names of the contributors, of the more important literary and philosophical productions of the time, in relation to the general progress of knowledge. The journal was not solely in the Hegelian interest; and more than once, when Hegel attempted to domineer over the other editors, he was met by vehement and vigorous opposition. It gave him besides a deal of trouble with sanguine authors, who looked forward to a favourable word from him as a passport to fame.

The revolution of 1830 was a great blow to him, as to many other Germans; and the prospect of democratic advances almost made him ill. His last literary work was an essay on the English Reform Bill of 1831, the first part of which appeared in the *Preussische Staats-zeitung*. It contains primarily a careful consideration of the effects likely to come from the alterations in the electoral franchise, in relation, first, to the character of the new members of parliament, and secondly, to the measures which they may introduce. In the latter connexion he enlarges on several points where England had done less than many Continental states for the abolition of monopolies and abuses. Surveying with much intelligence of English circumstances the questions connected with landed property, with the game laws, the poor, the Established Church, especially in Ireland, Hegel throws grave doubt on the legislative capacity of the English parliament as compared with the power of renovation and reform manifested in the more advanced states of western Europe. Much of the essay, unfortunately, has not become antiquated as a critique on the social state of Britain.

In 1831 the cholera had first entered Europe. Hegel and his family retired for the summer to a lodging in the suburbs, and there he finished the revision of the first part of his *Science of Logic*. On the commencement of the winter session, however, he returned to his house in the Kupfergraben. On this occasion an unseemly altercation occurred between him and his friend Gans, who in his notice of lectures on jurisprudence had recommended Hegel's *Philosophy of Right*. Hegel, indignant at what he deemed patronage, asked Gans in a rough missive to withdraw the note. On Friday 11th November Hegel had lectured as usual. On Sunday he had a violent attack of cholera, and on Monday, the 14th November 1831, he was dead. He was buried on the spot he had wished for himself, between Fichte and Solger.

Hegel's Philosophy.

Hegelianism is confessedly one of the most difficult of all philosophies. Every one has heard the legend which makes Hegel say, "One man has understood me, and even he has not." He abruptly hurls us into a world where old habits of thought fail us. In three places indeed he has attempted to exhibit the transition to his own system from other levels of thought; but in none with much success. In the introductory lectures on the philosophy of religion he gives a rationale of the difference between the modes of consciousness in religion and philosophy (between *Vorstellung* and *Begriff*). In the beginning of the *Encyclopaedie* he discusses the defects of dogmatism, empiricism, the philosophies of Kant and Jacobi. In the first case he treats the formal or psychological aspect of the difference; in the latter he presents his doctrine less in its essential character than in its special relations to the prominent systems of his time. The *Phenomenology of Spirit*, regarded as an introduction, suffers from a different fault. It is not an introduction—for the philosophy which it was to introduce was not then fully elaborated. Even to the last Hegel had not so externalized his system as to treat it as something to be led up to by gradual steps. His philosophy was not one aspect of his intellectual life, to be contemplated from others; it was the ripe fruit of concentrated reflexion, and had become the one all-embracing form and principle of his thinking. More than most thinkers he had quietly laid himself open to the influences of his time, and the lessons of history.

The *Phenomenology* is the picture of the Hegelian philosophy in the making,—at the stage before the scaffolding has been removed from the building. For this reason the book is at once the most brilliant and the most difficult of Hegel's works,—the most brilliant because it is to some degree an autobiography of Hegel's mind,—not the abstract record of a logical evolution, but the real history of an intellectual growth; the most difficult because, instead of treating the rise of intelligence (from its first appearance in contrast with the real world to its final recognition of its presence in, and rule over, all things) as a purely subjective process, it exhibits this rise as wrought out in historical epochs, national characteristics, forms of culture and faith, and philosophical systems. The theme is identical with the introduction to the *Encyclopaedie*; but it is treated in a very different style. From all periods of the world,—from mediæval piety and stoical pride, Kant and Sophocles, science and art, religion and philosophy,—with disdain of mere chronology, Hegel gathers in the vineyards of the human spirit the grapes from which he crushes the wine of thought. The human mind coming through a thousand phases of mistake and disappointment to a sense and realization of its true position in the universe,—such is the drama which is covertly Hegel's own history, but is represented objectively in the field of the world as the process of spiritual history which the philosopher wakes into consciousness and reproduces in himself. The *Phenomenology* stands to the *Encyclopaedie* somewhat as the dialogues of Plato stand to the Aristotelian treatises. It contains almost all his philosophy—but irregularly and without due proportion. The personal element gives an undue prominence to recent and contemporary phenomena of the philosophic atmosphere. It is the account given by an inventor of his own discovery, not the explanation of an outsider. It therefore to some extent assumes from the first the position which it proposes ultimately to reach, and gives not a proof of that position, but an account of the experience (*Erfahrung*) by which consciousness is forced from one position to another till at last it rests in *absolutes Wissen*.

It is impossible in a meagre sketch to do justice to this remarkable work, which is neither a mere psychology, nor logic, nor moral philosophy, nor history, but is all of these at once and a great deal more. What the *Phenomenology* wants is not development, but explanation and illustration from ordinary and more familiar thought and literature. It traces the attitudes of consciousness towards reality under the six heads of consciousness, self-consciousness, reason, spirit, religion, and absolute knowledge. The native attitude [illegible] world the realization of her own aims. Either in a crude way she pursues her own pleasure, and finds that necessity counteracts her cravings; or she endeavours to find the world in harmony with the heart, and yet is unwilling to see fine aspirations crystallized by the act of realizing them. Finally, unable to impose upon the world either selfish or humanitarian ends, she folds her arms in pharisaic virtue, with the hope that some hidden power will give the victory to righteousness. But the world goes on in its life, heedless of the demands of virtue. The principle of nature is to live and let live. Reason abandons her efforts to mould the world, and is content to let the aims of individuals work out their results independently, only stepping in to lay down precepts for the cases where individual actions conflict, and to test these precepts by the rules of formal logic.

So far we have seen consciousness on one hand and the real world on the other. The stage of "Geist" reveals the consciousness no longer as critical and antagonistic but as the indwelling spirit of a community, as no longer isolated from its surroundings but the union of the single and real consciousness with the vital feeling that animates the community. This is the lowest stage of concrete consciousness—life, and not knowledge; the spirit inspires, but does not reflect. It is the age of unconscious morality, when the individual's life is lost in the society of which he is an organic member. But increasing culture presents new ideals, and the mind, absorbing the ethical spirit of its environment, gradually emancipates itself from conventions and superstitions. This "Aufklarung" prepares the way for the rule of conscience, for the moral view of the world as subject of a moral law. From the moral world the next step is religion; the moral law gives place to God; but the idea of Godhead, too, as it first appears is imperfect, and has to pass through the forms of nature-worship and of art, before it reaches a full utterance in Christianity. Religion in this shape is the nearest step to the stage of absolute knowledge; and this absolute knowledge—"the spirit knowing itself as spirit"—is not something which leaves these other forms behind but the full comprehension of them as the organic constituents of its empire; "they are the memory and the sepulchre of its history, and at the same time the actuality, truth, and certainty of its throne." Here, according to Hegel, is the field of philosophy.

The preface to the *Phenomenology* signalled the separation from Schelling—the adieu to romanticism. It declared that a genuine philosophy has no kindred with the mere aspirations of artistic minds, but must earn its bread by the sweat of its brow. It sets its face against the idealism which either thundered against the world for its deficiencies, or sought something finer than reality. Philosophy is to be the science of the actual world—it is the spirit comprehending itself in its own externalizations and manifestations. The philosophy of Hegel is idealism, but it is an idealism in which every idealistic unification has its other face in the multiplicity of existence. It is realism as well as idealism, and in its highest speculations never quits its hold on facts. Compared with Fichte and Schelling, Hegel has a sober, hard, realistic character. At a later date, with the call of Schelling to Berlin in 1841, it became fashionable to speak of Hegelianism as a negative philosophy requiring to be complemented by a "positive" philosophy which would give reality and not mere ideas. The cry was the same as that of Krug, more than once alluded to by Hegel, asking the philosophers who expounded the absolute to deduce his pen. It was the cry of the Evangelical school for a personal Christ and not a dialectical Logos. Philosophy, as Schelling [illegible], was asked to supply the real God and not the mere conception of Him. [illegible] complained that the real world of matter and force had been supplanted by a fantastic tissue of logical terms and ethereal processes. The claims of the individual, the real, the material, and historical fact had been sacrificed, it was said, by Hegel, to the universal, the ideal, the spiritual, and the logical.

There was a truth in these criticisms. It was the very aim of Hegelianism to [illegible] primary form is, as it were, thoroughly transparent and absolutely fluid, and indissolubly interpenetrable in every part,—the spirit in its [illegible] [illegible]. [illegible] creation had produced a natural world, and thought had risen to independent existence in the social organism. The spirit in this its perfect form, when in all its parts [illegible], is what Hegel calls the "Idea." But the idea, though fundamental, is [illegible] found, in the process of the world, [illegible] as the [illegible] development of the [illegible]. [illegible] thought [illegible] consciousness of itself in its [illegible] and development. Accordingly the history of philosophy is the [illegible] of logic, or the three branches [illegible].

In [illegible] of the "Idea" is the work of the logic. As the total system [illegible] three parts, so every part of the system [illegible]; every truth, every reality, has three aspects or stages; it is the [illegible] of two contradictory elements, of two partial aspects of truth which are not merely contrary, like black and white, but contradictory, like same and different. The first step is a [illegible] affirmation and unification, the second a negation and differentiation, the third a final synthesis. For example, the seed of the plant is an initial unity of life, which when placed in its proper soil suffers a disintegration into its constituents, and yet in virtue of its vital unity keeps these divergent elements together, and reappears as the plant with its members in organic union. Or again, the process of scientific induction is a threefold one; the original hypothesis, the first unification of the facts, seems to melt away when confronted with opposite facts, and yet no scientific progress is possible unless the stimulus of the original unification is strong enough to clasp the discordant facts and establish a reunification. Thesis, antithesis, and synthesis, a Fichtean formula, is generalized by Hegel into the perpetual law of thought.

In what we may call their psychological aspect these three stages are known as the abstract stage, or that of understanding (*Verstand*), the dialectical stage, or that of negative reason, and the speculative stage or that of positive reason (*Vernunft*). The first of these attitudes taken alone is dogmatism; the second, when similarly isolated, is scepticism; the third, when unexplained by its elements, is mysticism. Thus Hegelianism reduces dogmatism, scepticism, and mysticism to factors in philosophy. The abstract or dogmatic thinker believes his object to be one, simple, and stationary, and intelligible apart from its surrounding. He speaks, *e.g.*, as if species and genera were fixed and unchangeable; and fixing his eye on the ideal forms in their purity and self-sameness, he scorns the phenomenal world, whence this identity and persistence are absent. The dialective of negative reason rudely dispels these theories. Appealing to reality it shows that the identity and permanence of forms are contradicted by history; instead of unity it exhibits multiplicity, instead of identity difference, instead of a whole, only parts. Dialectic is, therefore, a dislocating power; it shakes the solid structures of material thought, and exhibits the instability latent in such conceptions of the world. It is the spirit of progress and change, the enemy of convention and conservatism; it is absolute and universal unrest. In the realm of abstract thought these transitions take place lightly. In the worlds of nature and mind they are more palpable and violent. So far as this Hegel seems on the side of revolution. But reason is not negative or dialectic only; it binds up as well as breaks down, and, while it disintegrates the mass of unconscious unity, builds up a new unity with higher organization. But this third stage is the place of effort, requiring neither the surrender of the original unity nor the ignoring of the diversity afterwards suggested. The stimulus of contradiction is no doubt a strong one; but the easiest way of escaping it is to shut our eyes to one side of the antithesis. What is required, therefore, is to readjust or reconstitute our original thesis in such a way as to include and give expression to both the elements in the process.

The universe, then, is a process or development, to the eye of philosophy. It is the process of the absolute—in religious language, the manifestation of God. In the background of all the absolute is eternally present; the rhythmic movement of thought is the self-unfolding of the absolute. God reveals Himself in the logical idea, in nature, and in mind; but mind is not alike conscious of its absoluteness in every stage of development. Philosophy alone sees God revealing Himself in the ideal organism of thought as it were a pre-existent deity prior to the world and to any relation between God and actuality; in the natural world, as a series of materialized forces and forms of life; and in the spiritual world as the human soul, the legal and moral order of society, and the creations of art, religion, and philosophy.

This introduction of the absolute became a stumbling-block to Feuerbach and other members of the "Left." They rejected as an illegitimate metaphor the eternal subject of development, and, instead of one self-revealing God as the subject of all the predicates by which in the logic the absolute is defined, assumed only a series of ideas, products of philosophic activity. They denied the theological value of the logical forms,—the development of these forms being in their opinion due to the human thinker, not to a self-revealing absolute. Thus they made man the creator of the absolute. But with this modification on the system another necessarily followed; a mere logical series could not create nature. And thus the material universe became the real starting point. Thought became only the result of organic conditions,—subjective and human; and the system of Hegel was no longer an idealization of religion, but a naturalistic theory with a prominent and peculiar logic.

The logic of Hegel is the only rival to the logic of Aristotle. What Aristotle did for the theory of demonstrative reasoning, Hegel attempted to do for the whole of human knowledge. His logic is an enumeration of the terms or categories by which our experience exists. It carried out Kant's doctrine of the categories as *a priori* synthetic principles, but removed the limitation by which Kant denied them any constitutive value except in alliance with experience. According to Hegel the terms in which thought exhibits itself are a system of their own, with laws and relations which reappear in a less obvious shape in the theories of nature and mind. Nor are they restricted to the small number which Kant obtained by manipulating the current subdivision of judgments. But all forms by which thought holds sensations in unity (the formative or synthetic elements of language) had their place assigned in a system where one leads up to and passes over into another.

The fact which ordinary thought ignores, and of which ordinary logic therefore provides no account, is the presence of gradation and continuity in the world. The general terms of language simplify the universe by reducing its variety of individuals to a few forms, none of which exist simply and perfectly. The method of the understanding is to divide and then to give a separate reality to what it has thus distinguished. It is part of Hegel's plan to remedy this one-sided character of thought, by laying bare the gradations of ideas. He lays special stress on the point that abstract ideas when held in their abstraction are almost interchangeable with their opposites—that extremes meet, and that in every true and concrete idea there is a coincidence of opposites.

The beginning of the logic is an illustration of this. The simplest term of thought is being; we cannot think less about anything than when we merely say that it is. Being—the abstract "is"—is *nothing* definite, and nothing at least *is*. Being and not being are thus declared identical,—a proposition which in this unqualified shape was to most people a stumbling-block at the very door of the system. Instead of the mere "is" which is as yet nothing, we should rather say "becomes," and as "becomes" always implies "something," we have determinate being—"a being" which in the next stage of definiteness becomes "one." And in this way we pass on to the quantitative aspects of being.

It is impossible to give a brief account of the long development of thought, especially as the cogency of the demonstration lies in the details. The logical idea is treated under the three heads of being (*Seyn*), essence (*Wesen*), and notion (*Begriff*). The terms treated under the first head, in addition to those already mentioned, are the abstract principles of quantity and number, and their application in measure to determine the limits of being. Under the title of essence are discussed those pairs of correlative terms which are habitually employed in the explanation of the world,—such as law and phenomenon, cause and effect, reason and consequence, substance and attribute. Under the head of notion are considered, firstly, the subjective forms of conception, judgment, and syllogism; secondly, their realization in objects as mechanically, chemically, or teleologically constituted; and thirdly, the idea first of life, and next of science, as the complete interpenetration of thought and objectivity. The third part of logic evidently is what contains the topics usually treated in logic-books, though even here the province of logic in the ordinary sense is exceeded. The first two divisions—the "objective logic"—are what is usually called metaphysics.

The characteristic of the system, and one impossible to exhibit in a resumé, is the gradual way in which idea is linked to idea so as to make the division into chapters only an arrangement of convenience. The judgment is completed in the syllogism; the syllogistic form as the perfection of subjective thought passes into objectivity, where it first appears embodied in a mechanical system; and the teleological object, in which the members are as means and end, leads up to the idea of life, where the end is means and means end indissolubly till death. In some cases these transitions may be unsatisfactory and forced; it is apparent that the linear development from "being" to the "idea" is got by transforming into a logical order the sequence that has roughly prevailed in philosophy from the Eleatics; cases might be quoted where the reasoning seems a play upon words; and it may often be doubted whether certain ideas do not involve extra-logical considerations. The order of the categories is in the main outlines fixed; but in the minor details much depends upon the philosopher, who has to fill in the gaps between ideas, with little guidance from the data of experience, and to assign to the stages of development names which occasionally deal hardly with language. The merit of Hegel is to have indicated and to a large extent displayed the filiation and mutual limitation of our forms of thought; to have arranged them in the order of their comparative capacity to give a satisfactory expression to truth in the totality of its relations, and to have broken down the partition which in Kant separated the formal logic from the transcendental analytic, as well as the general disruption between logic and metaphysic. It must at the same time be admitted that much of the work of weaving the terms of thought, the categories, into a system has a hypothetical and tentative character, and that Hegel has rather pointed out the path which logic must follow, viz., a criticism of the terms of scientific and ordinary thought in their relation and interdependence, than himself in every case kept to the right way. The day for a fuller investigation of this problem will partly depend upon the progress of the study of language in the direction marked out by W. von Humboldt.

The Philosophy of Nature starts with the result of the logical development, with the full scientific "idea." But the relations of pure thought, losing their inwardness, appear as relations of space and time; the abstract development of thought appears as matter and movement. Instead of thought, we have perception; instead of dialectic, gravitation; instead of causation, sequence in time. The whole falls under the three heads of mechanics, physics, and "organic,"—the content under each varying somewhat in the three editions of the *Encyclopädie*. The first treats of space, time, matter, movement; and in the solar system we have the representation of the idea in its general and abstract material form. Under the head of physics we have the theory of the elements of sound, heat, and cohesion, and finally of chemical affinity,—presenting the phenomena of material change and interchange in a series of special forces which generate the variety of the life of nature. Lastly, under the head of "organic," come geology, botany, and animal physiology,—presenting the concrete results of these processes in the three kingdoms of nature.

The charges of superficial analogies, so freely urged against the "Natur-philosophie" by critics who forget the impulse it gave to physical research by the identification of forces then believed to be radically distinct, do not particularly affect Hegel. But in general it may be said that he looked down upon the mere natural world. The meanest of the fancies of the mind and the most casual of its whims he regarded as a better warrant for the being of God than any single object of nature. Those who supposed astronomy to inspire religious awe were horrified to hear the stars compared to eruptive spots on the face of the sky. Even in the animal world, the highest stage of nature, he saw a failure to reach an independent and rational system of organization; and its feelings under the continuous violence and menaces of the environment he described as insecure, anxious, and unhappy.

His point of view was essentially opposed to the current views of science. To metamorphosis he only allowed a logical value, as explaining the natural classification; the only real, existent metamorphosis he saw in the development of the individual from its embryonic stage. Still more distinctly did he contravene the general tendency of scientific explanation. "It is held the triumph of science to recognize in the general process of the earth the same categories as are exhibited in the processes of isolated bodies. This is, however, an application of categories from a field where the conditions are finite to a sphere in which the circumstances are infinite." In astronomy he depreciates the merits of Newton and elevates Kepler, accusing Newton particularly, *à propos* of the distinction of centrifugal and centripetal forces, of leading to a confusion between what is mathematically to be distinguished and what is physically separate. The principles which explain the fall of an apple will not do for the planets. As to colour, he follows Goethe, and uses strong language against Newton's theory, for the barbarism of the conception that light is a compound, the incorrectness of his observations, &c. In chemistry, again, he objects to the way in which all the chemical elements are treated as on the same level.

The third part of the system is the Philosophy of Mind. Its three divisions are the "subjective mind" (psychology), the "objective mind" (philosophic jurisprudence, moral and political philosophy), and the "absolute mind" (the philosophy of art, religion, and philosophy). The subjects of the second and third divisions have been treated by Hegel with great detail. The "objective mind" is the topic of the *Rechts-Philosophie*, and of the lectures on the Philosophy of History, while on the "absolute mind" we have the lectures on Æsthetic, on the Philosophy of Religion, and on the History of Philosophy,—in short, more than one-third of his works.

The psychological branch of the subject takes up half of the space devoted to "mind" in the *Encyclopädie*. It falls under the three heads of anthropology, phenomenology, and psychology proper. Anthropology treats of the mind in union with the body, and the natural soul, and discusses the relations of the soul with the planets, the races of mankind, the differences of age, dreams, animal magnetism, insanity, and phrenology. In this obscure region it is not to [illegible], but the suggestiveness of these speculations attracts more than it satisfies the inquiry. In the *Phenomenology*, consciousness, self-consciousness, and reason are dealt with. The title of the section and the contents recall, though with some important variations, the earlier half of his first work; only that here the historical background on which the stages in the development of the ego were represented has disappeared. Psychology, in the stricter sense, deals with the various forms of theoretical and practical intellect such as attention, memory, desire, and will. In this account of the development of an independent, active, and intelligent being from the stage where man like the Dryad is a portion of the natural life around him, Hegel has combined what may be termed a physiology and pathology of the mind,—a subject far wider than that of ordinary psychologies, and one of vast intrinsic importance. It is, of course, easy to set aside these questions as unanswerable, and to find artificiality in the arrangement. Still it remains a great point to have even attempted some system in the dark anomalies which lie under the normal consciousness, and to have traced the genesis of the intellectual faculties from animal sensitivity.

The theory of the mind as objectified in the institutions of law, the family, and the state is discussed in the "Philosophy of Right." Beginning with the antithesis of a legal system and morality, Hegel carrying out the work of Kant, presents the synthesis of these elements in the ethical life (*Sittlichkeit*) of the family and the state. Treating the family as an instinctive realization of the moral life, and not as the result of contract, he shows how by the means of wider associations due to private interests the state issues as the full home of the moral spirit, where intimacy of interdependence is combined with freedom of independent growth. The state is the consummation of man as finite; it is the necessary starting point whence the spirit rises to an absolute existence in the spheres of art, religion, and philosophy. In the finite world or temporal state, religion, as the finite organization of a church, is, like other societies, subordinate to the state. But on another side, as absolute spirit, religion, like art and philosophy, is not subject to the state, but belongs to a higher region.

The political state is always an individual, and the relations of these states with each other and the "world spirit" of which they are the manifestations constitute the material of history. The *Lectures on the Philosophy of History*, edited by Gans and subsequently by Karl Hegel, is the most popular of Hegel's works. The history of the world is a scene of judgment where one people and one alone holds for awhile the sceptre, as the unconscious instrument of the universal spirit, till another rises in its place, with a fuller measure of liberty—a larger superiority to the bonds of natural and artificial circumstance. Three main periods—the Oriental, the Classical, and the Germanic—in which respectively the single despot, the dominant order, and the man as man possess freedom—constitute the history of the world. Inaccuracy in detail and artifice in the arrangement of isolated peoples are inevitable in such a scheme. A graver mistake, according to some critics, is that Hegel, far from giving a law of progress, seems to suggest that the history of the world is nearing an end, and has merely reduced the past to a logical formula. The answer to this charge is partly that such a law seems unattainable, and partly that the idealistic content of the present which philosophy extracts is always an advance upon actual fact, and so does throw a light into the future. And at any rate the method is greater than Hegel's employment of it.

But as with Aristotle so with Hegel—beyond the ethical and political sphere rises the world of absolute spirit in art, religion, and philosophy. The psychological distinction between the three forms is that sensuous perception (*Anschauung*) is the organon of the first, presentative conception (*Vorstellung*) of the second, and free thought of the third. The work of art, the first embodiment of absolute mind, shows a sensuous conformity between the idea and the reality in which it is expressed. The so-called beauty of nature is for Hegel an adventitious beauty. The beauty of art is a beauty born in the spirit of the artist and born again in the spectator; it is not like the beauty of natural things, an incident of their existence, but is "essentially a question, an address to a responding breast, a call to the heart and spirit." The perfection of art depends on the degree of intimacy in which idea and form appear welded into each other. From the different proportion between the idea and the shape in which it is realized arise three different forms of art. When the idea, itself indefinite, gets no farther than a struggle and endeavour for its appropriate expression, we have the symbolic, which is the Oriental, form of art, which seeks to compensate its imperfect expression by colossal and enigmatic structures. In the second or classical form of art the idea of humanity finds an adequate sensuous representation. But this form disappears with the decease of Greek national life, and on its collapse follows the romantic, the third form of art, where the harmony of form and content again grows defective, because the object of Christian art—the infinite spirit—is a theme too high for art. Corresponding to this division is the classification of the single arts. First comes architecture,—in the main, symbolic art; then sculpture, the classical art *par excellence*; they are found, however, in all three forms. Painting and music are the specially romantic arts. Lastly, as a union of painting and music comes poetry, where the sensuous element is more than ever subordinate to the spirit.

The lectures on the Philosophy of History lead into the next [illegible] at [illegible], and [illegible] of [illegible], of the [illegible] the age of chivalry, &c., mark the [illegible] interest.

The lectures on the Philosophy of Religion, though unequal in [illegible] and belonging to different dates, serve to exhibit the [illegible] of the system with Christianity. Religion, like art, is [illegible] expression of the harmony between man and the absolute. It is the absolute truth as the poetry and [illegible] of the heart, in the [illegible] of feeling. Hegel after expounding the nature of religion passes on to discuss its historical phases. But in the [illegible] stage of religion [illegible] falls into several [illegible]. At the bottom of the [illegible] of nature-worships he places the religion of sorcery. The gradations which follow are apportioned with some uncertainty amongst the religions of the East. With the Persian religion of light and the Egyptian of enigmas we pass to those faiths where Godhead takes the form of a spiritual individuality, i.e., to the Hebrew religion (of sublimity), the Greek (of beauty), and the Roman (of adaptation). Last comes absolute religion, in which the mystery of the reconciliation between God and man is an open doctrine. This is Christianity, in which God is a Trinity, because He is a spirit. The revelation of this truth is the subject of the Christian Scriptures. For the Son of God, in the immediate aspect, is the finite world of nature and man, which far from being at one with its Father is originally in an attitude of estrangement. The history of Christ is the visible reconciliation between man and the eternal. With the death of Christ this union, ceasing to be a mere fact, becomes a vital idea,—the Spirit of God which dwells in the Christian community.

The lectures on the History of Philosophy deal disproportionately with the various epochs, and in some parts date from the beginning of Hegel's career. In trying to subject history to the order of logic they sometimes misconceive the filiation of ideas. But they created the history of philosophy as a scientific study. They showed that a philosophical theory is not an accident or whim, but an exponent of its age determined by its antecedents and environments, and handing on its results to the future.

For ten years after Hegel's death his system remained the foremost intellectual phenomenon of the time. Besides Gans, Hinrichs, Henning, and Hotho, who have been already alluded to, the most prominent of his immediate disciples were Gabler, whose *Propadeutik* is a good introduction to Hegel; K. L. Michelet, one of the most ardent Hegelians, who is now (1879) on the point of completing a summary of the system; Daub and Marheineke, two theologians, and Göschel, whose *Aphorismen über nicht-Wissen und absolutes Wissen* elicited an appreciative review from Hegel. In æsthetics, where the school won some distinction, are the names of Schasler, Rosenkranz, and Vischer. Karl Rosenkranz, the literary champion of the system, has just ended a life devoted to its exposition; Erdmann still teaches in its spirit at Halle, as does Kuno Fischer at Jena. The last two have specially distinguished themselves by their histories of modern philosophy. With Michelet they form the more orthodox and conservative section of the school. The opposition to its doctrines was concentrated in the *Zeitschrift für Philosophie*, founded in 1837 by the younger Fichte with the help of Weisse; while Beneke and other followers of Herbart vigorously attacked its metaphysics and psychology. But the most notable outgrowth of Hegelianism was the so-called "Left," the extreme and heterodox school of Feuerbach, Bruno Bauer, and Ruge. While Hegel had vindicated God as the subject of metaphysics, maintained the consonance of philosophy and theology, and elevated the state to sovereignty in ethics, the Left eliminated God from the system, exposed its alleged pantheistic or atheistic tendencies, and reasserted the supremacy of the individual in morals. To discuss the evolution of Hegelianism in this direction would almost be to write the history of modern German philosophy up to 1860. Hegelianism has now ceased to exist as an isolated system in Germany, though its spirit and method have leavened the whole mass of philosophic thought. Out of Germany, besides occasional admirers and disciples, it has attracted a considerable amount of general interest. In England it has stimulated philosophical thought, and probably suggested the correction of some national limitations; but few if any profess to accept the system in its integrity. Professor Vera of Naples is perhaps its most enthusiastic advocate on the Continent, whilst the *Journal of Speculative Philosophy* upholds its banner in America.

Bibliography.—Shortly after Hegel's death his collected works were published by a number of his friends, who combined for the purpose. They appeared in eighteen volumes in 1832, and a second edition came out about twelve years later. Volumes i.–viii. contain the works published by himself; the remainder is made up of his lectures on the Philosophy of History, Æsthetic, the Philosophy of Religion, and the History of Philosophy, besides some essays and reviews, with a few of his letters, and the Philosophical Propædeutic.

For his life see Rosenkranz, *Leben Hegels*, Berlin, 1844; Haym, *Hegel und seine Zeit*, Berlin, 1857; Kostlin, *Hegel in philosophischer, politischer, und nationaler Beziehung*, Tubingen, 1870; Rosenkranz, *Hegel als Deutscher Nationalphilosoph*, Berlin, 1870, and his *Neue Studien*, vol. iv., Berlin, 1878.

For the philosophy, see Ruge's *Aus Früherer Zeit*, vol. iv., Berlin, 1867; Haym as above; Trendelenburg in *Logische Untersuchungen*; Kym, *Metaphysische Untersuchungen*, and C. Hermann (*Hegel und die logische Frage*), and other works are noticeable as modern critics. Vera has translated the *Encyclopädie* into French, with notes; Benard, the *Æsthetics*. In English Dr Stirling's *Secret of Hegel*, 2 vols., London, 1865, contains a translation of the beginning of the *Wissenschaft der Logik*; the "Logic" from the *Encyclopädie* has been translated, with prolegomena, by W. Wallace, Oxford, 1874; and large portions have been translated in the *American Journal of Speculative Philosophy*—especially by its energetic editor, W. T. Harris.

(W. W.)

HEIBERG, JOHAN LUDVIG (1791–1860), Danish poet and critic, was the son of the political writer Peter Andreas Heiberg, and of the famous novelist, afterwards the Baroness Gyllembourg-Ehrensvard. He was born at Copenhagen, December 14, 1791. In 1800 his father was exiled, and he was taken by Rahbek and his excellent wife into their house at Bakkehuset. They found him, however, very difficult to manage, and about 1802 sent him back to his own family. His mother's marriage being by a state decree annulled, she married the Swedish baron Gyllembourg-Ehrensvard, keeping up, however, friendly correspondence with her first husband in Paris. In 1805 she describes, in one of these letters, the brilliant precocity of the young Johan. The latter proceeded to the university of Copenhagen in 1809. It was not needful that he should earn his bread, and accordingly his mother indulged for many years his extraordinary thirst for knowledge. In 1812 he visited Sweden, and made some long stay in Stockholm; he afterwards sent to his mother from Upsala the first important poem which he composed, *Hjemkomsten* (The Return Home), a piece of remarkable strength and brightness. In 1813 his first publication appeared, a romantic drama for children, entitled *The Theatre for Marionettes.* This was followed by *Christmas Jokes and New Year's Tricks* in 1816, *The Initiation of Psyche*, 1817, and *The Prophecy of Tycho Brahe.* These works attracted attention at a time when Baggesen, Oehlenschläger, and Ingemann possessed the popular ear, and were understood at once to be the opening of a great career. In 1817 Heiberg took his degree, and in 1819 went abroad with a grant from Government. He proceeded to Paris, and spent the next three years there, under his father's roof. In 1822 he published his drama of *Nina*, and was made professor of the Danish language at the university of Kiel. At this town he delivered a course of lectures, comparing the Scandinavian mythology as found in the *Edda* with the poems of Oehlenschläger. These lectures were published in German in 1827. In 1825 Heiberg came back to Copenhagen for the purpose of introducing the vaudeville[1] on the Danish stage. Meanwhile he was producing dramatic work of a more serious kind: in 1828 he brought out the national drama of *Elverhöi*, in 1835 the comedy of *The Elves*, and in 1838 *Fata Morgana.* In 1841 Heiberg published a volume of *New Poems*, containing "A Soul after Death," which is perhaps his masterpiece, "The Newly Wedded Pair," and other pieces. All this time he had been busily engaged in editing the famous journal, *The Copenhagen Flying Post*, which he founded in 1827 and continued until 1837. In 1831 he married Johanne Louise Pætges, the greatest actress that Scandinavia has produced. Heiberg's scathing satires at last began to make him very unpopular; and this antagonism reached its height when, in 1845, he published his little malicious drama of *The Nut Crackers*. Notwithstanding this he received in 1847 the responsible post of director of the national theatre, for which indeed he was more eminently fitted than any other living person. He filled it for seven years, working with great zeal and conscientiousness, but was forced by intrigues from without to resign it in 1854. His health was much disturbed by these attacks, and he retired into private life. Heiberg died at Bonderup, near Ringsted, on the 25th of August 1860.

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[1] He composed a great number of vaudevilles, of which the best known are *King Solomon and George Hatmaker*, 1825; *April Fools*, 1826; *A Story in Rosenborg Garden*, 1827; *Kjøge Huskors*, 1831; *The Danes in Paris*, 1833; *No*, 1836; *Yes*, 1839; and *Emily's Beating Heart*, 1840.

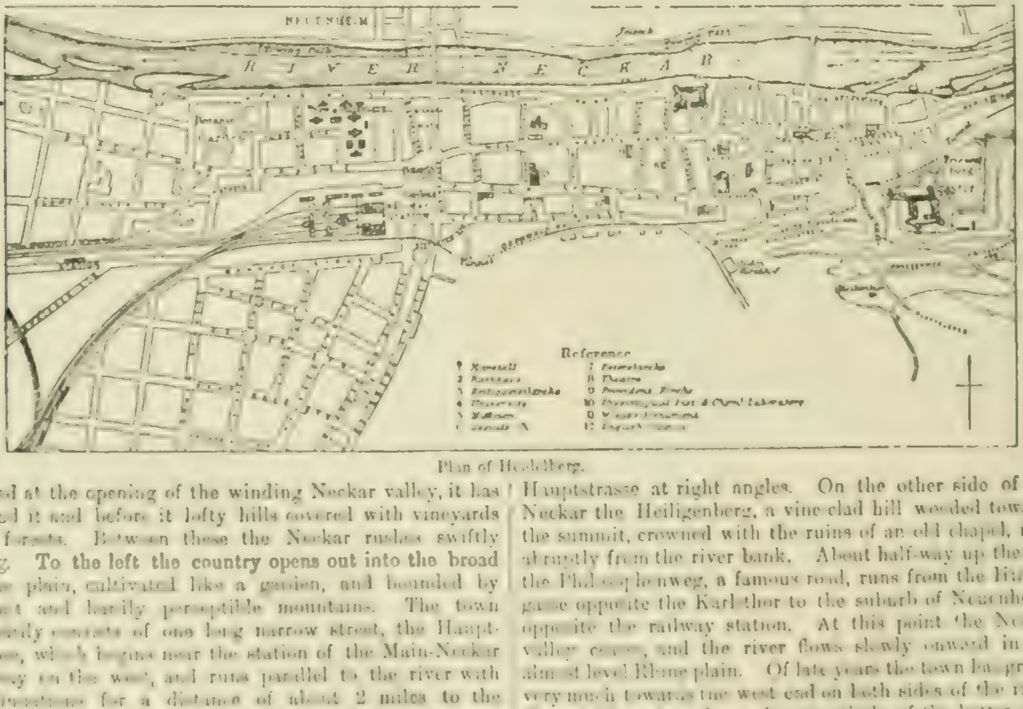
It has been said that "the average cultivated Dane nowadays is very much what Heiberg has made him." His influence upon taste and critical opinion was greater than that of any writer of his time, and can only be compared with that of Holberg in the 18th century. Most of the poets of the Romantic movement in Denmark were very grave and serious; Heiberg added the element of humour, elegance, and irony to the dignity of Oehlenschlager, the pathos of Ingemann, and the passion of Hertz. His versification was refined and exact, and his very best pieces are those in which he mingles rich lyrical expression with what is satirical or purely ludicrous. The works of Heiberg were collected, in 11 vols., in 1861-62.

HEIDE, a town of Prussia, chief town of the circle of North Ditmarsh, province of Schleswig-Holstein, is situated on a small plateau which stands between the marshes and moors bordering the North Sea, 35 miles N.N.W. of Glückstadt. It is the seat of a provincial office, a court of justice, and a head tax office, and possesses tobacco and cigar manufactories, a tannery, and a rope work. Heide in 1447 became the capital of the Ditmarsh peasant republic, but on the 13th June 1559 it was the scene of the complete defeat of the peasant forces by the Danes and the duke of Schleswig-Holstein. The population in 1875 was 6772.

HEIDEGGER, John Henry (1633-1698), theologian, was born at Barentschweil, in the canton of Zurich, Switzerland, on July 1, 1633. He began his studies in his native country, and completed them at Marburg and Heidelberg. Becoming doctor of philosophy at the latter university, he soon afterwards was appointed professor extraordinarius of Hebrew, and later of philosophy. From Heidelberg he was in 1659 summoned to Steinfurt to fill the chair of theology and ecclesiastical history, and in the same year he became doctor of theology of Heidelberg. In 1660 he revisited Switzerland; and, after marrying, he travelled in the following year over Holland. The war at this time having dispersed the students from Steinfurt, Heidegger returned in 1665 to Zurich, where he was immediately elected professor of moral philosophy. Two years later he succeeded Hottinger in the chair of theology, which he occupied till his death, January 15, 1698. Heidegger was the principal author of the *Formula Consensus Helvetica* in 1675, which was designed to unite the Swiss Reformed churches, but had an opposite effect.

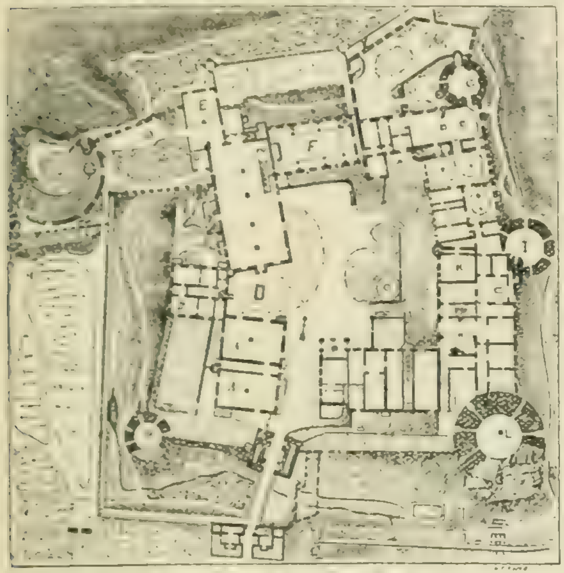
His writings are largely controversial, and are in great part levelled against the Roman Catholic Church. The chief are *De Historia sacra Patriarcharum Exercitationes selectæ*, 1667-1671; *Dissertatio de Peregrinationibus Religiosis*, 1670; *De Ratione Studiorum, opuscula aurea*, &c., 1670; *Historia Papatus*, 1684; *Tumulus Concilii Tridentini*, 1690; *Exercitationes Biblicæ*, 1700, with a life of the author prefixed; *Corpus Theologiæ Christianæ*, 1700; and lives of Hottinger, 1667, and Fabricius, 1698. His autobiography appeared in 1698, under the title *Historia Vitæ J. H. Heideggeri*.

HEIDELBERG, a German university city in the Baden circle and jurisdiction of the same name, lies in 49° 24′ N. lat. and 8° 41′ 32″ E. long., at the foot of the Castlehill, a spur of the Konigsstuhl on the south bank of the Neckar, about 12 miles from the junction of that river with the Rhine. The situation of the town is one of romantic beauty. Placed at the opening of the winding Neckar valley, it has behind it and before it lofty hills covered with vineyards and forests. Between these the Neckar rushes swiftly along. To the left the country opens out into the broad Rhine plain, cultivated like a garden, and bounded by distant and hardly perceptible mountains. The town properly consists of one long narrow street, the Hauptstrasse, which begins near the station of the Main-Neckar railway on the west, and runs parallel to the river with continuations for a distance of about 2 miles to the Karlsthor (where there is a smaller station) on the east. To the south of this the Anlage, a pleasant promenade flanked with fine houses and gardens, leads directly from the chief station to the centre of the town. A number of smaller streets run up from the river, intersecting the Hauptstrasse at right angles. On the other side of the Neckar the Heiligenberg, a vine clad hill wooded towards the summit, crowned with the ruins of an old chapel, rises abruptly from the river bank. About half-way up the hill the Philosophenweg, a famous road, runs from the Hirschgasse opposite the Karlsthor to the suburb of Neuenheim, opposite the railway station. At this point the Neckar valley opens, and the river flows slowly onward in the almost level Rhine plain. Of late years the town has grown very much towards the west end on both sides of the river. The additions have been almost entirely of the better class of houses.



Plan of Heidelberg.

Of the churches the chief are the Peterskirche (founded before 1130), where Jerome of Prague in 1406 expounded the Reformed doctrines; the Heiliggeistkirche, erected at the beginning of the 15th century, of which the nave is used for Protestant, the choir for Old Catholic worship; and the Jesuitenkirche, with sumptuously decorated interior. All these are built in the Gothic style. The rathhaus, the museum, and the university (1712) are large but common place erections. Two handsome bridges cross the Neckar. That to the east, opposite the castle (built 1788), is adorned with a gateway, and with statues of Minerva and the elector Charles Theodore of the palatinate; the other (built 1877) unites Heidelberg and Neuenheim. In the west part of the town there is a bronze statue of Field Marshal Prince Wrede (1767-1838), erected in 1860 by Louis I., king of Bavaria. The chief building at Heidelberg, and indeed its chief attraction for strangers, is the famous castle which overhangs the west part of the town. It is situated on the Castlehill, more properly called the Jettenbühel, 330 feet above the Neckar. Though now a ruin, yet its extent, its magnificence, its beautiful situation, its interesting history, render it by far the most noteworthy, as it certainly is the grandest and largest, of the old castles of Germany. It was begun about the end of the 13th century. Elector Rupert greatly improved it, and erected the Rupert's building in the early part of the 15th century; succeeding electors of the palatinate did much for it, especially Frederick V., the unfortunate king of Bohemia. It suffered greatly during the Thirty Years' War, but was restored by Charles Louis (1650-1680). It was dismantled by the French in 1689, and again in 1693. In 1764 it was struck by lightning and its destruction completed. The castle as it at present stands is a square edifice formed of several distinct structures built round a large court-yard; the entrance is on the south side. The court-yard contains a fountain adorned with four granite pillars brought from Charlemagne's palace at Ingelheim. The chief parts of the castle are Rupert's building (about 1400) on the left; Otto Henry's building (1556) on the right, "the finest example of Renaissance architecture in Germany," a lofty building of which the front is richly decorated; Frederick's building (1601), the finest part, forming the northern portion of the whole, and adorned with a large number of imposing statues. Within this is the chapel, and behind it the Altan (1610), or castle balcony, which directly overhangs the town and from which the finest of Heidelberg views is obtained. The castle contains an interesting antiquarian museum[1] formed by the Count Graimberg, and the celebrated Great Tun, which was built in 1751, but has been only used on one or two occasions. Its capacity is 49,000 gallons. There is a castle garden, spacious and well laid out.



Ground-Plan of Heidelberg Castle.

A. Rupert's Building.
B. Old or Rudolph's Building.
C. The Thick Tower.
D. The English or Elizabeth's Building.
E. The Great Tun Room.
F. Frederick's Building.
G. The Octagonal Tower.
H. Otto Henry's Building.
I. Library Tower.
K. Louis's Tower.
L. The Blown-up Tower.
M. Louis's Tower.

The university of Heidelberg is the oldest in the German kingdom. It was founded in 1356 by the elector Rupert, but it was not till 1386, when it obtained papal sanction, that its real life begins. It was constructed after the type of Paris, had four faculties, and possessed numerous privileges. Marselius von Inghen was its first rector. Frederick the Victorious, Philip the Upright, and Louis V. respectively cherished it. Otto Henry gave it a new organization, further endowed it, and founded the library. At the Reformation it became a stronghold of Protestant learning. The famous Heidelberg catechism was drawn up by its theologians. Then the tide turned. Damaged by the Thirty Years' War, it led a struggling existence for a century and a half. A large portion of its remaining endowments were cut off by the peace of Lunéville (1801). In 1803 however the elector Charles Frederick raised it anew, and reconstituted it under the name of "Ruperto-Carolina." At present (1880) it has 38 ordinary and 26 extraordinary professors. The students number about 500 in winter, and from 800 to 900 in summer. A very large proportion are English and Americans. The library was first kept in the choir of the Heiliggeistkirche, and then consisted of 3500 MSS. In 1623 it was sent to Rome by Tilly, and stored as Bibliotheca Palatina in the Vatican. It was afterwards taken to Paris, and in 1815 was restored to Heidelberg. In 1703 the new library was founded; it has now nearly 300,000 volumes, besides many valuable MSS. Among the other university institutions are the academic hospital, the maternity hospital, the physiological institution, the chemical laboratory, and the zoological museum.

The other educational foundations are a gymnasium and a burgher and a real school. There is a small theatre (closed during the summer months) and a Kunstverein. The manufactures of Heidelberg are unimportant. The inhabitants chiefly support themselves by supplying the wants of a large and increasing body of foreign permanent residents, of the considerable body of tourists who during the summer pass through the town, and of the university students. The population of the town and outlying suburbs was 19,988 in 1871, and 22,334 (or including Neuenheim, 23,918) in 1875. About one-third are Catholics. The town is well lighted, and is supplied with excellent water from the Wolfsbrunnen.

Heidelberg at an early period was a fief of the bishop of Worms, but the rulers of the palatinate came more and more to reside there, till Count Otho of Wittelsbach (1228-1253) made it the capital of the palatinate, and thus it continued to be for nearly six centuries. As Heidelberg was one of the great centres of the Reformed faith, it suffered severely in the Thirty Years' War. In 1622 it was sacked by Tilly, and in 1633 was taken by the Swedes. In 1634 it was beleaguered by the Bavarians. In 1635 it was occupied by the imperial forces under Gallas. At the peace of Westphalia (1648) Charles Louis, son of Frederick V., was restored, and he did much to raise the castle, the university, and the town. In 1688, and again in 1693, it was sacked by the French. On the last occasion, so thorough was the work of destruction that only one house—a quaintly decorated erection in the Marktplatz now used as an inn—escaped. In 1720 Charles Philip removed his court to Mannheim, and in 1803 the town became part of the grand duchy of Baden. On 5th March 1848 was held the famous Heidelberg assembly, at which steps were taken that led to the German revolution of that year.

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[1] This museum was acquired by the town in 1879.

Of the numerous topographical works on Heidelberg, those of Fickler (1853) and Oncken (2d ed., 1874) may be mentioned. The *Wegweiser durch Heidelberg* (1876) supplies a briefer and more popular account. The university annals are told in Hautz's *Geschichte der Universität Heidelbergs* (2 vols., 1862-64), and the very interesting history of the library in Wilken's *Geschichte der Bildung, Beraubung, und Vernichtung der alten Heidelberger Büchersammlungen* (1817), and in Ruland's *Zur Geschichte der alten aus Rom entführten Bibliothek zu Heidelberg*, Leip., 1856. The *Heidelberger Jahrbücher* (1817-73) contain a mass of interesting and important information as to the history of the town and castle. (F. WA.)

HEIDELOFF, KARL ALEXANDER VON (1788-1865), a German architect, was the son of Victor Peter Heideloff, a painter of some reputation, and was born at Stuttgart 2d February 1788. He studied at the art academy of his native town, and after following the profession of an architect for some time at Coburg was in 1818 appointed city architect at Nuremberg. In 1822 he became professor at the polytechnic school, and some years later he was chosen conservator of the monuments of art. Heideloff devoted his chief attention to the Gothic style of architecture, and the buildings restored and erected by him at Nuremberg and in its neighbourhood attest both his original skill and his purity of taste. He also achieved some success as an historical painter. He died at Hassfurt 28th September 1865.

Among his writings on architecture are *Die Lehre von den Säulenordnungen*, 1827; *Der Kleine Vignola*, 1832; *Nurnbergs Baudenkmaler der Vorzeit*, 1838-43; and *Die Ornamentik des Mittelalters*, 1838-42.

HEILBRONN, a town of Würtemberg, in the circle of the Neckar, is situated in a pleasant and fruitful valley on the Neckar, and at the junction of several railways, 26 miles N. of Stuttgart. It is the seat of a circle court, a jury court, a superior tribunal, a head tax office, and a chamber of commerce. In the older part of the town the streets are narrow, and it contains a number of high turreted houses with quaintly adorned gables. The old fortifications have now been demolished, and their site is occupied by promenades, outside of which are the more modern parts of the town with wide streets and many handsome buildings. The principal public buildings are the church of St Kilian, in the Gothic and Renaissance styles, begun in 1019 and completed in 1529, with an elegant tower 210 feet high, a beautiful choir, and a finely carved altar; the town-house, founded in 1540, and possessing a collection of interesting documents; the house of the Teutonic knights, now used as barracks; the Catholic church of St Joseph; the tower on the Neckar, in which Gotz von Berlichingen was confined in 1525; the synagogue, the prison, and the hospital. The educational establishments include a gymnasium, a real-school of the second order, an agricultural school, and a female school of industry. The town in a commercial point of view is the most important in Wurtemberg, and possesses an immense variety of manufactures, of which the principal are gold, silver, steel, and iron wares, machines, sugar of lead, white lead, vinegar, beer, eau de Cologne, sugar, tobacco, soap, oil, cement, sulphuric acid, tartaric acid, artificial manure, glue, soda, tapestry, thread, and cloth. Grapes, fruit, vegetables, and flowering shrubs are largely grown in the neighbourhood, and there are large quarries for sandstone and gypsum. By means of the Neckar a considerable trade is carried on in wood, bark, leather, agricultural produce, fruit, and cattle. The population in 1875 was 21,209.

Heilbronn occupies the site of an old Roman settlement. Its name (originally Heiligbronn or holy spring) was bestowed on it by Charlemagne from a spring of water which until 1857 was to be seen issuing from under the high altar of the church of St Kilian. In 1225 Heilbronn became a free imperial city. It was frequently besieged during the Middle Ages, and it suffered greatly during the Peasants' War, the Thirty Years' War, and the various wars with France. In 1803 it came into the possession of Wurtemberg.

HEILIGENSTADT, a town of Prussian Saxony, government district of Erfurt, is situated on the Leine and on the railway from Halle to Cassel, 32 miles E.N.E. of Cassel. It possesses an old castle, formerly belonging to the electors of Mainz, one Evangelical and two Catholic churches, a Catholic gymnasium, a Catholic normal school, two orphanages, and an infirmary. The principal manufactures are woollen wares, cigars, paper, bone dust, and needles. The population in 1875 was 5193.

Heiligenstadt is said to have been built by Dagobert, and was formerly the capital of the principality of Eichsfeld. In 1022 it was acquired by the archbishop of Mainz, and in 1103 it came into the possession of Henry the Proud, but when Henry the Lion was placed under the ban of the empire it again came to Mainz. It was destroyed by fire in 1333, and was captured in 1478 by Count Henry the Young of Schwarzburg, and in 1525 by Duke Henry of Brunswick. In 1803 it came into the possession of Prussia.

HEILSBERG, a town of Prussia, capital of a circle in the government district of Königsberg, is situated at the junction of the Simser and Alle, 38 miles S. of Königsberg. It has one Evangelical and two Catholic churches, and an old castle formerly the seat of the prince-bishops of Ermland, but now used as an infirmary. The principal industries are cloth-weaving, yarn and thread spinning, dyeing, and brewing, and there is considerable trade in grain. The population of the town in 1875 was 5762.

The castle founded at Heilsberg by the German knights in 1240 became afterwards the property of the bishops of Ermland, who in 1306 made it their seat—an honour which it retained for 500 years. On the 10th June 1807 a battle took place at Heilsberg between the French and the Russians under Benningsen, which, although the French who attacked thought it prudent to withdraw before victory declared for either side, resulted on the following day in the retreat of the Russians.

HEILSBRONN, or **KLOSTER-HEILSBRONN**, a market-village in the Bavarian government of Middle Franconia, with a station on the railway between Nuremberg and Ansbach. In 1871 it had only 998 inhabitants, but in the Middle Ages it was the seat of one of the great monasteries of Germany. This foundation, which belonged to the Cistercian order, owed its origin to Bishop Otto of Bamberg in 1132, and continued to exist till 1555. Its sepulchral monuments, many of which are figured by Hocker, *Heilsbronnischer Antiquitätenschatz* (Ansbach, 1731-40), were of exceptionally high artistic interest, ten burgraves of Nuremberg (it was their hereditary burial-place), three electoral princes, five margraves of Brandenburg, and many other persons of note having been laid to rest within its walls. The buildings of the monastery have all disappeared, with the exception of the fine church, restored between 1851 and 1866. The "Monk of Heilsbronn" is the ordinary appellation of a didactic poet of the 14th century, whose *Seven Degrees*, *Daughter of Syon*, and *Life of Saint Alexius* were published by Merzdorf at Berlin in 1870.

See "Notæ Halesbrunnenses" and "Annales Halesbrunnenses," in Pertz, *Mon. Germ. Hist.*, vol. xvi.; Muck, *Beitrage zur Gesch. von Heilsbronn*, Ansb., 1859; Rehm, *Ein Gang durch und um die Münster-Kirche zu Kloster-Heilsbronn*, Ansb., 1875; and Stillfried, *Kloster-Heilbronn, ein Beitrage zu den Hohenzoll. Forschungen*, Berlin, 1877.

HEIM, FRANÇOIS JOSEPH (1787-1865), French painter, belongs to that group of painters in whose works we find the special characteristics of the Restoration. Born at Belfort on 16th December 1787, he early distinguished himself at the École Centrale of Strasburg, and in 1803 entered the studio of Vincent at Paris. In 1807 he obtained the first prize, and in 1812 his picture of The Return of Jacob (Musée de Bordeaux) won for him a gold medal of the first class, which he again obtained in 1817, when he exhibited, together with other works, a St John—bought by Vivant Denon. In 1819 the Resurrection of Lazarus (Cathédral Autun), the Martyrdom of St Cyr (St

Gregory, and two scenes from the life of Vespasian (ordered by the King) attracted attention. In 1823 the Reopening of the Royal [illegible], the Martyrdom of St Laurence (Notre Dame), and several full-length portraits increased the painter's popularity, and in 1824, when he exhibited his great canvas, the Massacre of the Jews (Louvre), Heim was rewarded by the legion of honour. In 1827 [illegible] the King [illegible] at the Salon of 1824 (Louvre) [illegible] the picture by which Heim is best known [illegible]. Heim was now [illegible] the Gallery Charles X. (Louvre), work for which he was thought eminently fit. Like many other painters of this period, [illegible] only on such of the high-pitched [illegible] had to make an awkward contrast with the lively colour and movement by which he tried to give interest to his subjects, and with the emptiness of form and expression which resulted from the hasty execution necessitated by the vast number of his commissions. Ridiculed by the romantists, Heim maintained his position, and replaced Regnault at the Institute in 1834, shortly after which he commenced a series of drawings of the celebrities of his day, which are of much interest. His decorations of the Conference room of the Chamber of Deputies were completed in 1844; and in 1847 his works at the Salon—Champ de Mai and Reading a Play at the Théâtre Français—were the signal for attacks renewed with great violence. Yet something like a turn of opinion in his favour took place at the exhibition of 1851; his powers as a draughtsman and the occasional merits of his composition were recognized, and toleration extended even to his colour. Heim was awarded the great gold medal, and in 1855—having sent to the Salon no less than sixteen portraits, amongst which may be cited those of Cuvier, Geoffroy de St Hilaire, and Madame Hersent—he was made officer of the legion of honour. In 1859 he again exhibited a curious collection of portraits, sixty-four members of the Institute arranged in groups of four; and six years later, on 29th September 1865, he died, at the age of seventy-eight. Besides the paintings already mentioned, there is to be seen in Notre Dame de Lorette (Paris) a work executed on the spot; and the museum of Strasburg contains an excellent example of his easel pictures, the subject of which is a Shepherd Drinking from a Spring.

HEINE, HEINRICH (1799–1856), poet and journalist, was born, according to the most trustworthy accounts, on the 13th December 1799, at Dusseldorf, of Jewish parents. His father, after various vicissitudes in business, had finally settled in that town, and his mother, who seems to have possessed much energy of character, was the daughter of a physician of the same place. Heine received the rudiments of his education at the gymnasium or *lycée* (as it was called during the foreign occupation) of his native town, and, although not an especially apt or diligent pupil, he acquired while there a good knowledge of French and English,—he tells us that *Gulliver's Travels* in the original was one of the favourite books of his childhood,—as well as some tincture of the classics and Hebrew. But if the influence upon him of his teachers and their teaching was unimportant, not so that of the public events amid which he grew up. His early years coincided with the most brilliant period of Napoleon's career; and the boundless veneration which he is never tired of expressing for the emperor throughout his writings shows that his true schoolmasters were rather the drummers and troopers of a victorious army than the Jesuit fathers of the *lycée*; while, if to the vivid personal impression produced upon him by the pomp and circumstance of the imperial garrison in his birthplace there be added the public, and in a manner national, enthusiasm for Napoleon which he must often have heard vented by his elder co-religionists—who hailed the emperor as a temporal Messiah—the weighty bearing of his boyhood upon his subsequent fortunes becomes fully apparent. Upon his quitting school, attempts were made to engage him in commerce, but his father and uncle, the latter a wealthy banker of Hamburg, soon perceived that he was bent upon travelling a different path from that which they had followed. It speaks well for both these men that they should have refrained from coercion upon making this discovery; and Solomon Heine, the banker, at once gave his nephew an earnest of the generous treatment the latter was subsequently to experience at his hands, for he came forward with money to enable his young kinsman to go to a university, his sole stipulation being that his protégé should study with the view of entering the legal profession. Heine gladly accepted his uncle's terms, and entered the university of Bonn in the spring of 1819. During his stay there he was an eager student; but the subjects to which he devoted himself had no connexion with the profession which had been chosen for him. He seems to have attended no lectures save those on literature and history—notably A. W. von Schlegel's; and he not long afterwards acknowledged his obligations to Schlegel by dedicating a sonnet to him—a tribute which he recalled in later days by a wanton and outrageous attack upon the veteran critic in *Die Romantische Schule*. Why Heine left Bonn does not clearly appear, but it is at Göttingen that we find him in the autumn of 1820. His stay here was even shorter than at Bonn. In February 1821 the authorities of the "Georgia Augusta" rusticated him for some infraction of the duelling laws. Although from these beginnings Heine's academical career promised to pursue no very even course, he nevertheless determined, after his residence at Göttingen had been cut short, to seek a third university; and it was to Berlin that he now repaired, where Hegel was at the zenith of his renown. Whether or not the lectures of this philosopher benefited him in any way—by giving him, for instance, as some have supposed, a certain dialectical precision of style—he has himself confessed that he seldom understood them; and in after years Hegel's ultra-conservatism and orthodoxy made him the constant butt of his former pupil's ridicule and sarcasm. But the interest of Heine's life in Berlin was social and not academic. He enjoyed the privilege of mixing in the best literary circles of the capital. He was on terms of intimacy with Varnhagen von Ense and his wife, the celebrated Jewess, Rahel, and at their house—the rendezvous of Germany's genius and learning—he frequently met such men as the Humboldts, Hegel himself, and Schleiermacher; while he lived on a still more familiar footing with a number of his own co-religionists, who, without having acquired European reputation, were men of varied and approved abilities. In an atmosphere of such geniality as this his gifts were rapidly displayed. He began ere long to contribute poems to the *Berliner Gesellschafter*, many of which were subsequently incorporated in the *Buch der Lieder*, and in 1822 a volume came from the press entitled *Gedichte von Heinrich Heine*, his first avowed act of authorship. He was still further employed at this time as the correspondent of a Rhenish newspaper, as well as in completing his tragedies *Almansor* and *William Ratcliff*, which were published in 1823 with small success. He was now, indeed, fairly embarked upon his literary course. But he was still largely dependent upon his uncle; and in order so far to fulfil his engagements towards his benefactor, he returned to Göttingen in 1825, and shortly afterwards took his degree in law, having previously qualified himself for practice by publicly professing Christianity.

This act of "apostasy," as it has been called, calls for something more than a mere passing reference; for it not only laid Heine open to contumely while alive, but has provoked adverse criticism of special severity since his death. That he was guilty of "apostasy" is no doubt verbally true; but there are two circumstances in this connexion which should always be remembered. The one is that Heine was wholly wanting in the religious sense—that he never was a Jew save nominally and by the accident of birth—so that he cannot, with any real propriety, be said to have forsaken the creed of his race; the other, that his family, by encouraging him to adopt a profession which could not be entered except by the gateway of "apostasy," tacitly left him free to take that step. In short, Heine's "apostasy" was a purely secular act; and, although there will doubtless be found many to stigmatize him all the more blackly for this very reason, candour appears rather to require that this change of faith, if such it can be called, should be classed as one of his most venial offences, being the plainly outward act of one who throughout life made himself peculiarly obnoxious to the imputation of malice and bad-heartedness.

Heine seems never to have made any serious attempt to practise law. His life from the year 1826 until his death was devoted entirely to literature, and more especially to journalism, which alone indeed was the main source of his income for many years. At first he lived in Hamburg, and then it was that, besides the *Buch der Lieder*, the earlier portions of the *Reisebilder* appeared, both of which, but particularly the latter, at once created an immense sensation throughout Germany, not only among the youthful and enthusiastic, who found their own sentiments expressed by the new writer with the happiest felicity, but amongst such dignified and [illegible] personages as Metternich and Gentz. In 1827 Baron Cotta, the Bavarian publisher, offered Heine, who had risen at a bound into celebrity, the joint-editorship of the *Allgemeine Politische Annalen*. The young author accepted the offer, and betook himself to Munich in the winter of that year, after having paid a visit to London, where he found every person and everything detestable save Canning and his policy—and it may be said here in passing that a most violent hatred of England forms a marked feature of all Heine's writings. He remained for a considerable period in the South German capital, and it was owing, not to any disagreement with his employer, but to the demands of the court of Prussia, which was not long of taking umbrage at his freedom of opinion, that his editorial function ceased so abruptly as it did. What the secret history of the next two or three years of his life was—whether from the very first he really was an object of especial disfavour at Berlin, or whether, as is quite as likely, taking his vanity and love of publicity into account, he exaggerated his powers of offence beyond the endurance of the Government there, and forced it into what seemed a petty persecution—he presently perceived that he must either quit Germany altogether or prepare for a lifetime perhaps of fortress-imprisonment. He did not long hesitate between these two alternatives; and on the 1st of May 1831 Heinrich Heine left his native land for Paris, where he lived for the rest of his life, save [illegible] the [illegible], in 1843.

Just as his adoption of Christianity has led to Heine's being pronounced "apostate," so has his self-expatriation caused German writers to denounce him as "renegade." The one accusation is as groundless as the other. In the first place, Heine was a Jew, in spite of his [illegible], and cannot therefore rightly be called a "renegade" against Germany—least of all when the [illegible] social and political status of his race in that country at the date of his expatriation is remembered. Then again, his writings were systematically subjected to the crudest mutilations, and it is tolerably certain that had he remained in the "Fatherland," he would sooner or later have been deprived of all power of public speech. Was it any wonder, seeing that he had adopted the profession of letters, that he should have turned his back upon such a prospect? He at any rate was the best judge; and it ill becomes Germans to call him "renegade," when, had he continued to tarry among them, their literature would probably have suffered an irreparable loss. At the same time, and for the same reasons, it is equally inapt to assert that he was in the essential qualities of his mind a Frenchman who gravitated towards Paris by a sort of intellectual necessity. The necessity (to use that word) was physical. Heine would never have left Germany could he have freely expressed his opinions there.

After settling in his new home, where his life for many years must have been as gay and brilliant as latterly it was sad and sombre, and where he speedily became more or less intimate with such writers as Balzac, Dumas the elder, George Sand, Victor Hugo, and Théophile Gautier, Heine devoted himself more exclusively than ever to journalism; and from 1831 until 1847, he was an active and indefatigable publicist. The two series of papers entitled *Französische Zustände* and *Lutetia* contain a selection from his press-contributions during these years; and even at this date they well repay perusal, not only by the brilliancy of wit and elegance of style which they possess in common with almost all his writings, but also by the remarkable sagacity of their political [illegible]. Alongside of this main stream of journalism he also kept up a subsidiary current of literature in its more proper sense—although it may be said that all his writings are of an occasional nature—and to this we owe the *Salon* (18[illegible]), which comprises among other pieces a series of articles, "Zur Geschichte der Religion und Philosophie in Deutschland," which had originally appeared in the *Revue des Deux Mondes*, and in which Heine came forward as the introducer of German thought to the reading world of Paris. The *Salon* also contains several admirable papers in art-criticism, and a strange, fragmentary medley of sentiment and satire, in its author's most characteristic vein—"Die Florentinische Nächte." To this period, too, belongs *Die Romantische Schule*, to which reference has already been made, and the substance of which is sufficiently indicated by its name. In 1839 *Shakespeare's Mädchen und Frauen* appeared—Heine's [illegible] in this slight work [illegible] through a gallery of Shakespeare's heroines. The year 1840 was signalized by the publication of *Heinrich Heine über Ludwig Börne*, a brochure of the wittiest and most trenchant satire, in which the German refugees in Paris—a fraternity whom Heine always anxiously avoided—were far more severely handled than was the defunct author whose name it bore, and who, it may be noted, was himself a Jew. In 1844 *Deutschland, ein Wintermärchen*, came forth—the result of the visit to Germany which has been alluded to as the sole journey of the kind which Heine undertook; and this composition may be classed, along with a similar performance, *Atta Troll* ([illegible]), as belonging to his most inferior writings. It was in 1848 that Heine, in the very heyday of his activity, and with [illegible] within him for the [illegible] of a [illegible], was suddenly prostrated by the disease which finally carried him off, though not before it had confined him for seven years upon the "mattress-grave" of incurable infirmity. His sufferings throughout that time are reported to have been frequently excruciating, and he at length grew so habituated to the use of opium that the very largest doses failed to afford him relief. But when his malady—a softening of the spinal cord—allowed him a respite, his intellect was as clear and vigorous as ever; and it is to these closing years of his life, harrowing as they were, that we are indebted for the finest and most finished of all his poems—for the two collections, that is to say, *Romanzero* (1851) and *Neueste Gedichte* (1853-54), as well as for the various pieces posthumously published in *H. Heine's Letzte Gedichte und Gedanken*. It was from his "mattress-grave" too that the dying man put forth his *Geständnisse* or *Confessions*, the psychological interest of which is very great, whatever their value as truthfulness may be. He bore the misery of his protracted [illegible] with fortitude, nay, with cheerfulness, was kindly attended by his wife Mathilde, and towards the end by that mysterious lady whom he called "Die Mouche," and who was, it now appears, a Madame Krienitz; and there are many anecdotes on record of his [illegible] in the midst of his trials and [illegible] trials [illegible] the lot of man—which go far to prove that he possessed a healthy [illegible], for which his writings [illegible] give him credit. He died on the 17th February 1856 in Paris, in the Rue [illegible], and lies buried in the cemetery of Montmartre.

We have called Heine "poet and journalist"; but his reputation has, naturally enough, now come to rest almost exclusively upon his poetry, and above all upon his songs—the *Buch der Lieder* having passed through upwards of twenty-five editions. This great popularity may no doubt (and especially in foreign countries) be attributable, to a certain extent, to the singular good fortune which has wedded to very many of these songs the music of such composers as Schumann and Mendelssohn. But still, when all deductions upon this score are made,—and the true view of the matter probably is that the poet and his composers are mutually indebted,—the fact remains that Heine is one of the great song-writers of the world, not unworthy of a place beside Burns and Béranger, although far less masculine and passionate than the one, and far less jovial and debonnair than the other. The intense individualism which prevented him from ever becoming a literary artist in any other department—his dramas and essays in fiction are worthless—stood him in excellent stead in the lyric field,—was a positive and essential strength indeed, for, after all, a song to appeal to men's hearts must be an utterance of personal experience. And this condition is amply fulfilled in the *Buch der Lieder*, the greater portion of which was the direct outcome of a sentiment entertained by the poet for one of his cousins—a sentiment, by the way, which has been alluded to by German writers as a mere *Cousinenschwärmerei*, while others (not Germans) have affirmed that all Heine's bitterness and cynicism in after life arose from its having remained unrequited. On the whole, Heine as a song-writer is a fit descendant of Walther von der Vogelweide and those old *Minnesinger* who of yore assembled in the courts of princes, and recounted their sorrows and their joys, of those nameless folk, too, who sang the *Volkslieder*; and when all his other writings are forgotten, he will be remembered by such exquisite gems as "Die Rose, die Lilie, die Taube, die Sonne;" "Auf Flügeln des Gesanges;" and "Du bist wie eine Blume." There is much, too, of great beauty in many of his ballads and narrative pieces; witness among others, "Spanische Atriden," "Die Prinzessin Sabbath," "Jehuda ben Halevy," "[illegible]"—a piece of the most exquisite pathos and simplicity—and "[illegible]." But too often, no matter how sweet a chord is struck at the beginning, a discordant note creeps in, to end in a shrieking discord, and the outraged reader starts like one who should suddenly see Romeo and Juliet fall to grimacing and squeaking like Punch and Judy. Heine's confession that poetry was no more than his "holy plaything" would have been entitled to our unqualified acceptance had he omitted the adjective.

But when we turn to his prose writings—to his "journalism" that is to say, for, as we have remarked, almost all his prose falls under this category, in its widest acceptation—we see the man Heine indeed, not perhaps, as he was ambitious of being regarded by posterity, in the full panoply of a "soldier of human emancipation," but at any rate as no contemptible combatant of obscurantism and philistinism. Beside such a redoubtable champion of the catholic reason of mankind as Lessing "of the ponderous battle-axe," he looks somewhat small, it is true, and his rapier somewhat gimcrack. But ridicule will often reach whither heavier weapons cannot, and pierce the elephantine hide of pedantry and dulness, after these have been attacked in vain by battering rams; and Heine was a master of it. The worst is that in unscrupulous hands—and no one was more unscrupulous than he—it may be turned to illegitimate uses, and come to be indulged in finally for its own sake. How easily Heine became the slave of his propensity in this direction may be seen in the two works—which seem his best and most characteristic writings, notwithstanding—*Zur Geschichte der Religion und Philosophie in Deutschland* and *Die Romantische Schule*. Both these abound in the most irreverent passages, especially the former, wherein such philosophers as Kant, Fichte, and Schelling scarcely serve a higher purpose than to be used as pegs whereon the writer may hang his jests. And admirable these are. Nothing can be better, for instance, than his account of how Kant (who is parenthetically described as a man whom Nature intended to sell coffee and sugar across a counter) came to postulate a Deity in his practical, after having exploded that idea in his theoretical, system. He did this, says Heine (most adroitly hitting one of the chief *opprobria*, scientifically regarded, of the critical philosophy), for the sake of his old man-servant Lampe, who looked so dismally at the conclusions of the Pure Reason that the philosopher was moved to compassion! The *Romantische Schule*, being concerned for the most part with its author's contemporaries, is far more virulent than the treatise just mentioned, but equally happy; and it aimed a death-blow at a school which rivalled the wildest and most licentious ravings of a Monk Lewis and the most stilted horrors of an Ann Radcliff. And here it may be said, in connexion with the attack upon Schlegel occurring in this essay, that Heine's onslaughts were always open and above-board, unmerciful and sometimes grossly brutal as they were. He was a literary swashbuckler, it may be (though that term is singularly inapplicable to one who wrote in such a style), but he was neither a literary assassin nor a literary ghoul. Even his attack upon Börne was really aimed, as we have said, at men who were alive to resent it; and it was resented, though from a strange quarter. Börne's widow's husband challenged Heine, and the latter was slightly wounded in the encounter.

Of the *Reisebilder*, Heine's most voluminous and best-known prose work, and that which originally gave him fame, small space remains to speak. But if we except its first and third books, it has been greatly overrated. It is easy to understand the popularity it acquired upon its first appearance, falling as it did like a breath of genuine life upon a land well nigh asphyxiated by high art and the "Hübsch-Objectiv"—but nowadays, notwithstanding its undoubted mirth-provoking qualities, it chiefly serves to point out the gulf which was fixed between its author and him who took the *Sentimental Journey*. The most that can be said for it is that Sterne might have written it had he been a German Jew.

The best edition of Heine's works is that published by Hoffmann and Campe, *Heinrich Heine's Sämmtliche Werke*, 20 vols., Hamburg, [illegible]. Another edition has appeared in America, *Heinrich Heine's Sämmtliche Werke*, in 7 vols. *Heinrich Heine's Leben*, by Adolph Strodtmann, Berlin, 1870, is the only Life of Heine entitled to consideration, although the pleasure of reading it is certainly marred by its length. A biography of the poet has also appeared in England, *Life and Opinions of Heinrich Heine*, by W. Stigand,

1878. Mr Matthew Arnold has, in his *Essays in Criticism*, handled Heine with his accustomed grace and felicity. Mention may also be made of *Wit, Wisdom, and Pathos of Heinrich Heine*, by J. Snodgrass, London, 1879, a collection of extracts from Heine's works in an English dress. A translation of *Heine's Poems* [illegible], by Edgar A. Bowring, C.B., was issued in Bohn's Standard Library. His prose works have not as yet received an English rendering, although a version of the *Reisebilder* has been published in America. (J. W. F.)

HEINECCIUS, JOHANN GOTTLIEB (1681–1741), a celebrated jurist, was born 11th September 1681 at Eisenberg. He studied theology at Leipsic and law at Halle; and at the latter place he was appointed in 1713 professor of philosophy, in 1718 extraordinary, and in 1720 ordinary professor of jurisprudence. He subsequently filled legal chairs at Franeker in Holland and at Frankfort, but finally returned to Halle in 1733 as professor of philosophy and jurisprudence. He died there, 31st August 1741.

Heineccius belonged to the school of philosophical jurists. He endeavoured to treat law as a rational science, and not merely as [illegible]. Thus he [illegible] to first principles, and he develops his legal doctrines [illegible]. His chief works were *Antiquitatum Romanarum Jurisprudentiam illustrantium Syntagma* (1719), *Historia Juris Civilis Romani ac Germanici* (1733), *Elementa Juris Germanici* (1735), *Elementa Juris Naturæ et Gentium* (1737, English trans. by Turnbull, London, 2 vols., 1763). Besides these works he wrote on purely philosophical subjects, and edited the works of several of the classical jurists. His *Opera* (8 vols., Geneva, 1771, &c.) were edited by his son Johann Christian Gottlieb Heineccius.

HEINECKEN, CHRISTIAN HEINRICH (1721–1725), a child remarkable for extraordinary precocity of intellect, was born on February 6, 1721, at Lübeck, where his father was a painter. Able to speak at the age of ten months, by the time he was one year old he knew by heart the principal incidents in the Pentateuch. At two years of age he had mastered all the sacred history; at three he was intimately acquainted with history and geography, ancient and modern, sacred and profane, besides being able to speak French and Latin; and in his fourth year he devoted himself to the study of religion and church history. This wonderful precocity was no mere feat of memory, for the youthful savant could reason on and discuss the knowledge he had acquired. Crowds of people flocked to Lübeck to see the wonderful child; and in 1724 he was taken to Copenhagen at the desire of the king of Denmark. On his return to Lübeck he began to learn writing, but his sickly constitution gave way, and he died, June 22, 1725.

The Life, Deeds, Travels, and Death of the Child of Lübeck was published [illegible]. See also [illegible], vol. xvii., and *Mercure de France*, Jan. 17[illegible].

HEINSE, JOHANN JAKOB WILHELM (c. 1746–1803), German romance writer, was born at Langewiesen in the Thuringian Forest, February 16, 1746, or, according to some accounts, February 15, 1749. He was educated at the gymnasium of Schleusingen, and afterwards, through many privations, studied law at Jena and Erfurt. At Erfurt he became known to Wieland, and through Wieland's recommendation to the poet Gleim, who, charmed by some of Heinse's early literary attempts, offered him assistance and a home; but at this time he made the acquaintance of an adventurer, Captain von der Goltz, and was induced to accompany him on his travels. Von der Goltz easily succeeded in corrupting the taste and weakening the morals of the young author, and the baneful influence of this friendship pervades Heinse's writings. After parting with Von der Goltz, Heinse returned for a time to Langewiesen, and afterwards obtained, with Gleim's assistance, under the feigned name of Rost, a tutorship in the family of Von Massow at Quedlinburg, which, however, he did not keep very long. In 1774 he went to Düsseldorf to assist Jacobi in the production of the *Iris* journal. In 1780 he obtained from Jacobi leave and the necessary funds to travel in Italy. There he remained three years, living chiefly at Rome, where he was intimate with the painter Müller. In 1789 he obtained the post of reader to the elector of Mainz, who afterwards made him councillor and librarian. He died at Aschaffenburg, June 22, 1803.

Heinse's works are—*Sinngedichte*, Halberstadt, 1771; *Begebenheiten des Enkolp*, translated from the *Satyricon* of Petronius, 2 vols., Schwabach, 1773; *Die Kirschen*, [illegible]; *Laidion oder die Eleusinischen Geheimnisse*, Lemgo, 1774; prose translations of Tasso's *Jerusalem Delivered*, 4 vols., 1781, and Ariosto's *Orlando*, 4 vols., 1782; *Ardinghello und die glückseligen Inseln*, 2 vols., Lemgo, 1787; *Hildegard von Hohenthal*, 3 vols., Berlin, 1795; *Anastasia und das Schachspiel*, 2 vols., Frankfort, 1803. A collection of his entire works was published at Leipsic in 1838 in 10 vols., and another edition in 1857 in 5 vols.

HEINSIUS, or HEINS, DANIEL (1580–1655), one of the most famous scholars of the Dutch Renaissance, was born at Ghent, June 9, 1580. The troubles of the Spanish war drove his parents to settle first at Veere in Zealand, then in England, next at Ryswick, and lastly at Flushing. In 1594, being already remarkable for his attainments, he was sent to the university of Franeker to perfect himself in Greek under Henricus Schotanus. He stayed at Franeker half a year, and then settled at Leyden for the remaining sixty years of his life. There he studied under Joseph Scaliger, and there he found Marnix de St Aldegonde, Janus Douza, Paulus Merula, and others, and was soon taken into the society of these celebrated men as their equal. His proficiency in the classic languages won the praise of all the best scholars of Europe, and offers were made to him, but in vain, to accept honourable positions outside Holland. He soon rose in dignity at the university of Leyden. In 1602 he was made professor of Latin, in 1605 professor of Greek, and at the death of Merula in 1607 he succeeded that illustrious scholar as librarian to the university. The remainder of his life is recorded in a list of his productions. He died at the Hague, February 25, 1655. The Dutch poetry of Heinsius is of the school of Roemer Visscher, but attains no very high excellence. It was, however, greatly admired by Martin Opitz, who was the pupil of Heinsius, and who, in translating the poetry of the latter, introduced the German public to the use of the rhyming alexandrine.

He published his original Latin poems [illegible] in 1617.

HEINSIUS, NIKOLAES (1620–1681), Dutch scholar, was the son of Daniel Heinsius, and scarcely less illustrious than his father. While, however, Daniel was the type of the sedentary scholar, Nikolaes was by temperament restless and peripatetic. He was born at Leyden, July 20, 1620, and early displayed extraordinary precocity. His boyish Latin poem of *Breda Expugnata* was printed in 1637, and attracted much attention. In 1642 he began his wanderings with a visit to England in search of MSS of the classics; it is unhappily recorded that he met with great incivility from the English scholars. In 1644 he was sent to Spa to drink the waters; his health restored, he set out once more in search of codices, passing through Louvain, Brussels, Mechlin, Antwerp, and so back to Leyden, everywhere consulting MSS and taking philological and textual notes. Almost immediately he set out again, and arriving in Paris was welcomed with open arms by the French savants. After investigating all the classical texts he could lay hands on, he proceeded southwards, and visited on the same quest Lyons, Marseilles, Pisa, Florence (where he paused to issue a new edition of Ovid), and Rome. Next year, 1647, found him in Naples, from which he fled during the revolt of Masaniello. He pursued his labours in Leghorn, Bologna, Verona, and Padua, at which latter city he published in 1649 his volume of original Latin verse entitled Elegiae. He proceeded to Milan, and worked for a considerable time in the Ambrosian library; he was preparing to explore Switzerland in the same patient manner, when the news of his father's illness recalled him hurriedly to Leyden. He was soon called away to Stockholm at the invitation of Queen Christina, at whose court he waged war with Salmasius, who accused him of having supplied Milton with facts from the life of that great but irritable scholar. His health compelled him to pay a visit to Leyden in 1650, but immediately returned to Stockholm. In 1651 he once more visited Italy; the remainder of his life was divided between Sweden and Holland. He collected his Latin poems into a volume in 1666. His latest labours were the editing of Velleius Paterculus in 1678, and of Valerius Flaccus in 1680. He died at the Hague, October 7, 1681. Nicolaas Heinsius was one of the purest and most elegant of modern Latinists, and if his scholarship was not quite so perfect as that of his father, he displayed higher gifts as an original writer.

HEINSIUS, NIKOLAAS, an illegitimate son of the subject of last article, was born in 1655 at the Hague. At the age of twenty he wrote *The Delightful Adventures and Wonderful Life of Mirandor*, a work of extraordinary humour and genius, the sole original romance produced in Holland during the 17th century. Dr Ten Brink has pointed out that *Mirandor* preceded *Gil Blas*, which it curiously resembles, by at least forty years. The author, however, added nothing else to literature. He was disowned by his father, driven from the house, and in 1677 had to flee the country on account of a murder which he committed at night in the streets of the Hague. He lived a precarious life as an outlaw in Paris, Rome, and elsewhere, and died in obscurity.

HEIR. See INHERITANCE.

HELDER, or THE HELDER, a township of the Netherlands at the northern extremity of the province of North Holland, directly opposite the island of Texel. Since 1819 it has been the terminus of the North Holland Canal, and it is now connected (since 1865) by railway with Alkmaar and Haarlem. Its fortifications and its dykes are both constructed on an extensive scale, the former comprising four batteries and five forts, and the latter being the most striking on the whole coast. A garrison of 7000 to 9000 men is necessary for the defence of the place, and 50,000 men could be accommodated within the lines. The harbour, called the Nieuwe Diep, is one of the best in Europe. Its basin is 6000 feet long by 390 to 490 broad, and it has depth enough for the largest vessels, which are admitted to the North Holland Canal by the Koopvaarders sluice. The government naval yard comprises an extensive wet dock, a dry dock, and auxiliary establishments. Besides eight churches and a synagogue Helder possesses a palace for the board of marine, a royal institute for the education of naval cadets, a marine hospital, an orphan asylum, a town-house erected in 1836, and a meteorological observatory. The industries of the place are those usual in a flourishing seaport. Previous to 1819 the population was not much more than 2000, but since then it has rapidly increased. In 1870 the suburbs of Willemsoord, Nieuwe Diep, Nieuwstad, and the Canal Road being included, the total amounted to 18,265. As a commune it numbered 18,366 in 1870 and 20,194 in 1874.

Helder was originally an offshoot of the now decayed town of Huisduinen. The first church was built in 1624, and though the harbour became a favourite resort of the whale fishers, it was not till the construction of the Nieuwe Diep between 1770 and 1780, and its adoption in 1781 as a war harbour, that the prosperity of the place was secured. Under the Batavian republic the fortifications were extended and strengthened, and Napoleon still further improved them. In 1799 the English, under Abercromby, assisted by the Russians, drove out the French and secured the capitulation of the Dutch fleet in the Zuyder Zee.

HELENA, daughter of Zeus and of Leda the wife of Tyndareus king of Sparta, was sister of Castor, Pollux, and Clytemnestra, and was married to Menelaus. According to Homer she was obliged by Aphrodite to flee with Paris to Troy; and after the Trojan War she returned with Menelaus and lived with him as queen in Sparta. She had only one child, a daughter named Hermione, who was married to Neoptolemus. In the Homeric poems her character is drawn with marvellous skill; forced by the gods to do what she regrets, she seems to be separated from the wrong that she does, and remains always an object of interest and respect.[1] Goethe (*Faust*, part ii.) introduces Helena apparently to symbolize the Greek spirit acting on the modern mind. Among later poets the tales of Helen are much more complicated. She was carried off by Theseus to Attica in her childhood, but was recovered by her brothers. Her character often suffers much in the tales followed by lyric and tragic poets. Stesichorus and Euripides (*Helena*), however, relate that Paris on his homeward voyage was driven by stress of wind to Egypt. Proteus, king of Egypt, learning the facts, detained the real Helen in Egypt, while a shadowy Helen was taken to Troy and fought for. Menelaus on his way home from Troy was also driven to Egypt, and there found his true wife. After the death of Paris she is also said to have been married to his brother Deiphobus.

If we turn to the religious ceremonies and the genuine popular tales, we find traces of a more archaic Helen. At Rhamnus in Attica she was connected with the worship of Nemesis, whose daughter she was considered to be. In Argos she was counted mother of Iphigenia, and was said to have founded a temple of Eileithyia, the goddess of birth. At Sparta she was honoured as presiding over the care of children, and festivals were celebrated in her honour by the maidens. A tree appears to have been connected with her worship there (see *Theocr.*, xviii.); and in Rhodes she was worshipped by maidens with the epithet δενδρῖτις, a relic of the very oldest kind of worship, where a sacred tree was worshipped as the embodiment of the god. In most of these cults connexion with a moon-goddess, the most important of whose functions was the care over child-birth, is apparent; and we are led to regard ἑλένη as an epithet of the moon, which has gradually been severed from it and raised to an independent existence (*cf.* the account given of Gorgophone under GORGONS). Beauty is a specially common attribute of the moon and of moon-goddesses, such as Hera. This makes it most probable that the word, like σελήνη, is connected with the root *svar*, to shine. The tales connecting Helena with Achilles, who is clearly a sun-god originally, which are known already to the writer of the *Cypria*, are also very instructive. Over the Black Sea coasts Achilles and Helena were worshipped as united in the Elysian fields. With this we must compare the story of Cadmus and Harmonia (see HARMONIA), and of Hades and Persephone; and we must remember that the coasts of Miletus were closely connected with Attica. We may then look on it as probable that the rape of Helena by Theseus is merely a device of harmonizing skill to connect the Helena of Spartan religion with the Helena worshipped in Attica. Probably a similar reason has contributed to mould the tale which has formed itself round the undoubtedly historical fact of the destruction of Troy by a Greek tribe or army. The worship of Aphrodite, the goddess whose influence in the story of Paris and Helena is so great, was common to Troy and Cythera. Many facts also point to a close connexion between Aphrodite and Helena. The swan from whose egg she is born is the bird of Aphrodite. By the author of the *Cypria* and in Attic tradition Helen is made the daughter of Nemesis; but Nemesis as a goddess of fate is clearly a dawn goddess (see Kuhn, *Zft.*, iii. 449), and therefore may be identified in origin with Aphrodite. We have here another instance of the intimate relation of the moon and dawn goddesses, and the impossibility of dividing them by any broad line (see HEBE, HERA). It would be at once a most instructive and a most interesting task to trace the steps by which the antique pre-Greek goddess was gradually transformed into the charming heroine round whom the action of the *Iliad* revolves. The data for reconstructing the history of this figure are more than usually full, and are so clear that scholars of the most opposite schools, as Welcker, Gerhard, Mannhardt, Maury, Roscher, have recognized in Helena the ancient goddess.

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[1] Most appreciative and sympathetic analyses may be found in Gladstone's *Homeric Studies* and Mure's *History of Greek Literature*.

HELENA, SAINT, a woman of humble origin, said to have been the daughter of an innkeeper, was the wife of Constantius Chlorus. Of her nationality nothing certain is known. She had one son, Constantine the Great. In 292 A.D. Chlorus was raised to the purple by the emperors Diocletian and Maximian, and forced to divorce Helena to make room for a more noble wife. After her son became emperor she was treated with great respect and styled Augusta, and cities in Bithynia and Lydia were after her named Helenopolis. She became a Christian when her son was converted, and during a pilgrimage to Jerusalem she discovered the holy sepulchre and the true cross. Her zealous patronage of their religion made her a favourite with the Christian writers, and finally procured her the honour of canonization; but pagan historians, such as Zosimus, regard her with dislike, and even question, though without ground, the legality of her marriage. Many coins occur with the name of Helena, but it is difficult or impossible in many cases to determine whether they belong to Saint Helena or to others of the family of Constantine bearing the same name.

HELENSBURGH, a town and favourite watering-place of Dumbartonshire, Scotland, is situated at the mouth of the Gareloch, a branch of the Firth of Clyde, opposite Greenock, which is about 4 miles distant. It is 24 miles N.W. of Glasgow by railway. In 1776 the site of the town was advertised for feuing, and in 1802 Helensburgh, named after Lady Helen, wife of Sir James Colquhoun, the superior of the soil, was erected into a burgh of barony, under a provost and council. The boundaries have since been enlarged. The town is pleasantly situated on a gentle slope, the streets mostly intersecting each other at right angles, while many of the houses are surrounded by gardens, peculiarities that produce an agreeable regularity and openness. A handsome burgh hall was erected in 1879. Near the town is a hospital, and within its boundaries a public park. Convenient as headquarters for visiting the whole district of the Clyde, and connected with Glasgow by both rail and steamer, Helensburgh is much frequented in summer. The population in 1871 was 6231; it is now (1880) estimated at fully 10,000.

HELIAND (i.e., *Heiland*) is an Old Saxon poem of the 9th century. According to some critics it is a fragment of a larger work which dealt with the entire historical material of the Old and New Testaments. The part which we now possess sets forth the life of Christ as told by the four evangelists, whose various narratives the author seeks to harmonize. The poem is said to have been composed by a Saxon writer at the request of the emperor Louis the Pious, but who the author was, except that he was a Saxon, we have no means of knowing. The general opinion is that he lived in Westphalia, but even this is uncertain. Like all the most ancient remains of Teutonic poetry, *Heliand* is written in alliterative verse, of which the writer had a perfect mastery. It is almost the only monument of the Old Saxon dialect, and has therefore a high philological value; but it is still more interesting from a literary point of view. The poet does not merely repeat his authorities; while true to the main facts of the original story, he allows his imagination to play upon them in a free and poetic spirit. He realizes with intense force the incidents in the career of the Founder of Christianity, and gives vividness and distinctness to the received conception of His character. His [illegible] by [illegible] tion of [illegible] ment, and by [illegible] the [illegible] often [illegible] in imparting to his style colour, variety, and animation. The 9th century is remarkable in the history of Old English and of Old Norse poetry; the *Heliand* affords proof that the impulse which revealed itself in these two literatures was also experienced to the full by the higher minds of Germany. The historical aspects of this great work are hardly less important than those which claim the attention of the purely literary student. Of all the German tribes the Saxons were the last to submit to the influence of Christianity. They regarded baptism as the symbol of Frankish supremacy, and clung as long as they could to the ancient Teutonic faith. Not until Charlemagne, after more than thirty years of warfare, forced upon them Frankish institutions did they generally accept the new creed, and even then, while they talked of Christ and the saints, they thought of Wodan and Thor, and took delight in the heathen poetry which had been handed down from remote periods. Louis the Pious was of a gentle and conciliatory nature, and by treating the Saxons with kindness obliterated to a large extent the recollection of his father's severity. *Heliand* was one of the works with which he and the clergy endeavoured to replace pagan literature, so that we may regard it as the monument of a struggle between two civilizations. The author is dominated by the ideals and the sympathies of the Catholic Church, but occasional touches remind us of the order of life that was passing away, and these have been found suggestive by writers on German archaeology.

Heliand received its name from J. A. Schmeller, who edited it (Munich, 1830) from the two existing manuscripts, one of which is in the British Museum, the other in Munich (formerly in Bamberg). More recent editions have been issued by Köne (Münster, 1855, accompanied by a modern rendering), Heyne (2d ed. Paderborn, 1873), and Rückert (4th volume of *Deutsche Dichtungen des Mittelalters*, Leipsic, 1876). There are renderings into modern German by Kannegiesser (Berlin, 1847), Grein (Rinteln, 1854, reprinted [illegible], Cassel, 1869), Rapp (Stuttgart, 1856), and Simrock (2d ed. Elberfeld, 1866). See also Vilmar, *Deutsche Alterthümer im Heliand* (2d ed., Marburg, 1862); Windisch, *Der Heliand und seine Quellen* (Leipsic, 1868); Grein, *Die Quellen des Heliand* (Cassel, 1869); and Sievers *Der Heliand und die angelsächsische Genesis* (Halle, 1875).

HELICON, a mountain, or more strictly a mountain range, of Bœotia in ancient Greece, celebrated in classical literature as the favourite haunt of the muses, is situated between Lake Copais and the Gulf of Corinth. On the fertile eastern slopes stood a temple and grove sacred to the Muses, and adorned with beautiful statues, which, taken by Constantine the Great to beautify his new city, were consumed there by a fire in 404 A.D. Hard by sparkled the famous fountains of poetic inspiration, Aganippe and Hippocrene, the latter fabled to have gushed from the earth at the tread of the winged horse Pegasus, whose favourite browsing place was there. At the neighbouring Ascra dwelt the ancient Hesiod, a fact which probably enhanced the poetic fame of the region. Pausanias, who describes Helicon in his ninth book, asserts that it was the most fertile mountain in Greece, and that neither poisonous plant nor serpent was to be found on it, while many of its herbs possessed a miraculous healing virtue. The highest summit, the present Paleovuni (old hill), rises to the height of about 5000 feet. Modern travellers, aided by ancient remains and inscriptions, and guided by the local descriptions of Pausanias, have succeeded in identifying many of the ancient classical spots. For details of modern research see Clarke's *Travels in Various Countries* (vol. vii., 1818), Dodwell's *Classical and Topographical Tour through Greece* (1819), and Leake's *Travels in Northern Greece* (vol. ii., 1835).

HELIGOLAND (German, *Helgoland*, *Heiligeland*, or *Halligland*, as the natives call it), is one of the Frisian Islands, and an English possession, situated in the North

Sea, 54° 11′ 34″ N. lat., 7° 51′ E. long., 36 miles from Cuxhaven at the mouth of the Elbe, and about 100 from Hamburg. Though the red cliffs of the Rock Island are most familiar to the voyager entering the Elbe, there are in reality two islets, the second being the Dune or Sand Island, now lying a quarter of a mile east of the main one, though at one time connected with it by *de Waal*, a neck of land which the sea broke through and destroyed in 1720. The Rock Island is nearly triangular in shape, surrounded on every side by steep cliffs, the only beach being the sandy spit where the landing place is situated, near the south-east point. On this islet there are some 500 houses, divided into a lower town or *Unterland*, on the spit, and an upper town or *Oberland*, situated on the cliff above and connected with the lower town by a wooden stair of 190 steps, the only possible mode of communication between the two sections. The portion of the flat-topped rock not occupied by the houses, the church with graveyard, the Government residences, and place for a battery, comprises a little pasture-land, a few cabbage gardens, potato patches, and a powder magazine at the north end of the rock. About 200 sheep, tethered to particular spots, feed on the scanty herbage, eked out by potato peelings and halms, cabbage blades, or any other vegetable refuse, which is carried out to them every morning. From one end of the island to the other runs a footpath, called by the Heligolanders the "Landwee" or High Road, but better known to visitors by the name of "Kartoffel Allee" (Potato Walk). There is also a lighthouse; but, though a few guns are placed behind a rude earthwork, there are no fortifications except the inaccessible cliffs of the island, and no garrison of any kind unless a few coast-guard-men be considered as such. The greatest length of the island, which slopes somewhat from west to east, is 5880 feet, and the greatest breadth 1845 feet, its circumference 13,500 feet, its average height 198 feet, and the highest point 216 feet. The Dune or Sand Island is little more than a sand-bank covered with scanty herbage, and imperfectly bound together by bent, grass, and carices. It is only about 200 feet above the sea at its highest point, but the drifting sands and the constant inroads of the sea make the height rather variable. The sea bathing establishment is situated here; but, with the exception of the restaurant keeper and waiters, and the attendants who drag the bathing-coaches into the sea, there are no residents. A shelving beach of white sand presents excellent facilities for bathing; everything is under strict Government surveillance, the boats in which the bathers cross in the morning, the hours of bathing, and the tariff being all regulated by law. Approached from the sea the Rock Island, with its red-tiled houses perched in a little cluster on the red cliff,—"Am Falm," as it is called,—looks very picturesque, and even the narrow brick-paved or sandy lanes of the town are not deficient in a certain degree of quaintness. There are—with the exception of a wheelbarrow and an occasional perambulator—no wheeled carriages in the island, and no horses or other beasts of burden. Even the two cows kept in the Unterland for the use of invalid visitors, and whose milk is sold at the apothecary's shop, are removed at the end of the bathing season to Cuxhaven, the island not supplying food for both man and beast. Mud is unknown on the streets, the rain only serving to wash their sloping surfaces clean as the scoured floor of the housewives' kitchens. Most of the houses are built—the lower half at least—of brick, but some are of wood. There are a theatre, a "conversation house," and a number of hotels and restaurants, though during the season nearly every house is more or less let out to "baadegaster"—visitors for sea-bathing forming the great source of the islanders' prosperity. In both the lower and the upper town there are numbers of shops, but the articles for sale seem to be chiefly intended for the summer "bathing guests," the natives getting most of their supplies from Hamburg or Bremen. The dwellings of the fisher folk are reasonably clean, and the interiors bear evidence of the seafaring character of the population. Some of the houses have little gardens with flowers, cucumbers, &c., in front of them; and in places protected from the sea breezes there are a few fruit trees. At the foot of "the stair" are one or two lime trees sheltered by the contiguous houses; they are looked upon by the Heligolanders as objects of national pride.

During the summer from 2000 to 3000 people visit the island for sea bathing. Most of these are from Hamburg, English or other "guests" being rare. There are no English residents, the officials, the governor excepted, being either natives or Germans; and German, when Frisian is not employed, is the official language, though for form's sake on the postage stamps English and German words appear in duplicate. The natives speak a dialect of Frisian, barely intelligible to the other islands of the group. They are perfectly content with the almost perfect autonomy they enjoy under the English Government. There is little emigration, and accordingly the population is slowly increasing. In 1879 the number was a little over 2000. There is regular communication with Bremen and Hamburg in the summer and autumn months, but during the winter the island is often isolated for weeks at a time, owing to tempestuous weather, drift ice, and other causes. It is said that insanity and suicide are in consequence not rare. Epidemic diseases occur, though they do not commonly spread; but scrofula, owing to the poor character of the islanders' food, attacks three-fourths of the population. In ten years there were 309 deaths—about 15 to the 1000; while during the same period—from 1863 to 1872 inclusive—there were no less than 17 suicides. At one time the population did not exceed 300, and it was only when it increased to over 1000 that the inhabitants had to dispense with the few horses they kept to till their patches of land. This is now done with the spade, and loads are conveyed either in wheelbarrows or in shallow willow baskets.

The temperature of the Oberland is, owing to its exposure, about 1·5° lower than that of the Unterland. The following are the means of the months, from a series of observations taken for seven consecutive years at the lighthouse built on the highest point of the island:—January, 31·9° Fahr.; February, 33·9°; March, 35·2°; April, 43·1°; May, 48·9°; June, 57·5°; July, 62·2°; August, 61·0°; September, 58·4°; October, 48·2°; November, 40·0°; December, 34·3°—the mean temperature of the whole year being 47·2° Fahr.[1] The winters are however very stormy, and the air is so laden with salt spray that the rain leaves a delicate deposit of salt after it has evaporated. May and the early part of June are very wet and foggy, so that the first visitors do not arrive until the middle of the latter month.

The rocks composing the island are of Triassic age, bunter-sandstone, keuper, lias, oolite, muschelkalk, and chalk (now denuded), topped by Pliocene—"the brown rock," in which are found the scales and teeth mostly of freshwater fishes, freshwater *Mollusca*, and fruit and leaves of a *Carpinus*, a *Quercus*, an *Alnus*, a maple, a plant allied to a hoya (*Stomatophyllum helgolandicum*), &c. The cliffs are worn into caves, and around the Rock Island are many fantastic arches and columns of rock. There is no good ground, however, for believing that the Rock Island was ever much larger than it is,—the tales of the great size of Heligoland—its numerous churches and villages in early times—being doubtless exaggerated by tradition, while the maps affecting to show its former extension doubtless relate to the Sand Island, which was incontestably much larger in very recent periods, and is now yearly becoming smaller. The natural history presents nothing remarkable. There are no wild animals on it, and the numerous birds which breed in its cliffs, or light on it during their migrations, all belong to the mainland or to the North Sea.[2] Hallier has enumerated 220 flowering plants as growing in the island, but none of them are peculiar to it, though there are one or two local varieties. The sandy-bottomed shallows [illegible] abundance of flat fish, and in the deeper water [illegible], haddock, &c., abound. There are, however, not many fishing-boats, and these of small size. Most of the men act as pilots.

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[1] Zimmermann, *Die sanitären Zustände Helgolands, mit specieller Berücksichtigung des Ozongehaltes der Luft*, 1873, pp. 12, 13.

[2] Gätke, *Edinburgh New Philosophical Journal*, n. s., ix., p. 333; Blasius, "Naumannia," 1858, p. 303 (*Ibis*, 1862, p. 58); Cordeaux, *Ibis*, 1875, p. 172. Mr Gätke, the island secretary, is preparing a special work on Heligoland ornithology.

The trade of the island is insignificant. The only time when it enjoyed any commercial prosperity was during the Napoleonic wars, when, by the "continental system," the European ports were [illegible] [illegible] In [illegible] and the [illegible] from Bremen and Hamburg, [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] "Lur-[illegible]

[illegible]—The history of Heligoland, "the holy island," is interesting. "Seat of the [illegible] Frisians of Denmark, [illegible]," writes Adam of Bremen. "[illegible] [illegible] are the words of [illegible]. Here [illegible] had her great temple, and [illegible] from the mainland the [illegible] to worship at her shrine. Here lived King Radbod, a pagan, and on this isle St Willebrord, 1200 years ago, first preached Christianity; and for its ownership, before and after that date, many [illegible] have fought. Finally it settled down to be a fief of the dukes of Schleswig or Holstein, though often in pawn for loans advanced to these [illegible] princes by the free city of Hamburg. The island then happened in 1807 to be a Danish possession, when the British [illegible] it, and it was formally ceded to them in 1814. In [illegible] the value of Heligoland as a military position [illegible] the [illegible] has been doubted. There is not, with the exception of wells, the rain collecting in the [illegible] or [illegible], and [illegible] any water on the island, while the [illegible] afforded by the north and south harbours formed by the sand point on which the Unterland is built is [illegible]. It is only vessels of small size that can [illegible] [illegible] [illegible] for local purposes, and escape the compulsory military service to which they would be liable were they to become German or Danish subjects.

[illegible]

HELIODORUS, son of Theodosius, was born at Emesa in Syria in the second half of the 4th century. He [illegible] [illegible] after a series of exciting [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] about 100 A.D., also wrote a love romance. But the *Ethiopica* is the oldest work of the kind that has come down to us. It is full of the most improbable scenes and incidents; the hero is a weak and dull character, but the heroine is well drawn and full of interest. The description of customs and manners, especially of religious ceremonies, is minute, and often most interesting in an antiquarian point of view. The work not only became a model for the later Greek romance writers, but has been much imitated by the French and Italian writers of romance. Tasso praises the artful development of the plot; and the early life of Clorinda (*Jerusalem Delivered*, c. xii.) is almost identical with that of Chariclea. Racine meditated a drama on the subject of the romance, and Raphael has made scenes from it the subject of two of his pictures. The best edition is that of Coräes (Paris, 1804). The book has been translated frequently, and into almost all modern European languages.

HELIOGABALUS, a Græcized form of Elagabalus, the name of a Syrian deity, was the name adopted by Varius Avitus Bassianus, the Roman emperor. His pedigree is given in the accompanying table:—

Bassianus

Julia Domna = Emp. Sept. Severus
Julia Mæsa = Avitus

Caracalla

Julia Soæmias = S. Varius Marcellus
Julia Mammæa

Emp. Heliogabalus
Emp. Alex. Severus

On the murder of Caracalla (217 A.D.), Julia Mæsa was forbidden the court by the new emperor Macrinus. She retired to her ancestral city Emesa with her daughters and grandsons. Varius Avitus, though still only a boy, was appointed high priest of the Syrian sun-god Elagabalus, one of the chief seats of whose worship was Emesa. His beauty, and the splendid ceremonials at which he presided, made him a great favourite with the troops stationed in that part of Syria, and Mæsa increased his popularity by spreading reports that he was in reality the illegitimate son of Caracalla. Macrinus was very unpopular with the army; an insurrection was easily raised, and Varius under his adopted name Heliogabalus was proclaimed emperor. The troops sent to quell the revolt joined the new emperor, and Macrinus, advancing in person against him, was defeated and soon afterwards slain (218). Heliogabalus was at once recognized by the senate as emperor. After spending the winter in Nicomedia, he proceeded in 219 to Rome. He made it his business to exalt the honour of the deity whose priest he was. The Syrian god was proclaimed the chief deity in Rome, and all other gods his servants; [illegible] ceremonies in his honour were celebrated, at which Heliogabalus danced in public; and it was believed that secret [illegible] [illegible] were performed in his [illegible] [illegible] [illegible] [illegible] with the army declined, and Mæsa [illegible] that the liking of the soldiers inclined to Alexander Severus, persuaded him to raise his cousin to the dignity of Cæsar (221). Heliogabalus soon repented of this step. An attempt to murder Alexander was frustrated by the watchful Mæsa. [illegible] [illegible] a mutiny among the soldiers, in which Heliogabalus and his mother Soæmias were slain.

HELIOGRAPHY is the name applied to the method of communicating between distant points in which visual signals are obtained by reflecting the rays of the sun from a mirror or combination of mirrors in the required direction. The method can of course be only employed to advantage in places where the sky is free from clouds and the atmosphere clear for considerable periods of time, and the fact that an atmospheric change may indefinitely delay the transmission of a message is an insuperable obstacle to the establishment of permanent heliographic stations in most climates.

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[1] [illegible]

[2] [illegible] only the [illegible]

In favourable localities, however, heliography possesses important advantages for military signalling over other methods, the principal being the portability of the apparatus, the great distance to which messages can be sent without retransmission, and the fact that the signals are visible to those only who are on the direct line of signalling.

These signals are produced by causing the reflected beam to appear and disappear or be eclipsed alternately at the distant point, the periods of appearance and eclipsation being usually varied in length, so as to produce the combinations of long and short signals known as the Morse alphabet. This is done in two distinct ways. In the first of these, known as signalling by "appearance," the reflected beam or "flash" is obscured from the receiving station except when a message is being transmitted, the flashes then giving the requisite "dots" and "dashes"; while in the second method, or signalling by "eclipsation," the flash is kept continually on the receiving station, and only obscured for intervals forming signals. The first method is more easily read by learners; the second is less fatiguing to the eye, and possesses the advantage of enabling the signaller to correct the adjustment of his instrument at any time.

Glass mirrors with a plane surface are employed, hence the angle of divergence of the extreme rays in the reflected beam is the same as that subtended by the sun's diameter at the point, or about 32 minutes of arc; this small divergence rendering the flash visible to great distances.

The distance to which signalling by this method can be carried on depends on the size of the mirror employed and the angle of reflexion of the rays, a large mirror giving a more intense "flash" than a small one, since it reflects more rays, and being therefore visible to a greater distance; also when the angle of reflexion is nearly a right angle the flash will be more intense than when the rays are only diverted through a small angle from the greater extent of surface exposed to the sun's rays. The range, however, depends to so great a degree on the state of the atmosphere that it is impossible to assign any limits to the distance that the flash might be seen through in exceptionally clear weather. From the Himalayas a 5 inch mirror has been found to give very distinct signals over a distance of 60 miles; but when the air was at all misty a very much larger mirror had to be employed.

The more perfect reflexion when the angle between the direct and reflected rays is large is not sufficient to compensate for the loss of intensity caused by the small number of reflected rays. Hence when this angle is greater than a right angle two mirrors are used, the sun's rays being reflected from one back to the other and thence to the distant point. This is called the duplex method of working.

Two forms of instrument are at present used in the British army. In the one known as Begbie's field heliostat the mirrors are square, the sun mirror having a side of 5 inches, and the signalling mirror 4 inches. The object of this difference is to ensure the latter receiving the flash over its whole extent of surface. The mirrors are screwed on to tripod stands, the stand for the signalling mirror having a sighting bar with a frame of cross wires at the end, by means of which the alignment can be accurately taken by looking through a hole in the centre of the mirror. When this has been found a small white disc is put into a hole in the centre of the cross wire frame, and a black disc in the central hole in the signalling mirror, or, if two mirrors are used, the white disc in the signalling and the black disc in the sun mirror. The flash is then brought on the true line by making the shadow corresponding to the black disc fall on the white one; this movement is obtained by means of slow-motion screws in a vertical and horizontal direction, by which means also the sun's apparent motion is continually corrected. The eclipsation is effected by a screen placed on a tripod in the alignment of the flash, pivoted horizontally, and worked by a handle. In the heliograph patented by Mr Mance the mirrors are circular, the eclipsation being effected by giving a small angular motion to one of the mirrors, causing the reflected beam to travel through twice the angle and completely disappear from the distant point. This is more easily manipulated than eclipsation by a screen. Its working is made very similar to that of an ordinary Morse key. The sun's motion is corrected by slow motion screws, and the arrangements for directing the flash are very similar to those in the heliostat. Two tripod stands are employed: one is for the signalling mirror; the other in single working carries a jointed arm, fitted with a small white metal tablet having a black spot on which is thrown the shadow from an unsilvered hole in the centre of the signalling mirror, while in duplex working a piece of paper in the centre of the second mirror answers the same purpose.

In addition to its usefulness as a signalling instrument, the heliograph has been found of great service in defining exactly distant points for large surveys, such as the triangulation of India. For this purpose it was constantly employed by the late astronomer royal at the Cape, Sir T. Maclear, in his verification of the arc of the meridian. (P. C.)

HELIOPOLIS. See BAALBEC and EGYPT, vol. vii. p. 769.

HELIOTROPE, or TURNSOLE, *Heliotropium*, L. (Greek, *ἡλιοτρόπιον*, *i.e.*, a plant which follows the sun with its flowers and leaves, or, according to Theophrastus, *Hist. Plant.*, vii. 15, which flowers at the summer solstice), a genus of usually more or less hairy herbs or undershrubs of the tribe *Heliotropieæ* of the natural order *Boraginceæ*, having alternate, rarely sub-opposite leaves; small white, lilac, or blue flowers, in terminal or lateral one-sided simple or once or twice forked spikes, with a calyx of five deeply-divided segments, a salver-shaped, hypogynous, 5-lobed corolla, and entire 4-celled ovary; fruit 2- to 4-sulcate or lobed, at length separable into four 1-seeded nuts, or into two hard 2-celled carpels; and seeds generally with a scanty albumen. In some species the cone surmounting the stigma is bearded. The heliotropes are indigenous mostly to tropical and subtropical regions, but a few species are natives of Europe, as *H. europæum*, L., which is also a naturalized species in the southern parts of North America. *H. indicum*, L. (of the section *Heliophytum*, D.C.), is to be met with in equinoctial Africa, America, and Asia, but apparently not in Australia. Of 23 Australian species of *Heliotropium* that have been described, 16 are endemic. The common heliotrope of English hothouses, *H. peruvianum*, L., popularly known as "cherry-pie," is on account of the delicious odour of its flowers a great favourite with florists. It was introduced into Europe by the younger Jussien, who sent seed of it from Peru to the royal garden at Paris. About the year 1757 it was grown in England by Mr P. Miller from seed obtained from St Germains. The plant has been known to occur with double flowers (Masters, *Veg. Terat.*, p. 510, Ray Soc., 1869). *H. corymbosum*, Ruiz et Pav., which was grown in Hammersmith

Heliotropium suaveolens.

nurseries as early as 1812, has larger but less fragrant flowers than *H. peruvianum*. The species commonly grown in [illegible] gardens is *H. [illegible]*, which has white, highly-fragrant flowers. Heliotropes may be propagated either from seed, or, as commonly, by means of cuttings of young growths taken an inch or two in length. The plants require in hot weather a plentiful supply of water, and in winter careful protection from frost, which soon kills them. If favoured with a light rich soil and a warm conservatory, in which they may be grown in a border, or against a pillar, wall, or trellis, they bloom all the year round. The formation of flowers is promoted by a sunny situation. Many florists' varieties of heliotrope are now under cultivation.

Pliny (*Nat. Hist.*, xxii. 29) distinguishes two kinds of "heliotropium," the *tricoccum*, and a somewhat taller plant, the *helioscopium*; the former, it has been supposed, is *Croton tinctorium*, L., and the latter the ἡλιοτρόπιον μικρόν of Dioscorides, or *Heliotropium europaeum*. The heliotropium, according to Pliny, was variously employed in medicine; thus the juice of the leaves with salt served for the removal of warts, whence the term *herba verrucaria* was applied to the plant. What, from the perfume of its flowers, is sometimes called winter heliotrope, is the fragrant butterbur, or sweet-scented coltsfoot, *Petasites* (*Tussilago*) *fragrans*, Presl, a perennial Composite plant. (For fig. see Maund, *The Botanic Garden*, i., pl. iv., fig. 4, 1878; and *Gardener's Chron.*, Feb. 2, 1878, p. 147.)

See [illegible] and Paxton, *Fl. [illegible]*, [illegible] 1850; P. Miller, *Gard. Dict.*, ed. T. Martyn, [illegible], *Hist. Nat. des Plantes*, ed. A. de [illegible]; De Candolle, *Prodr.*, x. [illegible] 1846; Bentham, *Fl. [illegible]* 1864; Bentham and Hooker, *Gen. Plant.*, ii. 843, 1876; Henfrey, *[illegible] of [illegible]*, [illegible] p. [illegible], 1873; [illegible]; *Gardener's Chron.*, 1878, i. [illegible], and for figs. of *H. peruvianum* and *H. corymbosum*, *Curtis's Bot. Mag.*, No. 141, 1791 and No. 1609, 1814.

HELIOTROPE, or BLOODSTONE, a cryptocrystalline variety of quartz, dark green in colour, with small spots of red jasper, resembling drops of blood. The name, from the Greek ἥλιος, sun, and τρέπω, to turn, is stated by Pliny (*Nat. Hist.*, xxxvii. 60) to be due to its giving, when thrown into water, a red reflexion of the light of the sun. The modern heliotrope, however, is Pliny's *prasius* (*op. cit.*, xxxvi. 34); and what he terms heliotrope was apparently a leek-green prase or plasma, abundantly veined with blood-red jasper. Heliotrope is found in the Isle of Rum, and in Mull of Cantyre, Argyllshire, and in several foreign localities. It is of common occurrence in the trap-rocks of the Deccan. Medicinal and other virtues were formerly ascribed to the stone. It is used for signet rings and a variety of ornamental articles.

HELL. See ESCHATOLOGY, vol. viii. p. 536.

HELLANICUS, the most important of the Greek logographers, was a native of Mytilene. His father was named Andromenes or Aristomenes. His life, which, as Lucian tells, lasted eighty-five years, extends over the 5th century B.C., but the date of his birth is uncertain, and the circumstances of his life are unknown. If the quotation in the scholiast on Aristophanes, *Ran.*, 706, can be trusted (fr. 80), Hellanicus in one of his works referred to the battle of Arginusae (406 B.C.). In that case (482–397 B.C.) the dates assigned by Müller (*Fragm. Hist. Gr.*, i. p. xxiv.), following the author of the *Vita Euripidis*, must be approximately correct. On the other hand Thucydides (i. 97), who died in 403 B.C., mentions the work in which this statement ought to be expected to occur, which leaves a very narrow interval for the work to appear and acquire reputation enough to be taken notice of by Thucydides; while the style of the reference certainly suggests at first sight that Hellanicus was dead when Thucydides was writing. If on these grounds we disregard the scholiast, we may on the authority of Pamphila assign 496–411 as the limits of his life. Suidas says that he died at Perperene, a town on the Gulf of Adramyttium, and that he lived for some time at the Macedonian court along with Herodotus. If the latter fact be true, the time to which Suidas assigns it, viz., during the reign of Amyntas (553–504), is impossible.

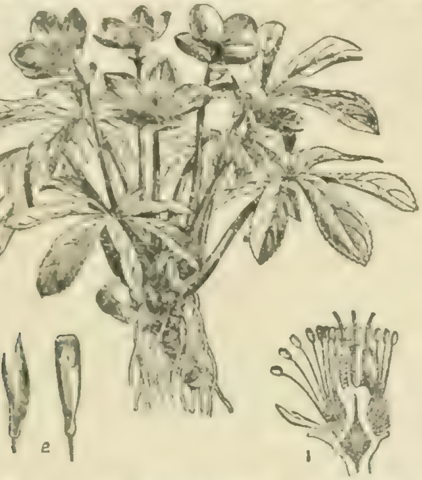
The following list of his works gives the results of Müller's careful discussion of the extant fragments:—

(1.) *Persica*, probably in two books. This work, which was written before those on Greek history, gave probably in bk. i. an account of the Assyrians and the Medes, and in bk. ii. a history of the Persian empire. (2.) *Phoronis*, Argolic traditions from Phoroneus, "father of mortal men," the contemporary of Ogyges, down probably to the return of the Heraclidae. It consisted chiefly of genealogies, with short notices of events in each period. It was probably in two books, and the works cited as *Argolica* and *Arcadica* are probably only portions of it. (3.) *Deucalioneia*, tracing Thessalian traditions in a similar manner from Deucalion, who corresponds to Phoroneus as the first man. It was in two books; and the *Thessalica* is probably only another name for it or the title of a part of it. *Asopis* was apparently an appendix giving the genealogy of the Aeacidae from Zeus and Aegina, daughter of Asopus, down to Miltiades. (4.) *Atlantis*, in two books, briefly enumerating the descendants of Atlas in general, but dwelling at much greater length on the offspring of Electra, and introducing in this part an account of Trojan history. Hence the work is often cited under the name of *Troica*. The works quoted as περὶ Ἀρκαδίας and περὶ Λυδίας are probably merely parts. (5.) *Atthis*, called by Thucydides (i. 97) ἡ Ἀττικὴ ξυγγραφή, giving in four books the history of the country from Ogyges or Cecrops down at least to the beginning of the Peloponnesian War. Thucydides says that he narrated the events between 480 and 431 B.C. very briefly, and with little regard to chronological sequence. These four works on Greek history (2–5) were probably published in one single work, and were divided by later grammarians into separate sections and books. (6.) *Lesbiaca* or *Aeolica*, a σύνταγμα ἐπιχώριον in two books at least. (7.) Ἱέρειαι τῆς Ἥρας, a list of the priestesses of the Argive Hera, comprising a synopsis both of what had been scattered through his other works and of history that had not come within the scope of these works. We may presume that a list of priestesses was preserved in the temple with a slight account of contemporary events, particularly those relating to festivals and religious matters, and that Hellanicus made this the basis of his work. Reference to this line of priestesses was one of the commonest methods of dating, and is used by Thucydides in important cases (ii. 2, iv. 133). This is probably the same work that is often referred to under the name of *Historiae*. It was in three books, the first came down to the apotheosis of Heracles and the voyage of Theseus to Crete, and the second probably to the Persian Wars. (8.) *Carneonicae*, a list of the victors in the Carneian games of Apollo from their foundation, Ol. 26; along with the enumeration of victors in the poetical and musical contests, it probably contained notices of literary events. (9.) Βαρβαρικὰ νόμιμα, quoted also with the titles [illegible], &c. As the history of the barbarian races was too little known to be arranged as Hellanicus had arranged the Greek history, the plan in this work was to enumerate the towns, and to describe the country, manners of the people, &c., like a geographer. The *Aegyptiaca* and the *[illegible]*, which were parts of this work, are [illegible] by Müller [illegible] by an Egyptian writer; while [illegible] is merely a part of [illegible]. Preller (*De Hellanici Lesbii Historia*) considers the whole work to be spurious.

As an historian Hellanicus is greatly in advance of preceding logographers. He was not content to repeat the traditions that had gained general acceptance through the poets, but he tried to give the traditions as they were locally current, and he availed himself of the few records of priests, &c., that preserved some slight contemporary information. Thus, in the first place, [illegible] that Troy had not been totally destroyed by the Greeks [illegible] Spartan [illegible] the Spartan [illegible]. Now it is certain that the Spartans [illegible] (Müller, *Frg. Hist.*, i. p. [illegible]). Secondly, Hellanicus had [illegible] His style, like that of the other logographers, was dry and bald, and there seems little foundation for the statement of Suidas that he wrote poetry, though perhaps some parts of the *Aeolica* were in verse.

HELLEBORE (Greek, ἐλλέβορος; Modern Greek also σκάρφη; German, *Niesswurz*, *Christwurz*; French, *ellébore*, and, in the district of Avranches, *herbe enragée*), *Helleborus*, L., a genus of plants of the natural order *Ranunculaceæ*,[1] natives of Europe, Western Asia, and North America. The leaves[2] are palmate or pedate (BOTANY, vol. iv. p. 111., fig. 108), are usually solitary, and have five persistent petaloid sepals, within the circle of which are placed the minute glandular tubular petals, the nectaries of Linnæus, of the form of a horn with an irregular opening, and representing, according to Baillon (*Nat. Hist. of Plants*, i. 13, 1871), "the lower or outermost stamens transformed into staminodes."[3] The stamens are very numerous, and are spirally arranged; and the carpels are variable in number, sessile or stipitate, and slightly united at the base, and dehisce by ventral suture (vol. iv. 141, 149).

Helleborus niger, L., Black Hellebore, or, as from blooming in mid-winter it is termed, the Christmas Rose (Ger., *Schwarze Niesswurz*; Fr., *Rose de Noël*), is found in southern and central Europe, and with other species was cultivated in the time of Gerard (see *Herball*, p. 977, ed. Johnson, 1636) in English gardens. Its knotty bracteated rhizome is blackish-brown externally, and, as with other species, gives origin to numerous straight roots. The leaves are radical, coriaceous, smooth, distinctly pedate, dark green above, and lighter below, with 7 to 9 segments, and long petioles. The scapes, which end the branches of the rhizome, have a loose entire bract at the base, and terminate in a single flower, with two bracts, from the axil of one of which a second flower may be developed. The flowers have 5 white or pink-tinged, eventually greenish sepals, 15 to 18 lines in breadth; 8 to 13 tubular green petals containing a sweet liquid secretion; and 5 to 10 free carpels.



Helleborus niger. 1, Vertical section of flower; 2, nectary, side and front view (nat. size).

Varieties of Black Hellebore are *H. niger minor*, or *H. angustifolius*, and Great Hellebore, distinguished as *H. niger major*, *maximus*, *grandiflorus*, and *altifolius*, or as a distinct species, *H. [illegible]*. *H. fœtidus*, L., Stinking Hellebore, in Western and Southern Europe, known also, from the shape of its leaves, as Bear's-foot or [illegible], is a native of England, where, like *H. viridis*, it is [illegible]; it is common in France and the south of Europe. Its leaves have 7- to 11 [illegible] segments, and the flowers are in panicles, numerous, cup-shaped, and drooping, with many bracts, and green sepals tinged with purple, alternating with the five petals.

H. viridis, L., or Green Hellebore proper, ranges from England, where it is probably indigenous in some of the southern and eastern counties, to Spain and Italy, and even it is said to Turkey. It has bright yellowish-green flowers, 2 to 4 on a stem, with large leaf-like bracts. Brunfels and Bock (16th century) regarded the plant as the Black Hellebore of the Greeks.

The radical leaves of *H. viridis* and its varieties, as also of *H. multifidus*, Visian., *H. purpurascens*, W. & K., *H. cyclophyllus*, Boiss., and several other forms, wither in winter. In *H. vesicarius*, Auch. (Boissier, *Fl. Orient.*, i. 61), a native of Syria, the flower-stem bears 4 to 5 flowers, and the carpels are much compressed laterally, and, when ripe, united half-way up, as in certain *Nigellæ*. *H. lividus*, Soland. (*H. argutifolius*, Viv., *triphyllus*, Mill., and *trifolius* and *corsicus*), Holly-leaved Hellebore, found in the Balearic Islands, and in Corsica and Sardinia, is remarkable for the handsomeness of its foliage. *H. atropurpureus*, Braun, which has purplish white flowers, occurs in Bithynian Olympus. *H. olympicus*, Lindl., is perhaps a variety of it. *H. cyclophyllus* (Boiss., *Fl. Orient.*, i. 61), a Grecian species, has ovate-orbicular green sepals. *H. orientalis*, Lam., *Ency.*, iii. 92 (*H. ponticus*, Braun, see Boiss., *op. cit.*), indigenous to Macedonia, Thrace, the vicinity of Constantinople, and northern Asia Minor as far east as Trebizond, has leaves pubescent below, and of 7 to 9 segments, and scapes bearing 3 to 5 flowers, with white or rosy sepals. Allied to it are *H. odorus*, W. & K., of which Koch regards *H. atrorubens* as a variety, and *H. caucasicus*, Koch,[4] having green and purplish-green sepals respectively.

Hellebores may be grown in any ordinary light garden mould, but thrive best in a soil of about equal parts of turfy loam and well-rotted manure, with half a part each of fibrous peat and coarse sand, and in moist but thoroughly-drained situations, more especially where, as at the margins of shrubberies, the plants can receive partial shade in summer. For propagation, cuttings of the rhizome may be taken in August, and placed in pans of light soil, with a bottom heat of 60° to 70° Fahr.; hellebores can also be grown from seed, which must be sown as soon as ripe, since it quickly loses its vitality. The seedlings usually blossom in their third year. The exclusion of frost favours the production of flowers; but the plants, if forced, must be gradually inured to a warm atmosphere, and a free supply of air must be afforded, without which they are apt to become much affected by greenfly. The flowers on one plant of *H. niger major* in Mr B. Hooke's garden at Bradfield, Berks, about the end of January 1878, numbered nearly 500 (*Gard. Chron.*, 1878, i. 445). For potting, *H. niger* and its varieties, and *H. orientalis*, *atrorubens*, and *olympicus* have been found well suited. After lifting, preferably in September, the plants should receive plenty of light, with abundance of water, and once a week liquid manure, not over-strong. The flowers are improved in delicacy of hue, and are brought well up among the leaves, by preventing access of light except to the upper part of the plants. Of the numerous species of hellebore now grown, the deep-purple-flowered *H. colchicus* is one of the handsomest. *H. atropurpureus*, introduced in 1844, blooms in March or at the end of February, and may be effectively used in flower borders to succeed hepaticas, scillas, and crocuses (Maund, *Bot. Gard.*, vi., pl. ccxviii., fig. 2). Hellebores having variously coloured spreading or bell-shaped flowers, spotted with crimson, red, or purple, were grown by Sauer, late superintendent of the Berlin University Garden, about the year 1851, as the result of crossing *H. guttatus*, Braun, and *H. purpurascens*. Other fine varieties have been obtained by Bouché, his successor, from crosses with *H. olympicus*, and by Carl Heinemann from *H. guttatus* and *H. abchasicus*.

The rhizome of *H. niger* occurs in commerce in irregular and nodular pieces, from about 1 to 3 inches in length, white, and of a horny texture within. Cut transversely it presents internally a circle of 8 to 12 cuneiform ligneous bundles, surrounded by a thick bark. It emits a faint odour when cut or broken, and has a bitter and slightly acrid taste. The drug is sometimes adulterated with the rhizome of baneberry, *Actæa spicata*, L., which, however, may be recognized by the distinctly cruciate appearance of the meditullium of the attached roots when cut across, and by its decoction giving the chemical reactions for tannin.[1] The rhizome is darker in colour in proportion to its degree of dryness, age, and richness in oil. A specimen dried by Schroff lost in eleven days 65 per cent. of water.

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[1] On the plants known as White Hellebore (*Veratrum album*), and American White Hellebore, incorrectly called "Green Hellebore" (*V. viride*), which are members of the natural order *Melanthaceæ*, see VERATRUM.

[2] On the development and structural relations of the leaves, see A. Trécul, *Ann. Sci. Nat.*, Bot., ser. iii., tom. xx. 260, 268, pl. 23, figs. 101–4, 1853; and Clos, *Bull. Soc. Bot. de France*, iii. 682, 1856.

[3] On the petals of the hellebores, see J. B. Payer, *Traité d'Organogénie comparée de la Fleur*, pp. 256–260, 1857. In the opinion of Baillon (*op. cit.*, pp. 15–16), the genera *Eranthis* and *Coptis*, from the structure of their flowers, as also *Isopyrum* and *Trollius*, should not be generically separated from *Helleborus*.

[4] According to Regel, *H. orientalis*, *caucasicus*, *colchicus*, *antiquorum*, *olympicus*, *guttatus*, and *abchasicus* should all be reduced to one species. Koch (*Gard. Chron.*, 1874, i. 118) regards the Hungarian *H. purpurascens*, W. & K., and the Caucasian *H. colchicus*, Reg. (= *H. porphyromelas*, Braun), as varieties of the last-named. The "*H. abchasicus*" of Belgian florists is stated by M. J. L. Le Bèle ("[illegible] Hellèb.," *La Belgique Horticole*, viii. 231) to be merely a variety of *H. intermedius*, Guss.

H. [illegible], *fœtidus*, and several other species of hellebore contain [illegible] [illegible] conjunctiva, and acts as a sternutatory, [illegible]

[illegible], Schroff found *H.* [illegible] "I have [illegible]

of this plant, if identical, as would appear, with that obtained by Tournefort at Prusa in Asia Minor (*Rel. d'un Voy. du Levant*, ii. 189, 1718), must be a remedy of no small toxic properties. According to an early tradition, black hellebore administered by the soothsayer and physician Melampus (whence its name *Melampodium*), was the means of curing the madness of the daughters of Prœtus, king of Argos. The drug was used by the ancients in paralysis, gout, and other diseases, more particularly in insanity, a fact frequently alluded to by classical writers, *e.g.*, Horace (*Sat.*, ii. 3, 80-83; *Ep. ad Pis.*, 300). Various superstitions were in olden times connected with the cutting of black hellebore. The best is said by Pliny (*Nat. Hist.*, xxv. 21) to grow on Mt Helicon. Of the three Anticyras (see vol. ii. p. 127), that in Phocis was the most famed for its hellebore, which, being there used combined with "sesamoides," was, according to Pliny, taken with more safety than elsewhere.

See [illegible] *Arznei-Gewächse*, i. pl. 2 and 7-10 [illegible]; Sibthorp, *Flora Græca* [illegible] Reichenbach, *Icon. Fl. Germ.*, iv. [illegible] [illegible]

HELLENISTS (Ἑλληνισταί) was the name usually applied by those who called themselves Greeks (Hellenes) to all Græcizing and more especially to all Greek-speaking foreigners,—a class which, after the conquests of Alexander the Great, formed a large and important element in almost every community throughout the civilized world. More particularly the word is applied in the New Testament (Acts vi. 1; ix. 29; and, according to the *textus receptus*, also xi. 20, where, however, the best MSS. and critical editions read Ἕλληνας) to Greek-speaking or "Grecian" Jews, who, besides being very numerous in the various countries of the dispersion, had also many synagogues in Jerusalem, and were remarkable there for their zeal. Indeed their presence in the capital of Judaism at all may safely be taken to have implied on their part a more than ordinary interest in the affairs of the ideal theocratic kingdom; their attitude therefore to Christianity, when that new system first came to be promulgated, could not fail to be very pronounced on the one side or on the other. The early records show that the apostles made many converts among the Hellenists of the city; and it is interesting to note that, if the names can be taken as a safe indication, all the seven deacons mentioned in Acts vi. 5 belonged to the "Hellenistic" and not to the "Hebrew" party within the primitive church. Saul of Tarsus also was a Hellenist; but whether he belonged to the synagogue of the "Libertines" or to that of "them of Cilicia" is a question which our data do not enable us to decide. In the Vulgate, which translates Ἑλληνισταί by the word "Græci," the distinction so consistently preserved in our authorized version between "Grecians" and "Greeks" is made to disappear.

HELLESPONT, the modern DARDANELLES (vol. vi. p. [illegible]), is variously named in classical literature Ἑλλήσποντος, Hellespontus, ὁ Ἕλλης πόντος, Fretum Helles, Hellespontum Pelagus, and Fretum Hellespontium. It received its name from Helle, in Greek mythology, daughter of Athamas, king of Orchomenus in Bœotia, and of the goddess Nephele, whom he had married at the command of Hera. Athamas, however, secretly loved the mortal Ino, and on his marrying her also the dissensions between his wives became so great that he went to consult the Delphic oracle. The priests there, bribed by Ino, replied that the sacrifice of Phrixus, the brother of Helle, was necessary to domestic harmony; but Nephele, in order to save her children, despatched them to Colchis in Asia, on the back of the ram with the golden fleece. Helle, however, had the misfortune, when crossing the strait, to slip from her seat and to be carried away by the current: hence the name *Hellespontus*, or "Sea of Helle."

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[1] [illegible] see [illegible], *Hist. des Drogues*, [illegible] 1878.

HELLIN (*Illunum*), a town of Spain, in the province of Albacete, is situated on the slope of the Sierra de Segura, 36 miles S.S.E. of Albacete. It is a clean and well-built town, and possesses the remains of an old Roman castle and a beautiful parish church, the fountains and marble pavements at the entrance of which are worthy of special notice. The principal manufactures are sulphur obtained from the celebrated mines about 15 miles distant, earthenware, linen, cloth, hats, leather, and oil. Hellin was sacked by the French under Montbrun, and was the point where Joseph and Soult united with Suchet after Marmont's defeat at Salamanca. The population is about 8000.

HELMERS, JAN FREDERIK (1767–1813), Dutch poet, was born at Amsterdam, March 7, 1767. His early poems *Nacht* (1788) and *Sonnets* (1790) were tame and sentimental, but he woke up after 1805 to the melancholy condition of the Fatherland, and determined, in company with his friend Cornelis Loots, to rouse national feeling by a burst of patriotic poetry. His poems, published in 1809 and 1810, but especially his great work *The Dutch Nation* (1812), created great enthusiasm and enjoyed immense success. Helmers died at Amsterdam, February 26, 1813. He was a fiery, somewhat turgid writer, by no means devoid of force, but owing his success mainly to the integrity of his patriotism and the opportune moment at which he sounded his counterblast to the French oppression. His posthumous poems were collected in 1815.

HELMET, or HELM (Anglo-Saxon, *Helm*; Italian, *Elmo*, *Elmetto*; French, *Heaume*; Icelandic, *Hjalmr*), is the term used in a general sense to include the various forms of head defences which were either made in solid metal or of metal plates. The form of helmet used among the Assyrians, as shown by the monumental sculptures, was a close-fitting skull-cap, round or conical, sometimes surmounted by a crest rising from the summit of the cone and curving forwards in a semicircular form. The Greek helmet was also in its simplest form a skull-cap, covering the head in front above the level of the eyes, but reaching down to the nape of the neck from ear to ear. Another form had this lower part prolonged and carried round so as to cover all down to the shoulders with the exception of a slit in front, partly protected by a nose-piece. Occasionally hinged cheek-pieces were added to the skull-cap, and the upper part of the casque was sometimes prolonged into a conical shape with a crest curving forwards, or surmounted by a ridged prominence on which was fastened a flowing crest of horsehair. The Greek helmets are often represented as highly decorated, and many examples of the different forms and their varieties of decoration occur on the painted vases, the gems, and the coinage. The Etruscan helmet differed but slightly from that of the Greeks. It was more conical in form, and often furnished with horns or wings in place of a crest. The Roman helmet was usually a skull-cap, with or without crest, and often plain and undecorated. The Gaulish helmet, of which a beautiful specimen was obtained from an Iron Age burial at Berru in Marne in 1872, was of hammered iron, conical in shape, terminating in an ornamented apex, and having a richly decorated border round the lower part. Conical helmets of an earlier character found at Theil and Auxonne have been assigned to the Age of Bronze. A silver helmet of the Early Iron Age, consisting of a skull-cap with a mask for the face fastened together by a hinge, which was found in the Thorsbjerg Moss in South Jutland, is the only specimen known of the early Teutonic helmet. An Anglo-Saxon helmet of iron, shaped like a skull-cap, and formed of ribs or flat strips of metal covered with plates of horn, and surmounted with the figure of a boar, was found in a tumulus at Benty Grange in Derbyshire. Such boar-crowned helmets are referred to in the Anglo-Saxon poem of Beowulf. The helmets worn by the Normans and Saxons at the time of the Conquest, as shown in the Bayeux tapestry, were conical in shape with a projecting nasal. The earliest known example of a date subsequent to the Norman Conquest is one which was discovered in the church of Faversham, and is now in the Musée d'Artillerie at Paris. It preserves the conical top of the earlier Norman headpiece, but has a barrel-shaped body, covering all the head and face with the exception of a vertical slit partially protected by a projecting nasal, and having transverse apertures on either side for the eyes. This barrel shape, with flattened instead of conical top, continued in use during the 12th century in England, although the conical cap with the nasal appears on the great seals of the Scottish kings down to the time of Alexander II. The helm of Edward the Black Prince (died 1376), which still hangs over his tomb in Canterbury Cathedral, has the top shaped like a truncated cone and the lower part more oval than barrel-shaped, the aperture for sight taking the form of a transverse slit between the upper and lower parts of the helm. In the lower portion the perforations for breathing are arranged in the form of a crown on both sides. The helm of Henry V. (died 1422), which hangs with his saddle and shield above his tomb in Westminster Abbey, is lower in the crown, more rounded to the shape of the head, and the *ocularium* or perforation for sight is protected by the projection of the lower part beyond the line of the upper. The helm of King Henry VI., which was suspended over his tomb in St George's Chapel, Windsor, has the lower part contracted to the form of the neck and rounded to the shape of the shoulders. The *ocularium*, which is wide, is protected by a series of curved bars riveted across it. The helm of Edward IV. (died 1483), which was also suspended in St George's Chapel, exhibits a still greater shaping to the form of the neck and shoulders; the top is rounder, and has a spike for a crest. In the end of the 15th century the great helm was superseded by the smaller headpiece with movable vizor and beaver or chinpiece and neck guard, which is properly styled a helmet. Other varieties of headpiece were the bascinet, of a plain oval form pointed at the top and somewhat compressed on the sides, having holes at the bottom for the attachment of the camail or gorget of chain mail. The bascinet was sometimes worn alone and sometimes under the helm. It was succeeded in the 15th century by the salade, a lighter skull-cap with the hinder part projecting, and occasionally a movable vizor. The armet, the burgonet, and the casque are varieties of the lighter form of headpiece, partaking more or less of the skull-cap form, while the morion and the chapelle de fer were distinguished by their flattened brims.

HELMOND, a town of the Netherlands, in the province of North Brabant, to the left of the river Aa, with a station (since 1866) on the state railway between Venloo and Eindhoven. The castle of Helmond remains a beautiful specimen of the architecture of the 15th century, and among the other buildings of note in the town are the spacious church of St Lambert, the Reformed church, and the town house. Cotton-weaving on a very extensive scale, dyeing, iron-founding, brewing, soap-boiling, and tobacco dressing are the chief industries of the commune. The population of the town proper in 1870 was only 5280, but the commune, which includes several suburbs, had about 6500.

Helmond is first mentioned as a town in 1354, but it may possibly be identified with a certain Harlemont or Harlomont which appears in the 11th century. In the middle of the 13th century it was the favourite residence of Mary of Brabant, queen of the Romans. Fortified shortly after the attack of the people of Guelderland in 1543, it continued a place of military importance till the peace of Münster. The occupation of the town by the duke of Parma in 1579, its recovery by the states of Holland in 1581, its capture by the count of Hohenlohe in 1588, and the seizure of the castle by Count Frederick of Nassau are the chief events in its military annals. In 1814 the town received the right of parliamentary representation, but it afterwards lost the privilege.

HELMONT, JEAN BAPTISTE VAN (1577–1644), was born at Brussels in 1577. He was educated at Louvain, and began the study of natural science under the Jesuits in that city. Their hard and dry philosophy, however, had few attractions for a nature so ardent and imaginative as his. Turning for relief to other systems, he found no rest except in the mysticism of A Kempis and Tauler. From them he learned that wisdom is the gift of the Supreme Being, that it must be obtained by prayer, and that we must renounce our own will if we wish to participate in the influence of the divine grace. From this time he began a life of exemplary meekness and humility, made over his property to his sister, and retired from the high society in which he had hitherto walked. He devoted himself to the study of medicine, read carefully all that had been written on the science, and felt dissatisfied with its method and results. He then turned to Paracelsus and the alchemists, and conferred a real boon on humanity by rescuing chemical science from the erratic absurdities of the post-Paracelsian alchemists, and applying to it more philosophical principles. He graduated as M.D. in 1599, and, after travelling through France and Italy, Switzerland and England, married a rich lady of Brabant, by whom he had several children. He died in Holland in 1644, in the sixty-seventh year of his age. Science is under real obligations to Van Helmont, though the greater part of his speculations present a curious mixture of mystical philosophy and acute chemical research. To him is due the invention, or at least the first application, of the term "gas" in the sense in which it is now used. He also discovered that gas was disengaged in abundance by the application of heat to various bodies, and during the solution of various carbonates and metals in acids.

Van Helmont's works were published at Amsterdam in 1648 by his son Mercurius; a more accurate and complete edition is that of Elzevir, 1652. The fullest account of his speculations is given in Rixner and Siber, *Beiträge zur Geschichte der Physiologie* (1819–26), Hft. vii. See also Spiess, *Helmont's System der Medicin*, 1840; Rommelaere, *Études sur J. B. v. Helmont*, 1868. Van Helmont's mystical theosophy and alchemy appeared in even greater confusion in the works of his youngest son, Franz Mercurius, who was born in 1618 and died, after a somewhat adventurous and troubled life, at Berlin in 1699. His chief works are *Cabbalah Denudata*, 1677; *Paradoxical Discourses*, 1685, and *Opuscula Philosophica*, 1690.

HELMSTADT, or HELMSTEDT, a town of Germany in the duchy of Brunswick, is situated on the railway from Magdeburg to Brunswick, 23 miles E. of Brunswick. It is the seat of a circle directorate, and of a circle and a district court. The principal buildings are the Juleum in the Byzantine style, founded by Duke Julius of Brunswick in 1575 for the university which was abolished in 1809, and now containing an old library of 40,000 volumes; the church of St Stephen's, dating from the 12th century; the Lutheran female foundation, with a beautiful church in the Roman style; and the Catholic church and ruined monastery of St Ludger. The educational institutions include a gymnasium, two city schools, an agricultural school, and two female schools of the higher grade. The principal manufactures are yarn, soap, tobacco, sugar, vitriol, earthenware, and tapestry paper. Not far from the town there is an iron mineral spring especially efficacious in gouty affections. Near it a monument has been erected to those who fell in the Franco-German war of 1870–71; and in the town there is also a monument to those who fell at Waterloo. The population in 1875 was 7783.

Helmstadt originated in connexion with the Ludger monastery, founded by Ludger, the first bishop of Münster, about the end of the 8th century. It obtained town rights in [illegible], and though it was destroyed by the archbishop of Magdeburg in 1199 it was soon rebuilt. In 1457 it joined the Hansa, and in 1490 it came into the possession of Brunswick. See Kunhard, *Beiträge zur Geschichte der Universität Helmstadts*, 1797; Ludewig, *Geschichte und Beschreibung der Stadt Helmstädt*, 1821; *Geschichte der ehemaligen Hochschule Julia Carolina zu Helmstädt*, 1876.

HELOISE. See ABELARD.

HELOTS, in Grecian antiquity, were the serfs or bondsmen of the Spartans. The most probable of the various explanations of their origin seems to be that they were the early aborigines of Laconia, who at the time of the Dorian invasion were reduced to slavery by the conquerors. The name is perhaps best derived from the root ἑλ, found in ἑλεῖν, ἥλων, and other words. The Helots were the lowest class of the inhabitants of Sparta; but those of them who were emancipated formed the class of *Neodamodes*, next in political rights to the Spartan citizens themselves. The *Mothones* or *Mothakes* were domestic slaves who had been brought up along with the young Spartans, and afterwards liberated. The Helots were the property of the state, which alone had the right of emancipating them, although it made over their services to individuals. They were attached to the soil—*adscripti glebæ*—and could not be sold away from it. They tilled the land which was allocated to them in the proportion of one lot to several families; and for each lot they paid to their masters an annual rent of 82 medimni of barley, and a quantity of wine and oil. They were also employed on public works, and performed all domestic service. In time of war the Helots generally served as light-armed troops; but when on special emergencies they fought as *hoplites*, they were usually rewarded with their freedom. The first occurrence of this kind was under Brasidas in 424 B.C. In the fleet the great bulk of the sailors were Helots. Although every care was taken to distinguish the serf from his lord, even in the matter of dress, the accounts of the cruel treatment of the Helots by the Spartans only hold true of the later history of Lacedæmon. The condition of the Helot was better than that of a slave in other Greek states, for, being a serf of the soil, he was not wholly at the mercy of his master, and there was a legal way whereby, after many stages, he could eventually attain freedom and citizenship. After the Messenian war, however, when the multitude of the Helots made them formidable to the diminished numbers of the full citizens, there is no doubt that very cruel measures were adopted against them. The evidence is strong that the *Crypteia*, instituted ostensibly to inure the Spartan youth to hardship, was really intended to reduce the number of the Helots by assassination; and we know from Thucydides (iv. 80) that on one occasion 2000 Helots were treacherously massacred by the Spartan citizens. At the close of the second Messenian war (668 B.C.), the conquered Messenians were classed with and treated as the Helots till Epaminondas restored them to their native country after the battle of Leuctra (371 B.C.).

For further details see Plutarch's *Life of Lycurgus*, Thirlwall's *History of Greece*, Grote's *History of Greece*, Müller's *History of the Dorians*, and Hermann's *Political Antiquities of Greece*.

HELPS, SIR ARTHUR (1813–1875), fourth and youngest son of Thomas and Ann Friscott Helps, was born at Balham Hill, in the parish of Streatham and county of Surrey, on the 10th of July 1813. His father was then and for many years afterwards head of a large mercantile house in the city of London, and for the last thirteen years of his life treasurer of St Bartholomew's Hospital. His mother was the only surviving child of John, fourth son of the Rev. Charles [illegible], M.A., of [illegible]. After the usual preliminary training at Eton, young Helps went to Trinity College, Cambridge, passing as B.A. in 1835, when he came out 31st wrangler in the mathematical tripos, and taking his M.A. degree in 1839. Although he took no high honours at the university,—and indeed he had not health sufficiently robust, even if he had possessed the ambition, to achieve them, he was recognized by the ablest of his contemporaries there as a man of superior gifts, and likely to make his mark in after life. They showed this by electing him as a member of the Conversazione Society, better known as the Apostles, a society which had been established in 1820 for the purposes of discussion on social and literary questions by a few young men attracted to each other by a common taste for literature and speculation. A body which in its early days included the names of Charles Buller, Frederick Maurice, Richard Chenevix Trench, Monckton Milnes, Arthur Hallam, and Alfred Tennyson had in it every element to make its gatherings delightful as well as useful. To be elected into its limited circle was a distinction of which Arthur Helps was proud then and to the close of his life; and, familiar as he was with the best and most intellectual society of his time, the social hours passed year by year with the Cambridge Apostles were always counted by him among his happiest, both in anticipation and in remembrance.

In the discussions of these and later days Helps may have found the suggestions for the dialogues of the *Friends in Council*, in which his genius appears at his best. But his first literary effort, which appeared under the title of *Thoughts in the Cloister and the Crowd* in 1835, the year he took his B.A. degree, assumes a very different but scarcely less ambitious form, that of a series of aphorisms upon life, character, politics, and manners. As a rule, such things are only valuable when they come as the fruits of wide experience and matured thought. Still in this volume are to be found passages which may take their place beside the sayings of Vauvenargues, Chamfort, and other masters of aphorism of the second rank, and are quite equal in quality to the many pithy quotable sayings scattered through Helps's later works.

Soon after leaving the university, where he had established many valuable friendships, Arthur Helps became private secretary to Mr Spring Rice (afterwards Lord Monteagle), then chancellor of the exchequer in Lord Melbourne's administration. This appointment he filled till 1839, when he went to Ireland as the private secretary of Lord Morpeth (afterwards earl of Carlisle), then the chief secretary of state for Ireland, where he remained until his principal left Ireland in 1841, on the Government passing from Lord Melbourne into the hands of Sir Robert Peel. In the meanwhile (28th October 1836) Helps had married Miss Bessy Fuller, a young Irish lady. He was also appointed one of the commissioners for the settlement of certain Danish claims which dated so far back as the siege of Copenhagen; but with the fall of the Melbourne administration his official experience closed for a period of nearly twenty years. The character which he had established for himself by his tact, sagacity, and business habits was not, however, forgotten by his political friends. And combined as these qualities were with an admirable manner which invited confidence while it repelled intrusion, and with a reticence and discretion on which absolute reliance could be placed, his fitness for official life was unmistakable. When therefore the clerkship of the Privy Council became vacant in 1860, on the resignation of the Hon. W. L. Bathurst, he was recommended for the appointment by his old friend Lord Granville, who knew that for ability, tact, and discretion it could not be in safer hands.

During his early official career Helps cultivated literature with varying success. His *Essays written in the Intervals of Business*, published in 1841, and his *Claims of Labour, an Essay on the Duties of the Employers to the Employed*, published in 1844, continue to interest, and are likely to keep their place in well-selected libraries. But two plays, *King Henry the Second, an Historical Drama*, and *Catherine Douglas, a Tragedy*, both published in 1843, have no particular merit. Neither in these, nor in his only other dramatic effort, *Oulita the Serf*, published in 1858, a work far superior, however, to his earlier efforts of the same kind, are to be found the sense of dramatic situation and movement, the sharp outlines and contrast of character, or the fitness and concise force of diction which alone justify the selection by an author of the dramatic form as the vehicle for his thoughts. Helps possessed, however, just enough dramatic power to give life and individuality to the dialogues which he introduced with excellent effect to enliven many of his other books. His first effort in this direction was in *Friends in Council, a Series of Readings and Discourse thereon*, published in 1847 and 1851. The plan of this book seems to have been suggested by a passage in Bacon's essay *Of Discourse*, which appears as the motto of it. "It is good in discourse and speech of conversation to vary and intermingle speech of the present occasion with arguments, tales with reasons, asking of questions with telling of opinions, and jest with earnest; for it is a dull thing to tire, and, as we say now, to jade anything too far." The variety and conflict of opinion, the play of character, the flashes of humour, got by submitting the formal essays on social and moral questions which made the staple of these volumes to be criticized and pulled to pieces by the imaginary personages, who, under the names of Milverton, Ellesmere, and Dunsford, grew to be almost as real to Helps's readers as they certainly became to himself, gave a special charm to a book which, by its richness of suggestion, its sweetness of tone, and beauty of style, made for its author a high and enduring reputation. The same expedient was resorted to for the discussion of the ideas of social and philanthropic improvement on which Helps's mind was always at work, in a second series of *Friends in Council*, published in 1859, and again in *Conversations on War and General Culture*, published in 1871. The old familiar speakers, with others added, also appeared in his *Realmah*, and finally in what certainly must always rank as the best of its author's later works, *Talk about Animals and their Masters*, published in 1873.

The subject of slavery was one which had a peculiar fascination for Helps. A long essay is devoted to it in the first series of *Friends in Council*. This was subsequently elaborated into a work in two volumes published in 1848 and 1852, called *The Conquerors of the New World and their Bondsmen*. Helps's interest in the subject led him into further investigations into the history of the conquest of America by the Spaniards, and he went to Spain in 1847 for the special purpose of examining the numerous MSS. bearing upon the subject at Madrid. The fruits of these researches were embodied in an historical work based upon his *Conquerors of the New World*, and called *The Spanish Conquest in America, and its Relation to the History of Slavery and the Government of Colonies*. This appeared in four volumes during the years 1855, 1857, and 1861. No pains were spared by its author to secure the most scrupulous accuracy as to the facts with which he dealt. He had found, as most inquirers into the sources of history have found, that this accuracy is rarely to be met with in accepted histories. On this point he was determined that he should not be open to censure; and so anxious was he that fact should not be coloured or distorted by imagination that he deliberately resisted the temptation to use the picturesque method of treatment by which other writers on the same subject have secured popularity. The success of this work with the public was injured by other peculiarities. History, like fiction, will not bear to be written with an obtrusively moral purpose, as this book was written. Its merits in a literary point of view were also diminished by the author's tendency to suspend the onward movement of the narrative whilst he pauses to analyse character, to investigate motives, and to philosophize upon results.

This book, the result of years of research and meditation, was not a success. But the excellence of the studies of the great pioneers of Spanish conquest which it contained was quickly perceived when some years afterwards they were recast and published as separate biographies. Thus *The Life of Las Casas, the Apostle of the Indies*, appeared in 1868, *The Life of Columbus* in 1869, *The Life of Pizarro* in the same year, and *The Life of Hernando Cortes* in 1871. In this form all that is [illegible] within the reach of a [illegible] circle of readers, to whom the result of Helps's researches otherwise would have been unknown.

From the time of his appointment as Clerk of the Council in [illegible] to his death, Helps continued to add to [illegible] [illegible] that, in the words of [illegible] (*[illegible]*, cap. [illegible]), "things in this world are not as they ought to be". No [illegible] [illegible] *Life of Mr Thomas Brassey* (187[illegible]), [illegible] (1874), *Social Pressure* (1875).

[illegible] make h[illegible] [illegible] [illegible]llection, published in 1862, of the Prince [illegible] [illegible] Sir Arthur Helps's friends for some years before his death.

This came after only a few days' illness on the 7th of March 1875.

Sir Arthur Helps was of middle height, slender, dark in complexion, with a high well-formed forehead, deep-set eyes, and a mouth the [illegible] grave expression of which was tempered by a pleasant smile, when his fancy was touched by the humorous [illegible] to which he was [illegible] sensitive. [illegible] (T. SA.)

HELSINGBORG, a town of Sweden, province of Skåne and län of Malmö, is beautifully situated at the narrowest part of the Sound—there only 3 miles wide—opposite Elsinore, and 32 miles N.N.W. of Malmö. It is connected with the Swedish railway by a branch line to [illegible], and it has regular communication with Denmark by steamer. The harbour, completed in 18[illegible], [illegible]. The [illegible] [illegible] [illegible] population, which in 1[illegible] was only 17[illegible]1, in 18[illegible] was [illegible], and in 1876 had reached 1[illegible].

[illegible]

HELSINGFORS (Finnish, *Helsinki*), chief city of the grand-duchy of Finland and the government of Nyland, in [illegible] [illegible] Helsinge, on the Gulf of Finland, 274 miles by rail [illegible] of St Petersburg. The latitude of the observatory is 60° [illegible] N., and longitude 24° 57′ [illegible] E. from Greenwich

The town is well laid out, with long and wide streets running at right angles. The houses are large and well built, and the principal square contains several fine buildings, as the senate-house, the university, and a magnificent church. [illegible] gardens, [illegible] well supplied with [illegible] a beautifully [illegible] The [illegible] 1827, has [illegible] 53 [illegible] a museum [illegible] There [illegible] In the hall of [illegible] the emperor; in [illegible] saved from [illegible] 16,000 volumes. [illegible] with 850 [illegible] front of the [illegible] the population was [illegible] about [illegible]

[illegible] The [illegible] 7,100 came from, and of [illegible] vessels of [illegible] vessels [illegible] in 1875 [illegible]

[illegible] in the 16th century, [illegible] it was removed by [illegible] In 17[illegible] it was the scene of [illegible] admiral, [illegible] A [illegible]

[illegible] 1874.

HELST, BARTHOLOMEUS VAN DER, was born in Holland at the [illegible] of the 17th century, and died at Amsterdam in 1670. [illegible] It has [illegible] by competent authority that Van der Helst was not a native of Amsterdam, [illegible] as early as 1607 [illegible] of Van der Helst in the [illegible] Museum [illegible] 1607, and there is no [illegible] really his; though if [illegible] would show that he learnt his art from [illegible] Hals and became a skilled master as early as 1631. [illegible] Dutch art [illegible] that Van der Helst was a resident at Amsterdam in 1636. His first great picture, representing a [illegible] of civic guards at a brewery, is variously [illegible] 1639 and 1643, and still adorns the town-hall of Amsterdam. His noble portraits of the burgomaster Bicker and Andreas Bicker the younger, in the gallery of Amsterdam, of the same date no doubt as Bicker's wife lately in the Ruhl collection at Cologne, were completed in 1642. From that time till his death there is no difficulty in tracing Van der Helst's career at Amsterdam. He acquired and kept the position of a distinguished portrait-painter, [illegible] little or nothing besides portraits at any time, but [illegible], in conjunction with Nicolaes de Helt Stokade, the painters' guild at Amsterdam in 1654. At some unknown date he married Constance Reynst, of a good patrician family in the Netherlands, bought himself a house in the [illegible], and ended by [illegible] a [illegible]. His [illegible] of Paul Potter at the Hague, executed in 1654, and his partnership with Bakhuysen, who laid in the background of one of his pictures in 1668, indicate a constant companionship with the best artists of the time. [illegible] has said that his portrait of Admiral Kortenaar, in the gallery of Amsterdam, betrays the [illegible] of Frans Hals, and the statement need not be gainsaid; yet on the whole Van der Helst's career as a painter was mainly a protest against the systems of Hals and Rembrandt. It is needless to dwell on the pictures which preceded that of 1648, called the Peace of Münster, in the gallery of Amsterdam. The Peace challenges comparison at once with the so-called Night Watch by Rembrandt, and the less important but not less characteristic portraits of Hals and his wife in [illegible]. Sir Joshua Reynolds was disappointed by Rembrandt, whilst Van der Helst surpassed his expectation. [illegible] asked whether Reynolds had not already been struck with blindness when he ventured on this criticism. The question is still an open one. But certainly Van der Helst attracts by qualities entirely differing from those of Rembrandt and Frans Hals. Nothing can be more striking than the contrast between the strong concentrated light and the deep gloom of Rembrandt and the contempt of chiaroscuro peculiar to his rival, except the contrast between the rapid sketchy touch of Hals and the careful finish and rounding of Van der Helst. The Peace is a meeting of guards to celebrate the signature of the treaty of Münster. The members of the Doele of St George meet to feast and congratulate each other not at a formal banquet but in a spot laid out for good cheer, where De Wit, the captain of his company, can shake hands with his lieutenant Waveren, yet hold in solemn state the great drinking-horn of St George. The rest of the company sit, stand, or busy themselves around,—some eating, others drinking, others carving or serving—an animated [illegible] on a long canvas, with figures large as life. Well has Burger said, the heads are full of life and the hands admirable. The dresses and subordinate parts are finished to a nicety without sacrifice of detail or loss of breadth in touch or impast. But the eye glides from shape to shape, arrested here by expressive features, there by a bright stretch of colour, nowhere at perfect rest because of the lack of a central thought in light and shade, harmonies, or composition. Great as the qualities of Van der Helst undoubtedly are, he remains below the line of demarcation which separates the second from the first-rate masters of art.

His pictures are very numerous, and almost uniformly good, but in his later [illegible] he wants power, and though still [illegible], [illegible] grey [illegible] touch. At Amsterdam the [illegible] the Workhouse [illegible] the gallery (1650), and four [illegible] in the town-hall (1657) are [illegible], to which [illegible] single portraits. Rotterdam [illegible] of 1864, still boasts of three of Van der Helst's works. The Hague, as we saw, owns but one. St Petersburg [illegible] of various shades of excellence. The Louvre has three, Munich four. Other [illegible] in the galleries of Berlin, Brunswick, Brussels, Carlsruhe, Cassel, Darmstadt, Dresden, Frankfort, Gotha, Stuttgart, and Vienna.

HELSTON, a municipal and parliamentary borough and market town of England, county of Cornwall, is situated on the declivity of a hill on the river Cober, 9 miles S.W.

of Falmouth. It consists of four main streets intersecting each other at right angles; at their junction in the centre stands the market-house. The principal other buildings are the church dedicated to St Michael and built by the earl of Godolphin in 1763, the town-hall, the old coinage hall, the literary institute, the grammar school, and the union workhouse. The prosperity of the town is due to its being the centre of an extensive agricultural and mining district. The principal manufacture is shoes. At Porthleven, about 3 miles distant, a considerable export and import trade is carried on. Population of municipal borough (1871), 5797, of parliamentary borough (area 10,992 acres), 8760.

Helston is one of the ancient stannary towns. It obtained a charter from King John, and the [illegible] by Edward III. [illegible] It was [illegible] parate town by Elizabeth. Before the Reform Act of 1832 it returned two members to parliament, but it now returns only one.

HELVETII. See SWITZERLAND.

HELVETIUS, CLAUDE ADRIEN (1715–1771), was descended from a family of physicians, the first of whom, John Frederick Schweitzer (Latinized into Helvetius), migrated from Germany to Holland about the year 1649, and became physician to the prince of Orange. His later years were spent in the study of alchemy. His son, John Adrien, also a physician, went to Paris in the hope of establishing a sale for his father's drugs. He failed in this attempt, but was so fortunate as to introduce with the greatest success the use of ipecacuanha, then an unknown drug. The duchess of Chaulnes, whom he had treated successfully, introduced him to Colbert, who recommended the young physician to the dauphin, after which his reputation was firmly established. His son, John Claude Adrien, who embraced the same career with even greater success, was appointed inspector-general of the military hospitals of Flanders and first physician to the Queen Marie Leczinska. He was remarkable for the generosity with which he received and visited poor patients who could pay him nothing. His son, Claude Adrien, the future author of *De l'Esprit*, showed as a boy little aptitude for study, but was fond of desultory reading. His father, who destined him for finance, placed him for a few years with his maternal uncle, M. D'Armancourt, "directeur des fermes" at Caen. There he learned all that was necessary for a profession so simple, and having plenty of spare time amused himself with writing verses and cultivating social graces. He was elected a member of the academy of Caen, and when he was only twenty-three years of age he had the singular good fortune to be appointed, at the queen's request, to a place as farmer-general, in other words, while still a very young man he was put into a post of great importance and dignity which was worth a hundred thousand crowns a year. Thus provided, young Helvetius proceeded to enjoy life to the utmost. He had every accomplishment except one, that of noble birth; he was the handsomest man of his time; he was possessed of a manner singularly charming; he was able to hold his own among the scholars and philosophers and poets; he was skilled in all those arts cultivated by gentlemen; he was generous like his father, and his great fortune enabled him to gratify his love of giving; he had [illegible] and was a friend of Fontenelle, Voltaire, and Montesquieu, besides being a patron of such writers as Marivaux, Saurin, and [illegible]. Probably there was no young man in Paris in the years 1740 and 1750 who [illegible] contented with his lot than the spoiled child of fortune, on whose name there rested but one blot, an almost morbid desire to shine. So far indeed did he carry this passion for distinction that he once danced on the stage of the opera under the mask and name of the public favourite Javillier.

As he grew older, however, [illegible] naturally ceased; the splendour of his youth had vanished; he began to dream of other and more lasting distinctions. Maupertuis, he observed, had put mathematics in fashion; he himself would be a mathematician. Voltaire was illustrious for poetry; he too would be a poet. Montesquieu had made so brilliant a success with his *Esprit des Lois* that he himself would become a philosopher. The mathematical dream seems to have produced nothing; his poetical ambitions resulted in his poem called *Le Bonheur*, in which he develops the idea that true happiness is only to be found in making the interest of one that of all; his philosophical studies ended in the production of his famous book *De l'Esprit*, the composition of which occupied him for more than seven years. In the year 1751 he married, his wife being a niece of Madame de Graffigny, the author of *Lettres d'une Péruvienne*; and he spent eight months in the year at his newly purchased estate of Voré in Le Perche; the remaining four months were given up to Paris and his duties of *maître d'hôtel* to the queen. It was characteristic of the man that as soon as he thought his fortune sufficient for his wants he gave up his post of farmer-general. The history of his life in the country is full of anecdotes which illustrate his generous and kindly disposition: he relieved the poor, sent physicians to the sick, mediated between those who quarrelled, encouraged agriculture, developed industries, and found happiness in the patriarchal life of a French seigneur, being as great a stickler as any for his seigneurial rights. It was in 1758 that his book *De l'Esprit*, which was to be the rival of *l'Esprit des Lois*, appeared. It was so far successful at the very outset as to attract immediate attention and to arouse the most formidable opposition, at the head of which was the dauphin, son of Louis XV. The Sorbonne condemned the book; the priests persuaded the court that it was full of the most dangerous doctrines, and the author, terrified at the storm he had raised, wrote three separate retractations; yet, in spite of his protestations of orthodoxy, he had to give up his office at the court, and the book was publicly burned by the hangman. The virulence of the attacks upon the work, as much as its intrinsic merit, caused the whole world to read it; it was translated into almost all the languages of Europe; it was discussed in every literary circle. Yet the *Esprit des Lois* lives and is still studied with profit, while *De l'Esprit* has long since been forgotten. It is indeed difficult to understand that the work could ever have had any serious influence upon the thought of the time. Voltaire said it was full of commonplaces; Buffon maliciously said that "Helvetius aurait dû faire un livre de moins et un bail de plus dans les fermes du roi;" Rousseau declared that the very benevolence of the author gave the lie to his principles; Grimm thought that all the ideas in the book were borrowed from Diderot; Madame du Deffand said that Helvetius had raised such a storm by simply revealing an "open secret"; Madame de Graffigny averred that all the good things in the book had been picked up in her own salon.

As for the philosophy of the book, it belongs to the sensational school; the four discourses of which it consists have been thus summed up:—(1) all man's faculties may be reduced to physical sensation, memory, comparison, judgment, are only feelings, our only difference from the lower animals lies in our external organization; (2) self-interest, founded on the love of pleasure and the fear of pain, is the only spring of our judgments, our actions, our affections; we have no liberty of choice between good and evil; there is no such thing as absolute right; ideas of justice and injustice change according to customs; (3) the inequalities of intellect do not depend on a more or less perfect organization, but have their cause in the unequal desire for instruction, and this desire springs from passions of which all men commonly well organized are susceptible to the same degree;

we can therefore all love glory with the same enthusiasm, and we owe all to education; (4) in this discourse the author treats of the ideas which are attached to such words as genius, imagination, talent, taste, good sense, &c. It is sufficient to add that, although the book was reprinted after the author's death, it ceased to have any influence even during his own life.

In 1764 Helvetius visited England, and the next year, on the invitation of Frederick, he went to Berlin, where the king paid him marked attention. He then returned to his country estate and passed the remainder of his life in perfect tranquillity. He died in 1771 at the age of fifty-six, leaving behind him a widow, who died in 1800, and two daughters.

A posthumous work of his, entitled *De l'Homme, de ses facultés intellectuelles, et de son éducation*, was found among his manuscripts after his death, and was published, but excited little notice. He also wrote a poem, *Le Bonheur*, published in 1772, 1773, and 1781. The complete works of Helvetius were published in 1774, 1777, 1781, 1784, 1792, and 1818. The best estimate of his work and of his relation to the philosophers of the 18th century is that in Damiron, *Mémoires*, ii. (W. BE.)

HELVIDIUS PRISCUS lived in the 1st century, during the reigns of Nero, Galba, Otho, Vitellius, and Vespasian. In those evil days he won the respect of all good men by his fearless love of freedom. Among the cringing and obsequious senators of Rome he dared to be sincere and outspoken. Tacitus says of him (*Hist.*, iv. 5) that in his early youth he devoted his great abilities to the highest pursuits, and made it his object to enter on public life with a spirit thoroughly fortified against all contingencies. It was natural that such a man should be a warm adherent of the Stoic school of philosophy. His father-in-law, Thrasea Pætus, had been the same; he had been driven to suicide in Nero's reign, and his last words to Helvidius were—"Young man, you have been born into times in which it is well to brace the spirit with examples of courage" (Tacitus, *Annals*, xvi. 35). Although he repeatedly offended the emperor, he held several high offices. During Nero's reign he was quæstor in the province of Achaia; he was also sent into Armenia in command of a legion, and by his good sense and moderation he succeeded in restoring peace and order in that country. By the provincials he was respected and trusted. His well-known sympathies with such men as Brutus and Cassius occasioned his banishment in 66 A.D., and he lived with his wife Fannia in Macedonia until Nero's death. Having been recalled to Rome by Galba in 68 A.D., he at once impeached Eprius Marcellus, one of the most villainous of the informers, and the very man who had been the accuser of Thrasea Pætus. After an angry debate he dropped the charge, as the condemnation of Marcellus would have involved a host of senators in like ruin. As prætor-elect he had once the courage to oppose Vitellius in the senate, and again as prætor in the following year he ventured to argue against the financial policy of Vespasian. Such matters, he maintained, ought to be left to the discretion of the senate. He proposed that the Capitol, which had been destroyed in the Neronian conflagration, should be restored at the public cost. It would seem that he rather perversely went out of his way to insult Vespasian, saluting him by his private name, and not recognizing him as emperor in the edicts he had to publish as prætor. There was very possibly in all this some of the affectation which often characterized the Stoics. The end of it was that he was banished, his wife Fannia, whose constancy and virtue are highly commended by his friend the younger Pliny, going with him into exile. Shortly afterwards he was executed by Vespasian's order. His life was written at his widow's request by Herennius Senecio; it took the form of a warm panegyric, and proved fatal to its author in the reign of Domitian.

HELVOETSLUYS (in Dutch, *Hellevoetsluis*), a fortified town of the Netherlands, in the province of South Holland, situated in the south of the island of Voorne-and-Putten, on the shore of the Haringvliet. It possesses a good harbour, a dry and a wet dock, extensive wharves, and a naval arsenal, and among its more important public buildings are the communal chambers, the Reformed church dating from 1661–1681, the Roman Catholic church, the synagogue, and the naval college. The population was only 1208 in 1795; by 1840 it had increased to 2523, and by 1874 it was 4175.

Helvoetsluys was fortified in the 17th century. The construction of the dock was decreed by the states of Holland in 1653, and the erection of the fortifications in 1668, but it was not till 1696 that the works were completed. The new harbour soon became an important rendezvous for the Dutch fleet, and in 1688 it was the starting point of William of Orange's expedition to England.

HELYOT, PIERRE (1660–1716), monastic historian, was born at Paris in January 1660, of supposed English descent. After spending his youth in study, he entered in his twenty-fourth year the convent of the third order of St Francis, founded at Picpus, near Paris, by his uncle Jérôme Helyot, canon of St Sepulchre. There he took the name of Père Hippolyte. Two journeys to Rome on monastic business afforded him the opportunity of travelling over most of Italy; and after his final return he saw much of France, while acting as secretary to various provincials of his order there. Both in Italy and France he was engaged in collecting materials for his great work, which occupied him about twenty-five years, *L'Histoire des Ordres Monastiques, Religieux, et Militaires, et des Congrégations Séculières, de l'un et de l'autre Sexe, qui ont été établies jusqu'à présent*, published in 8 volumes in 1714–21. Helyot died on January 5, 1716, before the fifth volume appeared, but his friend Maximilien Bullot completed the edition. This work, appearing at first anonymously, has been republished several times, and translated into German. Helyot's only other noteworthy work is *Le Chrétien Mourant* (1695).

HEMANS, FELICIA DOROTHEA (1793–1835), was born in Duke Street, Liverpool, September 25, 1793. Her father, George Browne, of Irish extraction, was at the time of her birth a merchant in Liverpool, and her mother, whose maiden name was Wagner, was the daughter of the Austrian and Tuscan consul at Liverpool, and of united German and Italian descent. Felicia, the fifth of seven children, was scarcely seven years old when her father failed in business, and retired with his family to Gwrych, near Abergele; and there the young poetess and her brothers and sisters grew up in the wildest seclusion, in a romantic old house by the sea-shore, and in the very midst of the mountains and myths of Wales, the monotony of her young life being varied only by two visits to London, which she never revisited in after years. The little Felicia was a lovely, precocious child. Her education was desultory; and she may indeed be said to have educated herself, the only subjects in which she ever received regular instruction having been French, English grammar, and the rudiments of Latin. Books of chronicle and romance, and every kind of poetry, she read with avidity; and she studied Italian, Spanish, Portuguese, and German sufficiently to be able to read them with ease and enjoyment. She was also fond of music, and played on the harp and piano, her preference being for simple national and pathetic melodies, especially those of Wales and Spain. In 1808, when she was only fourteen, a quarto volume of her *Juvenile Poems* was published by subscription. Among the earliest of these were "Congratulatory Lines on her Mother's Birthday," "A Prayer," an "Address to the Deity," and some "Lines to Shakespeare,"—stiff, little, childish productions, which show, however, a good ear for rhythm and a considerable imitative faculty. The verses having been rather harshly criticized in the *Monthly Review*, the little poetess was for some days in tears; but the muse was soon reawakened. One of her brothers was fighting in Spain under Sir John Moore; and Felicia, fired with military enthusiasm, wrote *England and Spain, or Valour and Patriotism*, a poem of some length and much elaboration, which was afterwards published and translated into Spanish. Her second volume, entitled *The Domestic Affections and other Poems*, appeared in 1812, on the eve of her marriage to Captain Hemans, which took place in the summer of that year. She lived for some time at Daventry, where her husband was appointed adjutant of the Northamptonshire militia, but about this time her father went on some commercial enterprise to Quebec and died there; and, after the birth of her eldest son, she and her husband took up their abode with her widowed mother at Bronwylfa. Here during the next six years four more children—all boys—were born; but in spite of domestic cares and uncertain health she still read and wrote indefatigably. Her poem entitled *The Restoration of Works of Art to Italy* was published in 1816, her *Modern Greece* in 1817, and in the following year appeared her volume of *Translations from Camoens and other Poets*.

In 1818 Captain Hemans went to Rome, leaving his wife, shortly before the birth of their fifth child, with her mother at Bronwylfa. No further explanation than that it was in the interest of Captain Hemans's health has ever been offered of this step; there seems to have been merely a tacit agreement, perhaps on account of their limited means, that they should live for a time apart. Letters were interchanged, and Captain Hemans was often consulted about his children; but the husband and wife remained separate, and indeed never met again. Kind and influential friends—among them the bishop of St Asaph and Bishop Heber—clustered round the poetess and her children. Her health, however, began to fail her, and her beauty, which was of a peculiarly delicate type, is said to have faded rapidly, leaving behind it an habitually worn and harassed expression. She became subject, too, to palpitation of the heart. Yet for the next six years her literary industry never flagged. In 1819 she published *Tales and Historic Scenes in Verse*, and in the same year she gained a prize of £50 offered for the best poem on *The Meeting of Wallace and Bruce on the Banks of the Carron*. The poem was published in *Blackwood's Magazine*. In 1820 appeared *The Sceptic* and *Stanzas to the Memory of the late King*. In June 1821 she won the prize awarded by the Royal Society of Literature for the best poem on the subject of *Dartmoor*, and during the same year she began her play, *The Vespers of Palermo*. She now applied herself to a course of German reading. Körner was her favourite German poet, and her lines on the grave of Körner are one of the best English tributes to the genius of the young soldier poet. *The Voice of Spring*, one of her best-known lyrics, was written in 1822, the same year in which she began to contribute to the *New Monthly Magazine*; and in the summer of 1823 a volume of her poems was published by Murray, containing "The Siege of Valencia," "The Last Constantine," and "Belshazzar's Feast," which last had appeared previously in a volume [illegible] for a charitable purpose by Joanna Baillie. *The Vespers of Palermo* was acted at Covent Garden, December 12, 1823, and Mrs Hemans received £200 for the copyright; but, though the leading parts were taken by Young and Charles Kemble, the play was a failure, and was withdrawn after the first performance. It was acted again in Edinburgh in the following April with greater success when an epilogue, written for it by Sir Walter Scott at Joanna Baillie's request, was spoken by Mrs Henry Siddons. An interchange of notes on this subject was the beginning of a cordial friendship between Mrs Hemans and the novelist. In the same year she wrote *De Chatillon, or the Crusaders*, but the manuscript was mysteriously lost, and the poem was not published till two years after her death, and then from a rough copy. In 1824 she began "The Forest Sanctuary," which appeared a year later with the "Lays of Many Lands" and miscellaneous pieces collected from the *New Monthly Magazine* and other periodicals.

In the spring of 1825 Mrs Hemans, with her mother and children and an unmarried sister, removed from Bronwylfa, which had been purchased by her brother, to Rhyllon, another house belonging to him on an opposite height across the river Clwyd. The contrast between the two houses suggested her *Dramatic Scene between Bronwylfa and Rhyllon*. The house itself was bare and unpicturesque, but the beauty of its surroundings has been celebrated in "The Hour of Romance," "To the River Clwyd in North Wales," "Our Lady's Well," and "To a Distant Scene." This time seems to have been the most tranquil in Mrs Hemans's life. Her children were growing up about her; her own variable health was at its best; her popularity was spreading, not only in England but in America, where Professor Norton of Harvard university undertook to superintend the publication of a complete edition of her works and to secure to her the profits. But the death of her mother in January 1827 was a second great breaking point in her life. Her own health began to alarm her; and though the nature of her illness, which afterwards proved heart complaint, was not at first apparent, she was from this time an acknowledged invalid. In the summer of 1828 the *Records of Woman* was published by Blackwood, and in the same year the home in Wales was finally broken up by the marriage of Mrs Hemans's sister and the departure of her two elder boys to their father in Rome. Mrs Hemans therefore left Rhyllon, and took a very small house in the village of Wavertree, near Liverpool, where she hoped to obtain good schooling for her children and society for herself. But, although she had a few intimate friends there,—among them her two subsequent biographers, Henry F. Chorley and Mrs Lawrence of Wavertree Hall,—she was disappointed in her new home. She thought the people at Liverpool stupid and provincial; and they, on the other hand, found her uncommunicative and eccentric. In the following summer she travelled by sea to Scotland with two of her boys, to visit the Hamiltons of Chiefswood. This visit to Scotland was one of the most [illegible], and perhaps the richest episode, in her uneventful life. She was cordially welcomed in Edinburgh, dined with Jeffrey and other celebrities, visited Henry Mackenzie, heard Alison preach, and stayed with Sir David and Lady Brewster, and with Sir Robert Liston at Milburn, where she sat for a bust to Angus Fletcher. Above all, while she was at Chiefswood, she enjoyed "constant, almost daily, intercourse" with Sir Walter Scott, [illegible] "Young Marmion." "There are some whom we meet and should like ever after to claim as kith and kin; and you are one of those," was Scott's compliment to her at parting. One of the results of her Edinburgh visit was an article, full of praise, [illegible], by Jeffrey himself in the *Edinburgh Review*. The poetess returned to Wavertree to compose her *Songs of the Affections*, which were published early in 1830. In the following June, however, she again left home, this time to visit Wordsworth and the Lake country, and in August she paid a second visit to Scotland. She was inclined to leave Wavertree, and wished to make Edinburgh her home; but the scheme was [illegible], and, as a brother and his family were already settled in Ireland, it was arranged that she should go to live in Dublin. In her new home kind friends and admirers gathered round the invalid, who now had with her only the youngest of her children. She was obliged to lie constantly, and the exertion of writing began to be painful to her. Her poetry of this date is chiefly religious. Early in 1834 her *Hymns for Childhood*, which had appeared some years before in America, were published in Dublin. At the same time appeared her collection of *National Lyrics*, and shortly afterwards *Scenes and Hymns of Life*. She was planning also a series of German studies, to consist of translations from German authors, with introductions and explanatory notes, one of which, on Goethe's *Tasso*, was completed and published in the *New Monthly Magazine* for January 1834. In intervals of acute suffering she wrote the lyric *Despondency and Aspiration*, and dictated a series of sonnets called *Thoughts during Sickness*, the last of which, "Recovery," was written when she fancied she was getting well. After three months spent at Redesdale, Archbishop Whately's country seat, which had been placed at the disposal of the dying poetess, she was again brought into Dublin, where she lingered till spring. The use of her limbs was entirely gone; but her passion for reading remained to the last, and the table at her bedside was strewn with books, one of which always lay open. Her last poem, the *Sabbath Sonnet*, was dictated to her brother on Sunday April 26th, and she died on the evening of Saturday, May 16, 1835, at the age of forty-one. She was buried in a vault under St Anne's church, Dublin. Besides the bust of Mrs Hemans by Angus Fletcher, there were three portraits taken of her in 1827 by the American painter West, one of which has been engraved; and another portrait, an engraving of which is in Chorley's *Memorials*, was painted in 1831 by a young Irish artist, Edward Robinson.

Mrs Hemans's poetry is the production of a fine imaginative and enthusiastic temperament, but not of a commanding intellect or very complex or subtle nature. It is the outcome of a beautiful but singularly circumscribed life, a life spent in romantic seclusion, without much worldly experience, and warped and saddened by domestic unhappiness and real physical suffering. Perhaps from these circumstances, aided by a course of self-instruction at best desultory and unguided, the emotional in a sensitive and intensely feminine nature was unduly cultivated; and this undue preponderance of the emotional is a prevailing characteristic in Mrs Hemans's poetry, and one to which Scott alluded when he complained that it was "too poetical," that it contained "too many flowers" and "too little fruit." Her genius—beautiful and pleasing as it was—was not of a very high order. Like her favourite music, it lay within a small compass, and gave little opportunity for intricate harmonies. Thus her tragedies, and her longer and more complicated poems, such as *The Sceptic* and *Forest Sanctuary*, though by no means devoid of striking passages, are the least notable of her works. It is not, however, as the writer of these more ambitious productions, which in their own time were but doubtful successes and are now rarely read, but as the authoress of many short occasional pieces, and especially as a lyrist, that Felicia Hemans has earned so high a place among our poets. In her lyrics she could concentrate her strength on the perfect expression of simple themes. Her skill in versification, her delicate ear for rhythm, and the few ruling sentiments of her nature here found ample scope. In her lyrics Mrs Hemans is uniformly graceful, tender, delicately refined,—sometimes perhaps, even here, too fervent, too emotional,—but always pure and spiritual in tone; and in these too she occasionally displays those rarer qualities which belong only to the finest lyric genius. Many of her poems, such as "The Treasures of the Deep," "The Better Land," "The Homes of England," "Casabianca," "The Palm Tree," "The Graves of a Household," "The Wreck," "The Dying Improvisatore," and "The Lost Pleiad," have become standard English lyrics, and on the strength of these, and others such as these, Felicia Hemans is ranked among our chief British lyrical poets.

An edition of Mrs Hemans's *Poetical Works* was published, 2 vols., in 1832; *Poetical Remains*, with Memoir by Delta, 1836; *Memorials*, &c., by H. F. Chorley, 1836; *Recollections of Mrs Hemans*, by Mrs Lawrence, 1836; *Works of Mrs Hemans, with a Memoir of her Life*, by her sister (Mrs Hughes), 7 vols., 1839, and American reprint, 2 vols., 1847; *Early Blossoms, a Collection of Poems written between eight and fifteen years of age*, with a Life of the Authoress, 1840; *Poems*, chronologically arranged, Edin., 1849; *Poems*, copyright edition, Edin. and London, 1872; *Poetical Works*, with critical memoir by W. M. Rossetti, London and Edin., 1873. (F. M.)

HEMEL HEMPSTEAD, a market-town of England, county of Hertford, is pleasantly situated on the declivity of a hill near the river Gade, 23 miles N.W. of London, 1½ miles from the Boxmoor station of the London and North-Western Railway, and on a branch line of the Midland Railway. The town consists almost wholly of one main street about a mile in length. Among the principal buildings are the parish church, cruciform in shape, and partly Norman in style, surmounted by a lofty octagonal spire, and containing an old brass of the time of Edward III.; the town-hall, a long narrow building formerly supported on square wooden pillars, but whose open market-place underneath has now been converted into a corn exchange; the union workhouse, and the West Herts infirmary. The chief industry is straw plaiting, but there are also manufactories of paper, an iron foundry, breweries, and tanneries. The population of the township in 1871 was 5996, and of the parish 8720.

From its name, meaning high stead or place, the town is apparently of Saxon origin. In Domesday it is written Henamsteda and Hamelamestede. It received a charter of incorporation from Henry VIII., which was renewed by Cromwell. It still makes annual choice of a bailiff, but he possesses no magisterial authority.

HEMEROBAPTISTS, an ancient Jewish sect, so named from their observing a practice of daily ablution as an essential part of religion. Epiphanius, who mentions their doctrine as the fourth heresy among the Jews, classes the Hemerobaptists doctrinally with the Pharisees, from whom they differed only in, like the Sadducees, denying the resurrection of the dead. The name has been sometimes given to the Mendæans on account of their frequent ablutions; and in the *Clementine Homilies* (ii. 23) St John the Baptist is spoken of as a Hemerobaptist. Mention of the sect is made by Hegesippus (see Euseb., *Hist. Eccl.*, iv. 22) and by Justin Martyr in the *Dialogue with Tryphon*.

HEMINGFORD, or HEMMINGFORD, WALTER, a Latin chronicler of the 14th century, was a canon regular of the Austin Priory of Gisborough, now Guisborough, in Yorkshire. Leland calls him Hemengoburgus, and in one of the manuscripts of his chronicle his name appears as Hemingburght. In a document of the priory the name is also given as De Hemingburgh; and in Gisborough Chartulary mention is made of a neighbouring family of that name Bale seems to have been the first to give him the name by which he is more commonly known. His chronicle embraces the period of English history from the Conquest (1066) to the nineteenth year of Edward III., with the exception of the latter years of Edward II. It ends with the title of a chapter in which it was proposed to describe the battle of Crécy (1346); but the chronicler seems to have died before the required information reached him. In compiling the first part, Hemingford apparently used the histories of Eadmer, Hoveden, Henry of Huntingdon, and William of Newbury; but the reigns of the three Edwards are original, composed from personal observation and information. There are several manuscripts of the history extant,—the best perhaps being that presented to the College of Arms by the earl of Arundel. The work is correct and judicious, and written in a pleasing style. One of its special features is the preservation in its pages of copies of the great charters; and Hemingford's versions have more than once supplied deficiencies and cleared up obscurities in copies from other sources.

The first two books were published by Dr Thomas Gale in 1687, in his *Historiae Anglicanae Scriptores Quinque*, and the remainder by Hearne in 1731. The first portion was again published in 1848 by the English Historical Society, under the title *Chronicon* [illegible] *Regum Angliae*, edited by H. C. Hamilton.

HEMIPTERA (ἡμι-, half, and πτερόν, wing), an order of the *Insecta* most commonly known by the name of "bugs," and containing the species so well known to infest houses. In their earlier stages they have what is known amongst naturalists as an incomplete metamorphosis; that is to say, after quitting the egg, and during the two stages of their existence before assuming the perfect form, they move freely about, thus unlike the *Lepidoptera*, &c., whose pupa state, or that preceding the perfection of the insect, is quiescent. When the transformation has been completed, the insect generally possesses four wings. The superior pair, or hemielytra as they are called by authors, are attached to the mesothorax, and are composed of two substances,—the basal portion coriaceous, or resembling leather, and the apical one membranaceous, or resembling thin, transparent parchment. The lower pair are attached to the metathorax, and are entirely membranous and generally transparent, and capable of being folded when the insect is in repose. This segment of the sternum likewise bears on each side, anteriorly, a more or less reniform-shaped orifice, within which lies a sac containing the fluid or matter from which so many of the *Heteropterous* portion of the order emit a most disagreeable odour. They also possess in all stages a mouth or rostrum composed of three or more joints formed for suctorial purposes.

The order is divided into two suborders, *Hemiptera Heteroptera* and *Hemiptera Homoptera*, [illegible] *Piesmidae*, [illegible] *Hemiptera* [illegible] one line in length. The first family affects trees and plants, in many instances distorting the leaves and buds; one of its species, [illegible], has been recorded by Lichtenstein in the *Annales* of the French Entomological Society for 1872 as producing [illegible] leaves which afterwards attain the size and form of a [illegible]. The [illegible] differ from the second family in having the power to leap, their third pair of legs being formed for this purpose. The *Aphidae* are perhaps best known by the terms "blight," "green fly," &c. These are to be found almost always in large [illegible] on nearly every kind of tree, plant, and shrub. They are said to produce the honey dew found upon many plants, though this has been disputed by [illegible] in the *Gardeners' Chronicle* for July 1878. They are furnished with two [illegible], varying considerably in length in the different species, placed one on each side of the abdomen on the [illegible] segment from the apex, from which is usually emitted a sweet fluid which the ants are well known to follow them for and consume. This family also contains the great vine-pest known by the name of *Phylloxera vastatrix*. The third family, *Coccidae*, has amongst its members the cochineal insect, [illegible], from the females of which, when gathered and killed, is obtained the dye so largely used in giving the red colours, scarlet and crimson. It is also used for making carmine. The last division [illegible] the *Aleyrodidae*, [illegible] contains the most [illegible] forms of the whole order. [illegible] which may be obtained by consulting the works of Fitch, Burmeister, Leach, and Denny.

Although the *Hemiptera* are of very ancient date, remains of some of the fossil forms having been found in the Primary and other formations, the number of these is but few; they are enumerated in a paper on "Fossil Entomology" by Mr H. Goss in vol. xv. of the *Entomologist's Monthly Magazine*.

The whole of the group is extremely widely distributed, being found in almost every portion of the globe; and they are very varied both in form and in their modes of life,—man, animals, birds, insects, and plants being subjected to their attacks. On the Continent they have for a long period engaged the attention of naturalists, but in England little was known of the actual number inhabiting these islands until Douglas and Scott in 1865 published their volume of *British Hemiptera Heteroptera*. In 1859 Dr A. Dohrn published what may be considered to be the first whole-world catalogue of the order; and, taking it as a basis, for there is no other approximate list, and adding a reasonable amount of new species collected in each year since that time, their number would amount to nearly 10,500 species, 5,500 belonging to the heteropterous section and the remainder to the second suborder. Out of these Europe lays claim to at least 3000, whilst Great Britain is known to possess not fewer than 1000. There is no record of any one of the species being cosmopolitan, except perhaps the house-bug, *Acanthia lectularia*, although some of the species inhabiting England are also to be met with in China and Japan. (J. SC.)

HEMLING. See MEMLING.

HEMLOCK is the *Conium maculatum* of botanists, a biennial umbelliferous plant, found wild in many parts of Great Britain and Ireland, where it occurs in waste places, on hedge-banks, and by the borders of fields, and which is also widely spread over Europe and temperate Asia, and naturalized in the cultivated districts of North and South America. It is an erect branching plant, growing from 3 to 6 feet high, and emitting a disagreeable smell, like that of mice. The stems are hollow, smooth, somewhat glaucous green, spotted with dull dark purple, as alluded to in the specific name, *maculatum*. The root-leaves have long furrowed footstalks, sheathing the stem at the base, and are large, triangular in outline, and repeatedly divided or compounded, the ultimate and very numerous segments being small, ovate, and deeply notched at the edge. These leaves generally perish after the growth of the flowering stem, which takes place in the second year, while the leaves produced on the stem become gradually smaller upwards. The branches are all terminated by compound many-rayed umbels of small white flowers, the general involucres consisting of several, the partial ones of about three short lanceolate bracts, the latter being usually turned towards the outside of the umbel. The flowers are succeeded by broadly ovate fruits, the mericarps (half fruits) having five ribs which, when immature, are waved or crenated; there are no vittæ or oil-ducts, and when cut across the albumen is seen to be deeply furrowed on the inner face, so as to exhibit in section a reniform outline. The fruits when triturated with a solution of caustic potash evolve a most disagreeable odour.

Hemlock is a virulent poison, but it varies much in potency according to the conditions under which it has grown, and the season or stage of growth at which it is gathered. In the first year the leaves have little power, nor in the second are their properties developed until the flowering period, at which time, or later on when the fruits are fully grown, the plant should be gathered. The wild plant growing in exposed situations is to be preferred to garden-grown samples, and is more potent in dry warm summers than in those which are dull and moist.

The poisonous property of hemlock resides chiefly in the alkaloid conia or conine which is found in both the fruits and the leaves, though in exceedingly small proportions in the latter. Conine resembles nicotine in its deleterious action, but is much less powerful. No chemical antidote for it is known. The plant also yields a second less poisonous crystallizable base called *conhydrine*, which may be converted into conine by the abstraction of the elements of water.

When collected for medicinal purposes, for which both leaves and fruits are used, the former should be gathered at the time the plant is in full blossom, while the latter are said to possess the greatest degree of energy just before they ripen. The fruits are the chief source whence conine is prepared. The principal forms in which hemlock is employed are the extract and juice of hemlock, hemlock poultice, and the tincture of hemlock fruits. Large doses produce vertigo, nausea, and paralysis; but in smaller quantities, administered by skilful hands, it has a sedative action on the nerves. It has also some reputation as an alterative and resolvent, and as an anodyne.

The acrid narcotic properties of the plant render it of some importance that one should be able to identify it, the more so as some of the compound-leaved umbellifers, which have a general similarity of appearance to it, form wholesome food for man and animals. Not only is this knowledge desirable to prevent the poisonous plant being deliberately used in place of the wholesome one, it is equally important in the opposite case, namely, to prevent the latter being mistaken for the detrimental agent. The plant with which hemlock is most likely to be confounded is the *Anthriscus sylvestris*, or cow-parsley, the leaves of which are freely eaten by cattle and rabbits; this plant, like the hemlock, has spotted stems but they are hairy, not hairless; it has similar divided leaves of the same general form, but they are downy and aromatic, not smooth and nauseous when bruised; the fruit of the *Anthriscus*, besides, is linear-oblong and not ovate.

HEMP, *Cannabis sativa*, an annual herb, having angular rough stems and alternate lobed leaves. The bast fibres of *Cannabis* are the hemp of commerce, but under the name of hemp fibrous products from many different plants are often included. Sunn hemp is the bast fibre of a papilionaceous plant, *Crotolaria juncea*, of India and the Sunda Islands; *Hibiscus cannabinus*, an Indian malvaceous plant, yields brown or Bombay hemp; Jute or Paut hemp is produced by *Corchorus capsularis* and *C. olitorius*, and to some extent by *C. fuscus*, *C. fascicularis*, and *C. decemangulatus*. Manilla hemp or feather fibre is derived from the fibro-vascular bundles of certain monocotyledons, namely, several species of *Musa*, chiefly from *M. textilis*, but to some extent from *M. sapientum*, *M. ensete*, *M. mindanensis*, and *M. Cavendishii*, in India, New Guinea, the Philippines, &c. Pita hemp is produced from certain species of *Agave*; the *Agave sisalina* of Central America yields grass hemp; and Murva or bowstring-hemp is obtained from an aloe-like plant, *Sanseviera zeylanica*, in Bengal, Ceylon, Java, and southern China.

The hemp plant, like the hop, which is the other member of the same natural order, *Cannabinaceæ*, is diœcious, that is, the male and female flowers are borne on separate plants. The male plant is smaller than the female, and ripens and dies earlier in the summer. The foliage of the female plant is darker and more luxuriant than that of the male. The leaves of hemp are constituted of 5 to 7 leaflets, the form of which is lanceolate acuminate, and sharply serrate. The loose panicles of male flowers and the short spikes of female flowers arise from the axils of the upper leaves. The height of the plant varies greatly with season, soil, and manuring; a variety (*C. sativa*, var. *gigantea*) has produced specimens over 17 feet in height, but the average height of the common sort is about 8 to 10 feet. There is but one species of hemp known, *Cannabis sativa*, the *C. indica*, Lam., and *C. chinensis*, Delile, owing their differences to climate, and losing many of their peculiarities when cultivated in temperate regions. Rumphius (in the 17th century) had noticed these differences between Indian and European hemp.

The original country of the hemp-plant was doubtless in some part of temperate Asia, probably near the Caspian Sea. It spread westward throughout Europe, and southward through the Indian peninsula.[1]

Wild hemp still grows on the banks of the Lower Ural and the Volga, near the Caspian Sea. It extends to Persia, the Altai range, and northern and western China. It is found in Kashmir, and on the Himalaya, growing vigorously as far up as 6000 or even 10,000 feet.

Hemp is grown for three products—(1) the fibre of its stem; (2) the resinous secretion which is developed in hot countries upon its leaves and flowering heads; (3) its oily seeds.

Hemp has been employed for its fibre from ancient times. Herodotus (iv. 74) mentions the wild and cultivated hemp of Scythia, and describes the hempen garments made by the Thracians as equal to linen in fineness. Hesychius says the Thracian women made sheets of hemp. Moschion (about 200 B.C.) records the use of hempen ropes for rigging the ship "Syracusia" built for Hiero II. The hemp plant has been cultivated in northern India from a considerable antiquity, not only as a drug but for its fibre. The Anglo-Saxons were well acquainted with the mode of preparing hemp. Hempen cloth became common in central and southern Europe in the 13th century.

The medicinal and intoxicating properties of hemp have probably been known in Oriental countries from a very early period. An ancient Chinese herbal, part of which was written about the 5th century B.C., while the remainder is of still earlier date, notices the seed and flower-bearing kinds of hemp. Other early writers refer to hemp as a remedy. The medicinal and dietetic use of hemp spread through India, Persia, and Arabia in the early Middle Ages. The use of hemp (bhang) in India was noticed by Garcia d'Orta in 1563. Berlu in his *Treasury of Drugs* (1690) describes it as of "an infatuating quality and pernicious use." Attention was recalled to this drug, in consequence of Napoleon's Egyptian expedition, by De Sacy (1809) and Rouger (1810). Its modern medicinal use is chiefly due to trials by Dr O'Shaughnessy in Calcutta (1838–1842). The plant is grown partly and often mainly for the sake of its resin in Persia, northern India, and Arabia, in many parts of Africa, and in Brazil.

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[1] The names given to the plant and to its products in different countries are of interest in connexion with the utilization of the fibre and resin. In Sanskrit it is called *goni*, *sana*, *shanapu*, *banga*, and *ganjika*; in Bengali, *ganja*; Persian, *bang* and *canna*; Arabic, *kinnab* or *cannab*; Greek, *kannabis*; Latin, *cannabis*; Italian, *canappa*; French, *chanvre*; Spanish, *cáñamo*; Portuguese, *cânamo*; Russian, *konopel*; Lettish and Lithuanian, *kannapes*; Slavonic, *konopi*; Erse, *canaib* and *canab*; Anglo-Saxon, *hænep*; Dutch, *hennep*; German, *hanf*; English, *hemp*; Danish and Norwegian, *hamp*; Icelandic, *hampr*; and in Swedish, *hampa*. The English word *canvas* sufficiently reveals its derivation from *cannabis*.

The hemp plant grown in some parts of the United States yields the active resin so freely that less than 1 grain of the extract is a full dose. But it is as a fibre producer that the hemp is now being more extensively cultivated in the United States. Hemp seeds were ordered for Plymouth colony as early as 1629, but the greater profit derivable from tobacco has always opposed the development of hemp-growing. The plant is chiefly grown in the States of Kentucky, Missouri, Tennessee, Ohio, Indiana, and New York. The produce of Kentucky in 1877 was 6140 tons. According to the census of 1870 the total production of the United States was 12,746 tons. In the northern part of the State of New York the crop is valued chiefly for the seeds, which may be from 20 to 40 bushels or more per acre. The produce per acre in the United States is from 700 to 1000 ℔ of fibre, 4 to 6 pecks of seed being usually sown.

Although the hemp-plant is grown in India chiefly for the production of the narcotic or intoxicating resin, yet a good deal of true hemp fibre is produced there. It is imported into England, however, chiefly from Russia, the United States, Italy, Holland, Germany, Hungary, and Turkey. It is grown in Ireland, and in some parts (Suffolk and Lincolnshire) of England. It thrives well in Algeria. It requires a rich deep soil and heavy manuring, and is an exhausting crop. In Great Britain about 3 pecks of seed per acre are drilled, 18 inches apart, in the middle of April. The male plants are pulled from the end of July to the end of August, the female or seed-bearing plants being gathered in September.

The yearly imports of hemp cannot be ascertained with accuracy, as [illegible] hemp [illegible]. The [illegible] the United Kingdom [illegible] taken with all necessary [illegible]:—

1873	1,[illegible] cwts.	1876	1,171,[illegible] cwts.
1874	1,[illegible] ,,	1877	1,[illegible] ,,
1875	1,[illegible] ,,	1878	1,[illegible] ,,

The [illegible] 1877 [illegible] that the [illegible] hemp, the [illegible], and [illegible], Manila hemp, Sunn hemp, and other [illegible].

Imports of Hemp into the United Kingdom in 1877.

From	Dressed.	Rough.	[illegible]
	Cwts.	Cwts.	Cwts.
Russia	4,[illegible]	[illegible]	[illegible]
Germany	[illegible]	[illegible]	[illegible]
Italy	1[illegible],477	[illegible]	41,[illegible]
[illegible]		[illegible]	...
United States	...	[illegible]	
[illegible]		[illegible]	
India		[illegible]	
Other countries	6,257	1[illegible]	[illegible]

There were [illegible] dressed hemp were [illegible] other countries, [illegible] 133,516 cwts. rough hemp, and 1[illegible] cwts. [illegible].

Nearly all the hemp imported into the United Kingdom is landed at [illegible], London, Hull, and Leith. [illegible] the manufacture of [illegible], tarpaulins, canvas, and sackcloth. The finest hemp comes from Italy, but it is deficient in some of the higher qualities of the Russian fibre. Russian hemp varies much in price, according to quality and market fluctuations, its price in November 1879 was from £23 to £25 per ton, Italian or garden hemp fetching from £38 to £41.

In order to free the fibre of the hemp plant from the soft and mucilaginous tissues of the bark, the stems are subjected to the same process as those of [illegible] flax. They are pulled, beaten, or crushed in a [illegible] mill, and then [illegible], preferably in soft water, after which they are again beaten with wooden mallets or in a specially constructed [illegible]. After breaking the stems are scutched, and [illegible] of the fibres [illegible] by the [illegible] and [illegible] they are subjected. The fibres are then hackled or combed.

According to Vetillart, the average length of European hemp fibre is [illegible] inches. Dr M[illegible] [illegible] flax [illegible] and flax; [illegible] according to [illegible] of 84·5 kilogrammes without breaking [illegible].

The chief constituent of the fibre of the hemp plant is cellulose, but small quantities of other substances are always present [illegible]. A [illegible] of [illegible] hemp gave on analysis [illegible] water 8·8, wax 0·6, ash 0·8, [illegible], cellulose 77·8. [illegible] hemp [illegible] and [illegible] of [illegible].

Hemp resin.—Hemp as a drug or intoxicant for smoking and chewing occurs in the three forms of bhang, ganja, and charas.

(1) *Bhang*, the Hindustani *siddhi* or *sabzi*, consists of the dried leaves and small stalks of the hemp; a few fruits occur in it. It is of a dark brownish-green colour, and has a faint peculiar odour and but a slight taste. It is smoked with or without tobacco, or it is made into a sweetmeat with honey, sugar, and aromatic spices; or it is powdered and infused in cold water, yielding a turbid drink, [illegible]. *Hashish* is one of the Arabic names given to the [illegible] preparations of the resinous hemp leaves. One of the commonest of these preparations is made by heating the bhang with water and butter, the butter becoming thus charged with the resinous and active substances of the plant.

(2) *Ganja*, the guaza of the London brokers, consists of the flowering and fruiting heads of the female plant. It is brownish-green, and otherwise resembles bhang, as in odour and taste. Some of the more esteemed kinds of hashish are prepared from this ganja. Ganja is met with in the Indian bazaars in coarse bundles of 24 plants or heads apiece. The hashish in such extensive use in Central Asia is often seen in the bazaars of large cities in the form of cakes, 1 to 3 inches thick, 5 to 10 inches broad, and 10 to 15 inches long.

(3) *Charas*, or churrus, is the resin itself collected, as it exudes naturally from the plant, in different ways. The [illegible] countries differs greatly in appearance and quality. Some [illegible] the form of [illegible] greyish brown colour, having when of high quality a [illegible] resinous

[illegible] Often it occurs in the form of irregular friable lumps, like pieces of impure linseed oilcake.

Hemp, however consumed, acts in a most strange way upon the nervous system, [illegible] its effects [illegible] greatly with [illegible] the first effect [illegible] appetite and [illegible], delirium, [illegible] the patient [illegible] [illegible] the same [illegible] with [illegible].

[illegible] hemp has been repeatedly tried in modern [illegible] without any [illegible] or [illegible] and [illegible] cough, [illegible] It is a [illegible] of [illegible], but does not cause constipation, check [illegible] like opium.

Hemp is very largely used in Eastern countries as an [illegible]—probably by nearly [illegible] millions of the human race. The amount consumed cannot be estimated. Of dried hemp and churrus there was sent in 187[illegible] not less than £[illegible] worth through the Khyber Pass [illegible] India.

[illegible] in the hemp [illegible] [illegible] by [illegible] [illegible] represented by C[illegible]H[illegible]; it [illegible] by a [illegible] per cent. [illegible] and 16 per cent. [illegible] in Indian [illegible] in any way [illegible] to [illegible] Moreover, [illegible] in hemp, though [illegible] established beyond doubt. The [illegible] found by Messrs T. & H. Smith [illegible] 7 per cent. [illegible] gives 3 per cent. as obtainable [illegible] hemp. The volatile oil in fresh hemp [illegible] By treating the commercial [illegible] afterwards, [illegible] and [illegible] vol. [illegible], n. s., p. 417 an [illegible] The [illegible] to this substance, [illegible]

Hemp Seed, Cake, and Oil.—The ripe seeds, really fruits, being nuts or [illegible] of the hemp plant, contain about 34 per cent. of oil and 1[illegible] of albuminoids. When the crushed seeds have been submitted to pressure, the residual cake is found to retain about 7 per cent. of oil. The value of hemp cake as a cattle food is lessened by its purgative property. The seeds are much used as a food for cage birds. A hundred parts of the seed yield from 70 to [illegible] and 15 to 20 of oil. The oil has drying properties, though it is in this respect much inferior to linseed oil. Its specific gravity is ·9307. The seeds are [illegible] ovate, about [illegible] inch in length, and of a dark grey colour, with a pale [illegible] network of surface-markings.

See Bentley and Trimen's *Medicinal Plants*, No. 2[illegible]; Vétillart's *[illegible] sur les fibres textiles*, pp. 72–87; Dickson's *[illegible]* [illegible] of Hemp [illegible]; the [illegible], and Johnston's *Chemistry of Common Life*, 1879. (A. H. C.)

HEMS, Homs, or Hums, a town of Syria, about 68 miles by road north-east of Tripoli [illegible], situated [illegible] feet, according to Czernik, above the level of the sea, on the eastern side of the valley of the Nahr el Asy or Orontes, which about [illegible] miles farther down forms the lake of Hems, [illegible], or Kades. The citadel or castle, a great mound "still crowned with a mass of torn and ruined towers," forms a striking landmark well known to the caravans journeying north from Damascus. It is about 100 feet in height, and has a base [illegible] feet and a width of 375. According to Captain Burton, it probably occupies the site of the temple of the sun, which formed the glory of the ancient city: not only does it contain [illegible] masses of syenite, grey granite, and white marble, but he found, apparently in position, a Doric pilaster. Though the ancient walls of Hems, with a circuit of about a mile and a half, are greatly dilapidated, and even in many places practically demolished, the town is entered by regular gates, six in number, which in olden times bore the names of the planets. Within it presents little except narrow and tortuous streets, poorly paved and foul, with houses for the most part of the meanest description; but none the less it is the seat of a Turkish vice-governor or mutesarrif, as well as of a Greek and a Maronite bishop, and its cavalry barracks are capable of containing two regiments. As the market-town of the neighbouring tribes it has some commercial importance: it trades in cotton, sesame, and oil; and among its craftsmen it numbers a body of skilful goldsmiths and about 3000 silk weavers, whose looms produce the finest kind of kaffiehs or head cloths. The population is estimated at from 20,000 to 30,000, and about 7000 are Christians. Jews are conspicuous by their absence, though one of the gates of the town in the quarter which they formerly occupied is still called the "Jews' Gate."

Hems is the Emesa, Emissa, or Hemesa of the Romans, and by Ptolemy it is assigned to the district of Apamene. Its inhabitants are mentioned among the early opponents of the Roman arms. Heliogabalus or Bassianus, declared emperor in 218 A.D., was a native of Emesa, and had before been a priest of the sun. It was in the neighbourhood of the town that the army of Zenobia was routed by Aurelian. The first Christian bishop is said to have been St Silvanus. About fourteen years after the Hegira Khalid bin Walid, who was to find his grave in one of its suburbs, made himself master of Hems; and from 1098 to 1187 it was in the hands of the crusaders. It was probably Saladin, by whom they were expelled, that turned the temple of the sun, which under Christian rule had been used as a cathedral, into the chief fortress of the place. In July 1832 Ibrahim Pasha, having defeated the governor of Aleppo at Hems, caused the fortress to be blown up.

The poet [illegible] is buried in the town, and the people shew one their grave which they wrongly believe to be that of Ja'afar el Tayyár.

See Burton and Tyrwhitt Drake, *Unexplored Syria*, 1872.

HEMSTERHUIS, François (1720-1790), writer on æsthetics and moral philosophy, was born at Franeker in Holland in 1720. He received an excellent education from his father, Tiberius Hemsterhuis, noticed below, and completed his studies at the university of Leyden. There undoubtedly he was attracted towards the study of the Platonic philosophy, which exercised the greatest influence both on the form and on the matter of his own writings. He did not, however, devote himself to a learned life after completing his university courses, but entered upon practical affairs, and for many years acted as secretary to the state council of the United Provinces. His interests were mainly philosophical, and partly by direct social intercourse with a few similarly disposed friends, partly by correspondence with philosophical writers of other countries, mainly with Jacobi, he preserved the continuity of his philosophical work. His writings, none of which can be described as of high speculative worth, are distinguished by elegance of form and by the touch of refined sentiment which is not uncommon among the amateur or dilettante philosophers of the 18th century. Any direct contributions to philosophy made by him are in the department of æsthetics or the general analysis of feeling. He died in 1790.

His first work, published in 1769, was a *Lettre sur la Sculpture*, written, like all the others, in French. It was followed in 1770 by the *Lettre sur les désirs*, in 1772 by the *Lettre sur l'homme et ses rapports*, in 1778 by *Sophyle*, a dialogue on the relation between soul and body, in 1779 by *Aristée*, a dialogue on the existence of the Divine Being, in 1787 by *Alexis ou l'âge d'or*, by *Simon, ou des facultés de l'âme*, and by the *Lettre de Dioclès à Diotime sur l'athéisme*. Collected editions of his works have been published in 1792 (2 vols.), and more completely by Meyboom, in 1846-50 (3 vols.). See Grucker, *François Hemsterhuis, sa Vie et ses Œuvres* (Paris, 1866).

HEMSTERHUIS, TIBERIUS (1685–1766), philologist and critic, was born on January 9, 1685, at Groningen in Holland. His father, a learned physician, recognizing the abilities of his son, gave him so good an early education that, when he entered the university of his native town in his fifteenth year, he speedily proved himself to be the best student of mathematics. After a year or two at Groningen, he was attracted to the university of Leyden by the fame of Perizonius; and while there he was entrusted with the flattering duty of arranging the manuscripts in the library. Though he accepted an appointment as professor of mathematics and philosophy at Amsterdam in his twentieth year, he had already directed his attention to the study of the ancient languages. In 1706 he completed the edition of Pollux's *Onomasticon* begun by Lederlin; but the praise he received from his countrymen was more than counterbalanced by two letters of criticism from Bentley, which mortified him so keenly that for two months he refused to open a Greek book. In 1717 Hemsterhuis was appointed professor of Greek at Franeker, but he did not enter on his duties there till 1720. In 1738 he became professor of national history also. Two years afterwards he was called to teach the same subjects at Leyden, where he died, April 7, 1766. Hemsterhuis deserves special note for reinstating the study of Greek in its honourable place among his fellow-countrymen, while he was also the founder of a laborious and useful Dutch school of criticism, of which Valckenaer, Lennep, and Ruhnken are the most famous disciples.

His chief writings are the following:—*Luciani Colloquia et Timon*, 1708; *Aristophanis Plutus*, 1744; *Notæ, &c., ad Xenophontis Ephesium* in the *Miscellanea Critica* of Amsterdam, vols. iii. and iv.; *Observationes ad Chrysostomi Homilias*; *Orationes*, 1784; a Latin translation of the *Birds* of Aristophanes, in Kuster's edition; notes to Bernard's *Thomas Magister*, to Alberti's *Hesychius*, to Ernesti's *Callimachus*, and to Burmann's *Propertius*. See *Elogium T. Hemsterhusii*, with Bentley's letters, by Ruhnken, 1768, and Bergman's *Supplementa Annotationis ad Elogium T. Hemsterhusii*, &c., Leyden, 1874.

HÉNAULT, CHARLES JEAN FRANÇOIS (1685–1770), French historian, was born in Paris 8th February 1685. His father, a farmer-general of taxes, was a man of literary tastes; and young Hénault obtained a good education at the Jesuit college and the Collége des Quatre-Nations. Captivated by the eloquence of Massillon, he in his fifteenth year entered the oratory with the view of becoming a preacher, but after two years' residence he changed his intention, and, inheriting a position which secured him entry to the most select society of Paris, he at an early period achieved distinction by his gay, witty, and graceful manners, and by his literary talent as manifested in the composition of various light poetical pieces, and of two discourses which respectively gained a prize at the French Academy in 1707, and at the Académie des Jeux Floraux in 1708. In 1706 he became councillor of the parliament of Paris, and in 1710 he was chosen president of the court of *enquêtes*. He was admitted into the French Academy in 1723, and subsequently into the leading literary societies of Europe. After the death of Bernard de Coubert he became superintendent of the household of Queen Marie Leczinska, whose intimate friendship he had previously enjoyed. On his recovery in his fiftieth year from a dangerous malady, he professed to have undergone religious conversion and retired into private life, devoting the remainder of his days to study and devotion. His devotion was, however, according to the Marquis d'Argenson "exempt from fanaticism, persecution, bitterness, and intrigue;" and it did not prevent him from continuing his friendship with Voltaire, to whom it is said he had formerly rendered the service of saving the manuscript of *La Henriade*, when its author was about to commit it to the flames. The literary work on which Hénault bestowed his chief attention was the *Abrégé Chronologique*, first published in 1744 without the author's name. It is a model of its kind, and is valuable both for popular use and as a work of reference. In the compass of two volumes he has comprised the whole history of France from the earliest times to the death of Louis XIV. His information is for the most part drawn from original sources, and for such a work the number of errors committed by Hénault was remarkably small. The results of deep researches and lengthened disquisitions on public law are summed up in a few words. The moral and political reflexions are always short and generally as fresh and pleasing as they are just. A few masterly strokes reproduce the leading features of each age and the characters of its illustrious men; accurate chronological tables set forth the most interesting events in the history of each sovereign and the names of the great men who flourished during his reign; and interspersed throughout the work are occasional chapters on the social and civil state of the country at the close of each era in its history. Continuations of the work have been made at separate periods by Fantin des Odoards, by Auguis with notes by Walckenaer, and by Michaud. Besides some other historical works of minor importance Hénault wrote several dramatic pieces of no particular merit. He died at Paris, 24th November 1770. His *Mémoires*, published in 1854, are somewhat fragmentary and disconnected, but contain many interesting anecdotes and details regarding persons of note.

See the *Correspondence* of Grimm, of Madame du Deffand, and of Voltaire; the notes by Walckenaer in his edition of the *Abrégé Chronologique*; and Sainte-Beuve, *Causeries du Lundi*, vol. xi.

HENBANE (in French, *jusquiame*, from the Greek *hyoscyamos*, or hog's-bean; in Italian, *giusquiamo*; and in German, *Schwarzes Bilsenkraut*, *Hühnertod*, *Saubohne*, and *Zigeuner-Korn* or "gipsies' corn") is the common name of the *Hyoscyamus niger*, a Solanaceous plant indigenous to Britain, found wild in waste places, on rubbish about villages and old castles, and cultivated for medical use at Mitcham and other places in Surrey, and in Bedfordshire, Cambridgeshire, and Hereford. It occurs also in central and southern Europe and in western Asia, and has long been naturalized in the United States. There are two forms of the plant, an annual and a biennial, which spring indifferently from the same crop of seed,—the one growing on during summer to a height of from 1 to 2 feet, and flowering and perfecting seed; the other producing the first season only a tuft of radical leaves, which disappear in winter, leaving underground a thick fleshy root, from the crown of which arises in spring a branched flowering stem, usually much taller and more vigorous than the flowering stems of the annual plants. The biennial form is that which is considered officinal. The radical leaves of this biennial plant spread out flat on all sides from the crown of the root; they are ovate-oblong, acute, stalked, and more or less incisely-toothed, of a greyish-green colour, and covered with viscid hairs; these leaves perish at the approach of winter. The flowering stem pushes up from the root-crown in spring, ultimately reaching from 3 to 4 feet in height, and as it grows becoming branched, and furnished with alternate sessile leaves, which are stem-clasping, oblong, unequally-lobed, clothed with glandular clammy hairs, and of a dull grey-green, the whole plant having a powerful nauseous odour. The flowers are shortly stalked, the lower ones growing in the forks of the branches, the upper ones sessile in one-sided leafy spikes which are rolled back at the top before flowering, the leaves becoming smaller upwards and taking the place of bracts. The flowers have an urceolate calyx which persists around the fruit and is strongly veined, with five stiff, broad, almost prickly lobes; these, when the soft matter is removed by maceration, form very elegant specimens when associated with leaves prepared in a similar way. The corollas are obliquely funnel shaped, of a dirty yellow or buff, marked with a close reticulation of purple veins. The capsule opens transversely by a convex lid, and contains numerous seeds. Both the leaves and the seeds are employed in pharmacy. The Mahometan doctors of India are accustomed to prescribe the seeds. Henbane yields a poisonous alkaloid, *hyoscyamine*, which is stated to have properties almost identical with those of atropine, from which it differs in being more soluble in water. It is usually obtained in an amorphous, scarcely ever in a crystalline state. Its properties have been investigated in Germany by Husemann, Schroff, Höhn, &c. Höhn finds its chemical composition expressed by $C_{15}H_{23}NO_3$. (Compare Hellmann, *Beiträge zur Kenntniss der physiologischen Wirkung des Hyoscyamins*, &c., Jena, 1871.) In small and repeated doses henbane has been found to have a tranquillizing effect upon persons affected by severe nervous irritability. In poisonous doses it causes loss of speech, distortion, and paralysis. In the form of extract or tincture it is a valuable remedy in the hands of a medical man, either as an anodyne, a hypnotic, or a sedative. The extract of henbane is rich in nitrate of potassium and other inorganic salts. The smoking of the seeds and capsules of henbane is noted in books as a somewhat dangerous remedy adopted by country people for toothache. Accidental poisoning from henbane occasionally occurs, owing sometimes to the apparent edibility and wholesomeness of the root.

HENDERSON, ALEXANDER (1583-1646), a celebrated Scottish ecclesiastic, was born in 1583. He was educated at the university of St Andrews, where he was appointed professor of rhetoric and philosophy, and questor of the faculty of arts in 1610. A year or two after this he was presented to the living of Leuchars by Archbishop Gladstones. As Henderson was forced upon his parish by an archbishop, and as he was known to sympathize with Episcopacy, his settlement was at first extremely unpopular; but he subsequently changed his views, and became a Presbyterian in doctrine and church government, and one of the most esteemed ministers in Scotland. He early made his mark as a church leader, and took an active part in petitioning against Episcopal innovations. On the 1st of March 1638 the public signing of the "National Covenant" began in Greyfriars Church, Edinburgh. Henderson is mainly responsible for this document; and he seems always to have been applied to when any manifesto of unusual ability was required. In July of the same year he proceeded to the north, to debate on the "Covenant" with the famous Aberdeen doctors; but he was not well received by them. "The voyd church was made fast, and the keys keeped by the magistrate," says Baillie. Henderson's next public appearance was in the famous Assembly which met in Glasgow on the 21st of November 1638. He was chosen moderator by acclamation, being, as Baillie says, "incomparablie the ablest man of us all for all things." The marquis of Hamilton was the king's commissioner; and, when the Assembly insisted on proceeding with the trial of the bishops, he formally dissolved the meeting under pain of treason. Nothing daunted, however, they sat till the 20th of December, deposed all the Scottish bishops, excommunicated a number of them, repealed all acts favouring Episcopacy, and reconstituted the Scottish Kirk on thorough Presbyterian principles. During the sitting of this Assembly it was carried by a majority of seventy-five votes that Henderson should be transferred to Edinburgh. He had been at Leuchars for about twenty three years, and was extremely reluctant to leave it. While Scotland and England were preparing for the "First Bishops' War," Henderson drew up two papers, entitled respectively—*The Remonstrance of the Nobility*, and *Instructions for Defensive Arms*. The first of these documents he published himself; the second was published against his wish by Corbet, a deposed minister. The "First Bishops' War" did not last long. At the Pacification of Birks the king had virtually to grant all the demands of the Scots. In the negotiations for peace Henderson was one of the Scottish commissioners, and made a very favourable impression on the king. In 1640 Henderson was elected by the town council rector of Edinburgh university—an office to which he was annually re-elected till his death. The Pacification of Birks had been wrung from the king; and the Scots, seeing that he was preparing for the "Second Bishops' War," took the initiative, and pressed into England so vigorously that Charles had again to yield everything. The maturing of the treaty of peace took a considerable time; and Henderson was again active in the negotiations, first at Ripon, and afterwards at London. While he was in London he had a personal interview with the king, with the view of obtaining assistance for Edinburgh university from the money formerly applied to the support of the bishops. On Henderson's return to Edinburgh in July 1641, the Assembly was sitting at St Andrews. To suit the convenience of the parliament, however, it removed to Edinburgh; and Henderson was elected moderator of the Edinburgh meeting. In this Assembly he proposed that "a confession of faith, a catechism, a directory for all the parts of the public worship, and a platform of government, wherein possibly England and we might agree," should be drawn up. This was unanimously approved of, and the laborious undertaking was left in Henderson's hands; but the "notable motion" did not lead to any immediate results. During Charles's second state-visit to Scotland, in the autumn of 1641, Henderson acted as his chaplain, and managed to get the funds, formerly belonging to the bishopric of Edinburgh, applied to the metropolitan university. In 1642 Henderson was engaged in corresponding with England on ecclesiastical topics; and, shortly afterwards, he went to Oxford to mediate between the king and his parliament; but his mission proved a failure. A memorable meeting of the General Assembly was held in August 1643. Henderson was elected moderator for the third time. He presented a draft of the famous "Solemn League and Covenant," which was received with great enthusiasm. Unlike the "National Covenant" of 1638, which applied to Scotland only, this document was common to the two kingdoms. Henderson, Baillie, Rutherford, and others were sent up to London to represent Scotland in the Assembly at Westminster. The "Solemn League and Covenant," after undergoing some slight alterations, passed the two Houses of Parliament and the Westminster Assembly, and thus became law for the two kingdoms. By means of it Henderson has had an extraordinary influence on the history of Great Britain. As Scottish commissioner to the Westminster Assembly, he was in England from August 1643 till August 1646; and the action of the Scottish commissioners gave a fresh impulse to English Presbyterianism. Early in 1645 Henderson was sent to Uxbridge to aid the commissioners of the two parliaments in negotiating with the king; but nothing came of the conference. In 1646 the king joined the Scottish army; and, after retiring with them to Newcastle, he sent for Henderson, and discussed with him the two systems of church government in a number of papers. Meanwhile Henderson was failing in health. He sailed to Scotland, and eight days after his arrival died on the 19th of August 1646. He was buried in Greyfriars Churchyard, Edinburgh; and his death was the occasion of national mourning in Scotland. An absurd story was at once invented to the effect that, after recanting to the king's views, he had died of remorse. A document was forged, purporting to be a "Declaration of Mr Alexander Henderson," and, although this paper was thoroughly disproved, and shown to be false in the General Assembly of August 1648, the fiction was used by Clarendon, and still finds a place in professedly historical compilations.

Henderson is one of the greatest men in the history of Scotland, and, next to Knox, is certainly the most famous of Scottish ecclesiastics. He had great political genius; and his statesmanship was so influential that "he was," as Professor Masson well observes, "a cabinet minister without office." He has made a deep mark on the history, not only of Scotland, but of England; and the existing Presbyterian Churches in Scotland are largely indebted to him for the forms of their doctrine and their ecclesiastical organization. He is thus justly considered the second founder of the Reformed Church in Scotland.

For further information about Henderson reference may be made to *Memorials of Alexander Henderson*, 1846; Aiton's *Life and Times of Alexander Henderson*, 1836; *The Letters and Journals of Robert Baillie*, [illegible] *of Milton*. (J. Gi.)

HENDERSON, EBENEZER, Scottish dissenting minister and theological and miscellaneous writer, was born at the Linn near Dunfermline, November 17, 1784, and died at Mortlake, May 17, 1858. He was the youngest son of an agricultural labourer, and after three years' schooling spent some time as a watchmaker and as a shoemaker's apprentice. In 1803 he joined Mr Robert Haldane's theological seminary, and in 1805 was selected to accompany the Rev. John (afterwards Dr) Paterson to India; but as the East India Company would not allow British vessels to convey missionaries to India, Henderson and his colleague went to Denmark to await the chance of a passage to Serampore. Being unexpectedly delayed, they ultimately decided to settle in Denmark, and in 1806 Henderson was fixed at Elsinore. From this time till about 1817 he was engaged in encouraging the distribution of Bibles in the Scandinavian countries, and in the course of his travels he visited Sweden and Lapland (1812-13), Iceland (1814-15), and the remainder of Denmark and part of Germany (1816), [illegible] In 1817, [illegible] was proposed [illegible] Russia, [illegible] languages spoken in the Russian empire. After [illegible] Henderson returned to England, and in 1825 was appointed [illegible] Mission College, Gosport. In 1830 he succeeded Dr [illegible] professor of [illegible] of Homerton, Coward, and Highbury, he was [illegible] at Mortlake. His first work was a translation of the book of Jonah. Henderson was a man of great scientific attainments; in the course of his labours he made himself more or less acquainted, not only with the ordinary languages of scholarly accomplishment and the various tongues of the Scandinavian group, but also with Hebrew, Syriac, Ethiopic, Russian, Arabic, Tatar, Persic, Turkish, Armenian, Manchu, Mongolian, and Coptic. He organized the first Bible Society in Denmark (1814), and paved the way for several others. In 1817 he was nominated by the Scandinavian Literary Society a corresponding member; and in 1840 he was made D.D. by the university of Copenhagen. He was honorary secretary for life of the Religious Tract Society, and one of the first promoters of the British Society for the Propagation of the Gospel among the Jews. The narrative of his travels in Iceland (1818) were valuable contributions to our knowledge of that island. His other principal works are *Biblical Researches and Travels in Russia* (1826), *Divine Inspiration* (1836), and annotated translations of Isaiah (1840, 1857), the twelve minor prophets (1845), and Jeremiah (1851).

See *Memoir of Ebenezer Henderson*, by Thulia S. Henderson his daughter, London, 1859.

HENGSTENBERG, ERNST WILHELM (1802-1869), for more than forty years one of the most conspicuous and able champions of the strictest Lutheran orthodoxy, was born at Fröndenberg, a Westphalian village near Hamm and not far from the Ruhr, on October 20, 1802; received his entire school education under the care of his father, who was a minister of the Reformed Church, and head of the Fröndenberg Fräuleinstift; and entered the university of Bonn in 1819, shortly before the completion of his seventeenth year. There he attended the lectures of Freytag and Gieseler on Old Testament exegesis and church history, but his energies were principally devoted to philosophy and philology, and his earliest publication was an edition of the *Moallakah* of Amru'l Kais (*Amrulkeisi Moallakah cum scholiis Zuzenii* [illegible] *E. G. H.*, 1823), which gained for him the prize at his graduation in the philosophical faculty, and the public commendation of Sylvestre de Sacy. This was followed in 1824 by a German translation of Aristotle's *Metaphysics*. On quitting Bonn it had been Hengstenberg's wish to complete his theological studies under Neander and Tholuck in Berlin; but finding himself without the means of doing so, he accepted for a year a situation at Basel as tutor in Oriental languages to J. J. Stähelin. There it was that, [illegible] he began to direct his attention, with an ardour formerly unknown to him, to the spiritual truths of the Bible. His studies and experiences at this time resulted in a conviction, never afterwards shaken, not only of the divine character of [illegible] Taking as [illegible] 17, [illegible] In 1826 he became [illegible] theological faculty [illegible] and in July 1827 [illegible] the first number of the *Evangelische Kirchenzeitung*, [illegible] however, [illegible] in 1830 an anonymous article (by E. L. von Gerlach) appeared, which openly charged Gesenius and Wegscheider with infidelity [illegible] and on the ground of these accusations advo-

[illegible] of the civil power, thus [illegible] which [illegible] He died [illegible] May 1869.

[illegible] 1848, and "Dissertations on the [illegible]" 1847, in which the [illegible] along with [illegible] 2d ed. 1856-62, Eng. transl. [illegible] 1854-58, which shows the [illegible] 2d ed. [illegible] Eng. transl. by [illegible] 1861 [illegible] 1867-71 [illegible] as, for example, on "The [illegible]" "Freemasonry," "Duelling," and [illegible] the Lord and the Christian church," which [illegible] were afterwards printed [illegible] 1870-75, and [illegible] was published, from [illegible] See Bachmann's *Ernst Wilhelm Hengstenberg* (1876-79); also his article in Herzog and [illegible] (1879).

HENKE, HEINRICH PHILIPP KONRAD (1752-1809), a learned German theologian of the broad school, best known as a writer on church history, was born at Hehlen, Brunswick, on July 3, 1752, was educated at the gymnasium of Brunswick and the university of Helmstadt, and from 1778 until his death, which occurred on May 2, 1809, held a professorship of theology in that university. His principal work, [illegible], in 6 vols., 1788-1804; 2d ed. [illegible], is commended by Baur for fulness, accuracy, and attractive composition, as one of the best in that class of [illegible]. His other works are *Lineamenta institutionum [illegible]* (1783), *Opuscula [illegible]* (1802), and two volumes of *Predigten*. His son, Ernst Ludwig Theodor (1804-1872), has also left a name in the history of theology and ecclesiastical history, having been the author of monographs upon *Georg Calixt u. seine Zeit* (1853-60), *Papst Pius VII.* (1860), *Konrad von Marburg* (1861), *Kaspar Peucer u. Nik. Krell* (1865), *Jak. Fried. Fries* (1867), as well as of other works.

HENLEY, JOHN (1692-1759), an eccentric clergyman of the last century, commonly known as "Orator Henley," was born August 3, 1692, at Melton Mowbray, where his father was vicar. After attending the grammar schools of Melton and Oakham, he in his seventeenth year entered St John's College, Cambridge, and while still an undergraduate he addressed in February 1712, under the pseudonym of Peter de Quir, a letter to the *Spectator* displaying no small wit and humour. After graduating B.A. he became assistant and then head-master of the grammar school of his native town, uniting to these duties those also of assistant curate. His superabundant energy was not, however, entirely consumed by the plurality of offices, for besides publishing in 1714 a poem entitled *Esther, Queen of Persia*, containing many vigorous and eloquent passages, he also devoted his attention to the compilation of a grammar of ten languages entitled *The Complete Linguist* (2 vols., London, 1719-21). In his school he is said to have introduced many new methods of study, but whether it was that his innovations were not sufficiently appreciated, or that he desired a wider sphere for the exercise of his exceptional abilities, he resolved to place his services at the disposal of the metropolis, where he arrived with thirty recommendatory letters from some of the most influential persons of his native county. He succeeded in obtaining the appointment of assistant preacher in the chapels of Ormond Street and Bloomsbury, and in 1723 was presented to the rectory of Chelmondiston in Suffolk; but residence being insisted on, he resigned both his appointments, and on July 3, 1726, opened what he called an "oratory" in Newport Market, which he licensed under the Toleration Act. Into his services he introduced many peculiar alterations: he drew up a "Primitive Liturgy," in which he substituted for the Nicene and Athanasian creeds two creeds taken from the apostolical constitutions; for his "Primitive Eucharist" he made use of unleavened bread and mixed wine; he distributed at the price of one shilling medals of admission to his oratory, with the device of a sun rising to the meridian, with the motto *Ad summa*, and the words *Inveniam viam aut faciam* below. But the most original element in the services was Henley himself, who is described by Pope in the *Dunciad* as

> "Preacher at once and zany of his age."

He possessed some oratorical ability and adopted a very theatrical style of elocution, "tuning his voice and balancing his hands;" and his addresses were a strange medley of solemnity and buffoonery, of clever wit and the wildest absurdity, of able and original disquisition and the worst artifices of the oratorical charlatan. His services were much frequented by the "freethinkers," and he himself expressed his determination "to die a rational." Besides his sermons on Sunday he delivered on Wednesday lectures chiefly on social and political subjects; and he also projected a scheme for connecting with the "oratory" a university on quite a novel plan, and intended to be, in a sense too utopian to be realized, the foster mother of the arts and sciences. For some time he edited the *Hyp Doctor*, a weekly paper established in opposition to the *Craftsman*, and for this service he enjoyed a pension of £100 a year from Sir Robert Walpole. At first the orations of Henley drew great crowds, but, although he never discontinued his services, his audience latterly dwindled almost entirely away. He died 13th October 1759.

Henley is the subject of several of Hogarth's prints. His life, professedly written by A. Welstede, but in all probability by himself, was inserted by him in his *Oratory Transactions*. See Nichols's *History of Leicestershire*, and Disraeli's *Calamities of Authors*.

HENLEY-ON-THAMES, a market-town of Oxfordshire, England, is situated on the left bank of the Thames and at the terminus of a branch of the Great Western Railway. It is 22 miles S. of Oxford and 35 W. from London by rail, and 47 miles from Oxford and 64½ from London by the river. It occupies one of the most beautiful situations on the Thames, at the foot of the finely wooded Chiltern Hills. The river is crossed by an elegant stone bridge of five arches, constructed in 1786 at a cost of £10,000. The principal buildings are the parish church, a handsome Gothic structure recently restored at a cost of over £7000, possessing a lofty tower of intermingled flint and stone, which is attributed to Cardinal Wolsey, but which was more probably erected by Bishop Longland; the grammar school, founded in 1605; the town-hall, a neat building supported by Doric columns; the reading-room and library, and various charitable institutions. Henley is a favourite summer resort, and also possesses some trade in corn, flour, malt, and timber. It is celebrated for the Henley Royal Regatta, the principal gathering of amateur oarsmen in England, which usually takes place in July. The population of the parish in 1871 was 3736, and of the local board district 4623.

Henley existed at a very early period, and according to some authorities was a Roman station. It obtained a charter of incorporation from [illegible], in which it is named [illegible] or [illegible]. In [illegible] it was occupied by the Parliamentary troops, who successfully repelled an attack made upon them by the Royalists.

See *History of Henley-on-Thames*, by John Southerden Burn, [illegible], and *An Account of the* [illegible] *their commencement* [illegible] June 1839 *to the year* [illegible], [illegible].

HENNA is the Persian name for a small shrub found in the East Indies, Persia, the Levant, and along the African coasts of the Mediterranean, where it is frequently cultivated. It is the *Lawsonia alba* of botanists, and from the fact that young trees are spineless, while older ones have the branchlets hardened into spines, it has also received the names of *Lawsonia* [illegible] and *L. spinosa*. It forms a slender shrubby plant of from 6 to 10 feet high, furnished with opposite oval lance-shaped smooth leaves, which are entire at the margins, and bears small white four-petalled sweet-scented flowers disposed in panicles. The four spreading petals are obovate, and furnished with claws; and alternating with them are eight stamens approximating by pairs. Its Egyptian name is *Khenna*, its Arabic name *Al* [illegible], its Indian name [illegible], while in England it is called *Egyptian privet*, and in the West Indies, where it is naturalized, [illegible].

Henna or Henne is of ancient repute as a cosmetic. The powder of the leaves of the *Lawsonia* powdered and made up into a paste; this is employed by the Egyptian women, and also by the Mahometan women in India, to dye their finger nails and other parts of their hands and feet of an orange-red colour, which is considered to add to their beauty. The colour lasts for three or four weeks, when it requires to be renewed. It is moreover used for dyeing the hair and beard, and even the manes of horses; and the same material is employed for dyeing skins and morocco leather a reddish yellow, but it contains no tannin. The practice of dyeing the nails was common amongst the [illegible] afforded by [illegible] of which are most commonly [illegible]

There is a quality in the drug which gently restrains perspiration in the hands and feet, and produces an agreeable coolness equally conducive to health and comfort." She further suggests that if the Jewish women were not in the habit of using this dye before the time of Solomon, it might probably have been introduced amongst them by his wife, the daughter of Pharaoh, and traces to this probability the allusion to "camphire" in the passages in Canticles above referred to.

The preparation of henna consists in reducing the leaves and young twigs to a fine powder, catechu or lucerne leaves in a pulverized state being sometimes mixed with them. When required for use, the powder is made into a pasty mass with hot water, and is then spread upon the part to be dyed, where it is generally allowed to remain for one night.

It has been already noted that the flowers of the *Lawsonia* are very fragrant, whence they derive in the West Indies the name of Jamaica mignonette. According to Lady Callcott, they are often used by the eastern women to adorn their hair; and Mr Simmonds states that the distilled water from the flowers is used as a perfume. The plant is further credited with the possession of [illegible] and astringent properties.

HENNEBONT, a town of France, arrondissement of Lorient, and department of Morbihan, is situated on the Blavet, not far from its mouth, and [illegible] miles W.N.W. of Vannes. It is a picturesque old town, and contains some remains of its former fortifications. The church of Notre Dame de Paradis, a beautiful building of the 16th century, possesses some fine wood carving. The town has an important corn-market, and considerable shipping trade in iron, corn, honey, wax, hemp, cider, and wine. Shipbuilding, sawing, and tanning are also carried on. Hennebont is famed for the resistance which it made, under the widow of John de Montfort, when besieged by the armies of Philip of Valois and Charles of Blois. The population in 1876 was [illegible].

HENNEQUIN, PHILIPPE AUGUSTE (176[illegible]–1833), French painter, was a pupil of David. He was born at Lyons in 17[illegible], distinguished himself early by winning the "grand prix," and left France for Italy. The disturbances of Rome, during the course of the Revolution, obliged him to return to Paris, where he executed the [illegible] of July, [illegible] large design commissioned for the town-hall, when in July 17[illegible] [illegible]

HENNERSDORF, or **SEIFHENNERSDORF**, a manufacturing village of Saxony, in the circle of Bautzen, and 20 miles S.S.E. of the town of that name. The inhabitants are engaged in weaving and bleaching, and in the manufacture of woollen goods, satin, arnotto, machinery, bricks, and wooden shoes. There is also an iron foundry. Population (1875), 6366.

HENRIETTA MARIA (1609–1666), queen of Charles I. of England, born November 25, 1609, was the daughter of Henry IV. of France. When the first overtures for her hand were made on behalf of Charles, prince of Wales, in the spring of 1624, she was little more than fourteen years of age. Her brother, Louis XIII., only consented to the marriage on the condition that the English Roman Catholics were relieved from the operation of the penal laws. When, therefore, she set out for her new home in June 1625, she had already pledged the husband to whom she had been married by proxy on May 1 to a course of action which was certain to bring unpopularity on him as well as upon herself.

That husband was now king of England. The early years of the married life of Charles I. were most unhappy. He soon found an excuse for breaking his promise to relieve the English Catholics. His young wife was deeply offended by treatment which she naturally regarded as unhandsome. The favourite Buckingham stirred the flames of his master's discontent. Charles in vain strove to reduce her to tame submission. After the assassination of Buckingham in 1628 the barrier between the married pair was broken down, and the bond of affection which from that moment united them was never loosened.

For some years Henrietta Maria's chief interests lay in her young family, and in the amusements of a gay and brilliant court. She loved to be present at dramatic entertainments, and her participation in the private rehearsals of the *Shepherd's Paradise*, written by her favourite Walter Montague, probably drew down upon her the savage attack of Prynne. With political matters she hardly meddled as yet. Even her co-religionists found little aid from her till the summer of 1637. She had then recently opened a diplomatic communication with the see of Rome. She appointed an agent to reside at Rome, and a papal agent, a Scotchman named Con, accredited to her, was soon engaged in effecting conversions amongst the English gentry and nobility. Henrietta Maria was well pleased to become a patroness of so holy a work, especially as she was not asked to take any personal trouble in the matter. Protestant England took alarm at the proceedings of a queen who associated herself so closely with the doings of "the grim wolf with privy paw."

When the Scottish troubles broke out, she raised money from her fellow Catholics to support the king's army on the borders in 1639. During the session of the Short Parliament in the spring of 1640, the queen urged the king to betake himself to the House of Commons in defence of the Catholics. When the Long Parliament met, the Catholics were believed to be the authors and agents of every arbitrary scheme which was supposed to have entered into the plans of Strafford or Laud. Before the Long Parliament had sat for two months, the queen was urging upon the pope the duty of lending money to enable her to restore her husband's authority. She threw herself heart and soul into the schemes for rescuing Strafford and coercing the parliament. The army plot, the scheme for using Scotland against England, and the attempt upon the five members were the fruits of her political activity.

In the next year the queen effected her passage to the Continent. In February 1643 she landed at Burlington Quay, placed herself at the head of a force of loyalists, and marched through England to join the king near Oxford. After little more than a year's residence there, on April 3, 1644, she left her husband to see his face no more. At Exeter she gave birth to her youngest child, who was one day to be duchess of Orleans, and to negotiate the treaty of Dover. Henrietta Maria found a refuge in France. Richelieu was dead, and Anne of Austria was compassionate. As long as her husband was alive the queen never ceased to encourage him to resistanc

During her exile in France she had much to suffer. Her husband's execution in 1649 was a terrible blow. She brought up her youngest child Henrietta in her own faith, but her efforts to induce her youngest son, the duke of Gloucester, to take the same course only produced discomfort in the exiled family. The story of her marriage with her attached servant Lord Jermyn needs more confirmation than it has yet received to be accepted, but all the information which has reached us of her relations with her children points to the estrangement which had grown up between them. When after the Restoration she returned to England, she found that she had no place in the new world. She received from parliament a grant of £30,000 a year in compensation for the loss of her dower-lands, and the king added a similar sum as a pension for himself. In January 1661 she returned to France to be present at the marriage of her daughter Henrietta to the duke of Orleans. In July 1662 she set out again for England, and took up her residence once more at Somerset House. Her health failed her, and on June 24, 1665, she departed in search of the clearer air of her native country. She died on August 31, 1666, at Colombe, not far from Paris.

Kings of England.

HENRY I. (1068–1135), king of England, fourth and youngest son of William the Conqueror and Matilda of Flanders, was born some time in the autumn of 1068. Local tradition fixes his birthplace at Selby in Yorkshire. Little is known of his earlier life, except that he received an unusually good education, and attained a proficiency rare among the princes of his day. In 1086 he was dubbed knight. Next year his father bequeathed to him on his death-bed a sum of five thousand pounds, and is said to have foretold that he would eventually be king. Condemned, by the division of the Conqueror's territories, to a position of inferiority to his two brothers, he used his legacy to improve that position. Robert, being in need of money, sold him the districts of the Côtentin and the Avranchin, which he held of his brother as a fief. His relations with Robert were not always friendly, but he defended Normandy against Rufus, and aided his liege lord in putting down a revolt in Rouen. Nevertheless, in the treaty between William and Robert made in 1091, he was excluded from the succession, and soon afterwards was deprived of his lands in Normandy.

The treatment he met with from Robert was not likely to make him support the terms of the treaty of 1091. Immediately after the death of Rufus, he rode to Winchester, and seized the royal hoard in that city. Next day (August 3, 1100) he was elected king by such of the witan as were present, and on Sunday, August 5th, he was crowned at Westminster. In order to conciliate the clergy and the nation, he recalled Anselm, imprisoned Ranulf Flambard, and issued a comprehensive charter of liberties. Before the year was out he married Matilda, daughter of Malcolm and Margaret, and great-granddaughter of Edmund Ironside, a step which greatly strengthened his otherwise insecure title to the crown. The alliance thus contracted with the church and the nation was his constant support in the struggle with his brother and his unruly vassals, which began immediately. It resulted in the conquest of Normandy, the temporary suppression of feudalism, and the consolidation of royal power on both sides of the Channel. Robert, as soon as he returned from the Holy Land, attempted with the aid of a conspiracy in

England to wrest the crown from the usurper. He landed at Portsmouth (August 1, 1101), but before a blow was struck the brothers came to terms. Robert recognized Henry as king of England, and returned to Normandy. Henry's vengeance fell upon his brother's partisans, and Robert of Belesme and several others were banished from the country and lost their English estates. Secure in England, Henry carried the war into the enemy's country. His brother's misgovernment gave him both pretext and opportunity. After two or three expeditions, the struggle was brought to a close by the battle of Tenchebrai (September 28, 1106), in which Robert was taken prisoner. He remained in captivity till his death in 1134, and Normandy passed into the possession of the English king. This conquest at once brought Henry into collision with France. Louis the Fat [illegible] supporter of Henry's [illegible], William, son of Robert. Henceforward Henry had to spend most of his time in the duchy. A war with France (1111-1113), ended in a peace which brought some advantages to Henry. Louis gave up his claim to the suzerainty of Maine and Brittany, and Henry was able to carry his old opponent, Robert of Belesme, to England where he was imprisoned for the rest of his life. Henry had already, though in vain, attempted to secure the aid of Flanders by two treaties with Count Robert (1103, 1108). He now sought a mightier ally in the emperor Henry V., to whom he married his daughter Matilda (January 7, 1114). Another war with France, which broke out in 1116, and in which Louis took up the cause of William, son of Robert, against his uncle, was marked by the battle of Noyon (1119). At a council at Rheims (1119) Louis accused Henry before Pope Calixtus of [illegible] and usurpation. Henry, however, pleaded his own cause before the pope at Gisors so persuasively that Calixtus brought about a peace between the two kings (1120) on the basis of a mutual restoration of conquests. During the war Henry had suffered a severe loss in the death of his queen Matilda. He now felt it more than ever necessary to take measures for securing the succession to his only son William. The barons of Normandy and England were made to do homage to the young prince (1115), who shortly afterwards married Matilda, daughter of Fulk of Anjou, an alliance by which Henry hoped to turn a dangerous foe into a firm friend, and to secure at least the chance of a rich inheritance. All these hopes were, however, shattered by the death of William (1120). Deprived of an heir to his throne, Henry now married Adelaide, daughter of Godfrey, count of Louvain (1121), but the marriage unfortunately proved childless. Shortly afterwards another rebellion, headed by Count Waleran of Meulan, broke out in Normandy (1123). The rebels were encouraged by the [illegible] of the king of France and the count of Anjou, but were entirely defeated at Bourgtheroulde (1124). The terrible vengeance taken by Henry on this occasion, together with the death of William, son of Robert, in 1128, seems to have finally crushed the opposition in Normandy. [illegible] Meanwhile Henry had recalled his daughter Matilda, now a widow, from Germany. In default of an heir to the throne, he made the barons swear to accept her as lady of England and Normandy [illegible]. Next year he gave her in marriage to Geoffrey, son of Fulk, count of Anjou, hoping thereby to secure the objects frustrated by the death of William. Fate, however, thwarted the [illegible] of these schemes.

The annals of England, after the expulsion of Robert of Belesme, are uneventful. In his ecclesiastical policy Henry, without giving up the control over the church which his father had asserted, was forced to recognize to a certain extent the advancing claims of Rome. His dispute with Anselm was conducted with good temper on both sides, and was brought to a satisfactory conclusion. Anselm had made no objection to the ecclesiastical supremacy claimed by Rufus, but the decrees of the Lateran Council (1099) obliged him to resist a similar claim when put forward by Henry I. He refused to do homage to his new king, or to consecrate the bishops whom Henry invested, according to ancient custom, with the symbols of ecclesiastical dignity. Neither side would give way. Henry continued to make bishops as before, and Anselm refused to consecrate them. In 1103 he left England. For the next three years the affairs of Normandy hindered the settlement of the question, but a compromise was effected in 1107. The pope, Paschal II., consented that homage should be done to the king, while Henry gave up his claim to investiture with the ring and staff. The question thus settled was not reopened till the days of Becket. In other respects Henry acquiesced in the tendency of the time towards ecclesiastical separatism, and countenanced the decrees of the synod of 1102, which forbade the marriage of the clergy and the tenure of temporal offices by ecclesiastics. He showed his care for the church by the establishment of two new sees, those of Ely (1109) and Carlisle (1133), taken respectively from the unwieldy dioceses of Lincoln and York. In the old quarrel between York and Canterbury, Henry supported the claims of the southern metropolitan against Archbishop Thurstan. On Anselm's death, Henry was guilty of leaving the see vacant for five years, but in his other dealings with the church he seems to have been actuated by worthy motives. He refused, however, to open her high places to Englishmen, and till near the end of his reign no native attained the dignity of prelate. The same exclusive spirit made itself felt in the appointments to temporal offices. But although political liberty and influence were not granted to Englishmen under Henry I., the English nation as a whole prospered greatly in his rule. Its chief wants were justice and order, and protection from feudal tyranny; and these blessings it obtained. The insecurity of his position compelled Henry to rely mainly on his English subjects. As a counterpoise to the local influence of the baronage, he did his best to restore to activity the old popular institutions of the hundred and the county court, of tithings and frankpledge, of watch and ward. His frequent progresses through the country, for judicial and other purposes, form a link between the annual courts held by the Conqueror and the regular circuits of the justices established by Henry II. In the administration of justice and the tasks of government he relied on new men, raised from the ranks and dependent on himself for their position. The older baronage he jealously depressed, and every [illegible] the power of the feudal nobility, while it strengthened the link between the king and the nation.

Thus secure at home, Henry was disturbed by few neighbours within the four seas. Over Scotland, Ireland, and Wales a sort of undefined supremacy was preserved. On the northern frontier there was peace during the reign; on the western there was some disturbance. Henry planted a colony of Flemings in Pembroke (1111), and made two expeditions into Wales (1114, 1121), in one of which he received the submission of several Welsh princes. The unbroken peace which England enjoyed for a period of thirty-four years is the best testimony to Henry's merits as a king. As a man his character is not admirable, nor yet wholly to be condemned. He was hard, merciless, and unbending, but not wantonly cruel. He sometimes displayed a grim humour which reminds one of his father; but he never gave way to the vices and brutality of Rufus, nor to the jovial good humour which was so winning in his eldest brother. Regarded as the "Lion of Justice" by his people, and bitterly regretted after he was gone, he was not a popular king. He died, after bequeathing his crown to his daughter Matilda, near Rouen (December 1, 1135). His body was carried to England, and buried in the abbey he had founded at Reading.

The following *general authorities* may be consulted for this and the next five reigns here included:—*Statutes of the Realm*; Rymer's *Foedera*, the *Pipe-Rolls*, *Rotuli Chartarum*, *Rotuli Litterarum Pat. and Claus.* &c. (ed. Hardy); Lappenberg and Pauli, *Geschichte von England*; Stubbs, *Constitutional History of England*; Stubbs, *Documents illustrative of English History* (for Henry I., II., III.); Lingard, *History of England*; Green, *History of the English People*.

For this reign, *original authorities*—*Anglo-Saxon Chronicle*; Florence of Worcester, *Chronicon ex Chronicis*, with its *continuation*; Simeon of Durham, *De Regibus Anglorum*, &c.; Ordericus Vitalis, *Historia Ecclesiastica*; William of Malmesbury, *Gesta Pontificum Anglorum*, *Gesta Regum Anglorum*, and *Historia Novella*; Eadmer, *Vita Anselmi* and *Historia Novorum*; Robert du Mont, *Chronicon*, and *continuation* of William of Jumièges; the *Magnum Rotulum Scaccarii*, 1131 A.D. (ed. Hunter).

Modern authorities.—Freeman, *History of the Norman Conquest*, vol. v.; Church, *Life of Anselm*; Palgrave, *History of Normandy and England*. (G. W. P.)

HENRY II. (1133–1189), king of England, son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I., was born at Le Mans, March 5, 1133. He was left in France during the first part of his mother's struggle with Stephen, but was sent over to England in 1141. There he remained four years, in the charge of his uncle, Robert of Gloucester. In 1147 he took a more active part in the war, but was not successful. He now sought the aid of David, king of Scotland, and was knighted by him (1149), but nothing came of the alliance with that prince. On his return to Normandy (1151), Louis VII. conferred the duchy upon him, and later in the year he became, by his father's death, count of Anjou. In 1152 he married Eleanor of Aquitaine, and added Poitou and Guienne to his dominions. He again went to England in 1153, and the great position he had won on the Continent turned the scale in his favour. After a short struggle Stephen consented to negotiate. By the treaty of Winchester (November 7, 1153) it was settled, among other things, that Stephen should reign undisturbed during the rest of his life, and that Henry should succeed him. A year later Stephen died, and Henry took quiet possession of the throne. He was crowned on December 19, 1154, and at once issued a charter of liberties, in which he confirmed the charter of Henry I.

His reign falls into three main periods. During the first Henry was occupied in restoring and maintaining order. The second is that of the quarrel with Becket. The third is for the most part a period of rebellion and trouble, the consequences of that quarrel. Henry's first business was to fulfil the promises made in the treaty of Winchester, and to undo the work of his predecessor. Several of Stephen's earldoms were abolished, new sheriffs were appointed, the adulterine castles destroyed, the royal domains recovered. In this task the king met with little serious opposition, and his presence generally sufficed to ensure success. In 1156 Henry was able to go to France, where his brother Geoffrey was causing trouble by his claims on Anjou. He had to subdue him by force of arms, after which he allowed him to be chosen count of Nantes. He then exacted homage from his Continental vassals, and himself did homage to Louis VII. At Easter 1157 he returned to England, to complete the restoration of order there. Those of the great barons who had not yet given up their castles had now to do so, and the king of Scotland surrendered the three northern counties. An unsuccessful expedition to Wales followed. In 1158, on his brother Geoffrey's death, Henry secured his inheritance. At the same time he betrothed his second son Henry (the eldest, William, being dead) to Margaret, daughter of Louis. Next year he made an attack upon Toulouse, which he claimed in right of his wife, but after some successes retired, owing to the opposition of the French king. In a peace made soon after, he retained Cahors, but gave up his claim to the rest of the county. Hostilities between him and Louis were, however, more or less continuous during this time, in spite of the efforts of Alexander III. In January 1163 Henry returned to England after five years' absence, and his quarrel with Becket immediately began.

Becket had been consecrated archbishop of Canterbury in June 1162. He at once resigned his temporal offices, and demanded the restitution of lands alienated from his see. At a council at Woodstock he refused to pay the tax of two shillings per hide demanded by the king. A little later the struggle was removed to still more dangerous ground. Becket refused his consent to the king's proposal for settling the dispute between the temporal and spiritual courts. Upon this Henry asked him and the bishops whether they would abide by the ancient customs of the realm. So vague a question met with an evasive answer. The bishops would only consent "saving their order." However, at the council of Clarendon (January 1164) the disputed customs were drawn up in the form of sixteen constitutions, and after considerable hesitation accepted by Becket. He nevertheless got absolution from the pope, who refused to confirm the constitutions. Henry now attacked Becket with a series of charges connected with his chancellorship, the result of which the latter evaded by leaving England. Henry took possession of the see, and expelled Becket's friends and relations. The greater part of the next five years he spent abroad. During this time he was occupied in maintaining order among his unruly vassals, checking the intrigues of Louis, and negotiating with the pope. He also obtained possession of Brittany for his son Geoffrey, and betrothed Richard to Alice, daughter of Louis. With the object of securing the succession he had his son Henry crowned by the archbishop of York at Westminster (June 1170). The young king's wife was not crowned with him. Louis, taking this as an insult, invaded Normandy, and only made peace with Henry on condition that he would restore Becket to favour. A meeting between the king and the archbishop ended in a compromise, and the latter returned to England. His first step was to suspend the archbishop of York and other bishops who had taken part in the coronation of the young king, and Henry, on hearing of this, uttered the angry words that led to Becket's murder. The pope was, however, in too critical a position to quarrel seriously with Henry. Negotiations between them ended in a meeting with the legates at Avranches (1172), in which Henry received absolution, and promised to abolish all the bad customs introduced during his reign. He had employed the interval in making an expedition to Ireland, and appropriating the conquests made by Strongbow a few years before.

The ecclesiastical quarrel seemed to have died away, but its consequences were felt in the great rebellion of 1173. A confederacy was organized by the French king, the count of Flanders, the king of Scotland, and Henry's sons, with the object of placing the young Henry on his father's throne. The first campaign was indecisive, but on the whole favourable to the king. In view of a general attack which was to be made next year, Henry crossed over to England and did penance at Becket's tomb. Fortunately his justiciar, De Lucy, captured the Scotch king at Alnwick, and the rebellion in England was speedily put down. William the Lion was forced to buy his release by doing homage to Henry; the other confederates made peace; and Henry was left stronger than ever. He at once proceeded to secure his position by further legislative enactments, and henceforward he had no trouble in England. But he was involved in constant difficulties with his sons and with the French king, owing to the mutual jealousies of the former and the intrigues of the latter, to which Henry's partiality for his youngest son John and his refusal to allow the marriage of Richard with Alice gave rise. A war between the brothers in 1183 was brought to an end by the death of the young Henry in the same year. The feud broke out again in 1184, and continued at intervals, in spite of the death of Geoffrey in 1186, to the end of the reign. At length Henry's apparent intention to name John as his successor forced Richard to ally himself with Philip II., and in the war that followed Henry was beaten at all points. He was forced to make a disgraceful peace, the terms of which, together with the discovery that John was among his enemies, broke his heart. He died at Chinon, July 6, 1189, and was buried at Fontevraud.

Henry's legislative activity, which was great and constant, deserves special notice. His aim was the consolidation of royal power by means of a centralized system of justice and administration. The Constitutions of Clarendon were an essential part of this scheme, designed to bring the clergy, as well as other classes of the nation, under the rule of law, and to prevent an ecclesiastical "imperium in imperio." Other enactments, as the Assize of Clarendon (1166), were intended to perfect the judicial system and to supersede the baronial by the royal courts. The system of recognition by jury took the place of trial by battle. The grand jury was organized for the presentment of criminals for trial. The jury system was further employed for the inquiry into the conduct of the sheriffs (1170), and for the assessment of the Saladin tithe (1188). The circuits of the justices itinerant were, after repeated experiments, brought to something like perfection, and a high court of justice formed out of the Curia Regis, which was the origin of the Court of King's Bench. By the commutation of feudal service for scutage, and by the Assize of Arms (1181), which revived the national militia, Henry made himself independent of the baronage, and formed that alliance between king and people which was the surest basis of his power. Whatever may be said against his private character, the wisdom and steadiness with which he pursued these aims, and the permanence of the mark that he left upon the constitution, secure him the title of a great king.

Original Authorities: William of Newbury, *Historia Rerum Anglicarum*; Ralph de Diceto, *Imagines Historiarum*; Gervase of Canterbury, *Chronicle*, &c.; *Chronicle* of Benedict of Peterborough (so called); Roger of Hoveden, *Annales Anglicani*; Jordan Fantosme, *Histoire de la Guerre*, &c.; Giraldus Cambrensis, *Expugnatio Hibernica*, *Itinerarium Cambriae*, &c.; Ralph Glanvill, *Tractatus de Legibus*, &c.; Walter Map, *De Nugis Curialium*, &c.; *Letters* and *Lives of Becket* (ed. Giles); Robert du Mont, *Chronica*; *Dialogus de Scaccario*; the *Pipe Rolls*.

Modern Authorities: Stubbs, *Prefaces* to Benedict of Peterborough and Roger of Hoveden; Robertson's *Life of Becket*; Eyton's *Itinerary of Henry II.* (G. W. P.)

HENRY III. (1207–1272), king of England, eldest son of John and Isabella, was born on October 1, 1207, and was just nine years old on his father's death. Ten days after that event he was crowned at Gloucester (October 28, 1216). His long reign falls into four periods,—that of the regency, ending with the fall of De Burg; that of government by favourites, which led to the Mad Parliament; the period of the Barons' War; and the short period between the close of the war and Henry's death. At his accession the whole country was in rebellion, and Louis with his Frenchmen held the east and south. In this crisis it was fortunate that the government fell into the hands of such a man as William Marshall, and that the pope gave him all the assistance in his power. The acceptance of the charter at once recalled many to their allegiance, and the defeat and retirement of Louis broke up the opposition. The charter was confirmed (1217) and order rapidly restored. The legate Gualo aided the earl marshal and Archbishop Langton in the work. On Marshall's death (1219) Pandulf took Gualo's place, and asserted the papal authority in a way which obliged Langton to make a personal protest at Rome. Pandulf was recalled, and Hubert de Burg, the justiciar, ruled with Langton till the latter's death (1228), and alone afterwards. The influence of Peter des Roches, bishop of Winchester, the head of the foreign party and guardian of the king's person, was successfully resisted. Meanwhile a last outbreak of pure feudalism under Falkes de Breauté was put down, and the charter again issued in its final shape (1227). But the worst plague of the reign, the influence of foreign favourites, had already made itself felt, while another great evil, the financial exactions of Rome, was causing much discontent. An expedition to Poitou, opposed by De Burg, caused the first quarrel between him and the king. Shortly afterwards Peter des Roches returned from a temporary banishment, and gained such influence over Henry that he dismissed De Burg with insult and ingratitude (1232). From this point his real reign may be said to have begun.

The bad promise of his youth was amply redeemed in the events of the next twenty-six years. Under the influence of Peter des Roches, foreigners began to flock to the court, and even foreign mercenaries were introduced into England. Richard, earl marshal, who openly rebuked the king for this conduct, was outlawed, but other barons took up his cause, and collisions between them and the king's troops took place. Civil war appeared imminent, when Archbishop Edmund persuaded Henry to dismiss Peter des Roches, and the danger was avoided for the time (1234). But the king's partiality for foreigners was a constant source of content. In 1236 he married Eleanor of Provence. Two uncles of the queen, William, bishop of Valence, and Peter of Savoy, came over with her, and were immediately placed in positions of honour and emolument. In 1238 Henry married his sister Eleanor to Simon de Montfort, an event which nearly produced an outbreak. Resistance already centred in the Great Council, which in 1236 had declined "to change the laws of England," and supported the bishop of Chichester in his refusal to give up the great seal at the king's demand. Henry's personal extravagance caused him much embarrassment, and the extortions of the papal see pressed heavily on the church. In 1242 the barons refused to give the aid demanded by the king for another expedition to Poitou, and when they met again after his return, they joined with the clergy in a general protest against his misgovernment (1244). In order to remedy this state of things, it was proposed that the king's advisers should be chosen by the parliament, as it now began to be called, but Henry found means of evading the demand. Hitherto his brother Richard, earl of Cornwall, had been the leader of the opposition, but Simon de Montfort, earl of Leicester, was now becoming the centre of constitutional resistance. In 1246 the king's step-father, the count of La Marche, died, and Henry's half-brothers came to England bringing with them a fresh crowd of hungry followers. The demands made upon the great cities, especially London, upon the Jews, and upon the clergy, to meet the expenses caused by the king's favourites, were constantly on the increase. Owing to the cessation of the office of justiciar since the fall of De Burg, the judicial system was falling into decay, and crime of all kinds was rampant. At the same time the pope, engaged in his great struggle with Frederick II., regarded England as an "inexhaustible spring of wealth," and redoubled his demands. He won over most of the bishops by supporting them in their claim to inspect the monastic houses in their dioceses, and the church, deprived of its natural head,—for Boniface, an uncle of the queen, was archbishop of Canterbury,—was disunited and helpless.

Grosseteste, bishop of Lincoln, was almost alone in his efforts to follow in the steps of Stephen Langton. He and De Montfort were at one in their desire for reform, but the nation was not yet ready. Two mistakes on the part of Henry brought matters to a crisis. He had conferred the government of Gascony on De Montfort in 1248, and the latter had reduced the province to obedience. But accusations made against him found ready audience with the king, who feared and disliked his brother-in-law. The result was a bitter quarrel (1252), which Henry followed up by superseding De Montfort in his government, and sending his eldest son Edward to take his place. This had the effect of throwing the earl once for all into the arms of the national party. A little later an event occurred which forced that party to take active measures. The pope persuaded Henry to accept the kingdom of Sicily for his second son Edmund, and to bind himself to pay the expenses of its conquest, together with a large debt already incurred (1255). This important scheme was entered into without the knowledge of the parliament, and the nation suddenly found itself pledged to an undertaking which had purely dynastic or papal objects. The coalition of pope and king produced a corresponding union of the church and the baronage, and the troubles of the year 1257, Scotch and Welsh inroads, together with a failure of the harvest, united the nation against the Government.

A parliament which met at Westminster (April 1258) forced Henry to promise reform, and elected a committee of twenty-four to act for the king till a complete scheme could be drawn up. On June 11th the assembly, called afterwards the Mad Parliament, met at Oxford. A council of fifteen, of whom two-thirds were on the baronial side, was appointed, who, together with twelve representatives of the "community," were to take charge of the government and meet in parliament thrice a year. Hugh Bigod was named justiciar, other offices were filled up, the castles were entrusted to Englishmen, and four knights were summoned from each county to declare grievances. These reforms, together with certain general enactments, went by the name of the Provisions of Oxford. The king's authority was completely superseded, and the rule of a baronial oligarchy established. Next year, owing to the demands of the knighthood, who felt themselves neglected, a further series of Provisions was issued. The Sicilian project was formally repudiated, and a final peace made with France, in which the claim on Normandy and other districts was renounced. But beyond this the baronial Government did nothing. The nation testified its disappointment, and a quarrel took place between the earls of Leicester and Gloucester which divided the baronial party. The king took advantage of this state of affairs, and in 1261 obtained absolution from the Provisions at the hands of the pope. He then fortified the Tower, deposed the baronial justiciar, and soon began to rule as before. In this crisis the baronial party made a bid for popular favour by summoning representatives of the counties to a parliament, but the reaction was for the time complete, and Henry had leisure to go to France in order to win over Louis IX. to his side. In 1263 hostilities broke out on the Welsh border, and the barons seized the opportunity to renew their attack on the king. After some months of desultory warfare, it was agreed to submit to the arbitration of Louis. That king, in the Mise of Amiens, decided in favour of Henry, and annulled the Provisions. Leicester at once appealed to arms. The battle of Lewes (May 14, 1264) was a complete victory for him, and put the king and his eldest son into his hands. For a time he was master of the country, but the party he headed was not that which had been dominant at six years before, and Henry now had many adherents among the greater barons. Nevertheless, for more than a year he remained practically a prisoner in the hands of De Montfort. At a parliament which met in June 1264, and at which knights of the shire were certainly present, a constitution was drawn up, which, while preserving to the king a high position as head of the executive, placed supreme power in the hands of the "community." Early next year, in a parliament to which members from the boroughs as well as from the counties were summoned, this constitution was confirmed, and Henry swore to observe it. In accordance with the settlement made at Lewes, Edward was now to be released. His father was already supposed to be at liberty, but in reality both he and Edward were kept in restraint. Edward's escape (May 1265) caused an immediate renewal of the war, and at the battle of Evesham (August 4, 1265) De Montfort was killed and Henry set free. Two years later the war was practically concluded by the capture of Kenilworth. Henry had little to do with the conduct of the war, and acquiesced in the arrangements made by his son for the pacification of the country. His triumph was, however, complete, and for the rest of his reign the kingdom was at peace. He died on November 16, 1272, leaving behind him the memory of one whose virtues were of the priestly kind, and whose worst vices were those of indulgence, ill-temper, and prodigality. As a subject he would have been harmless, and even perhaps respectable; as a king he was weak, hasty, imprudent, equally incapable in the position of a ruler, an administrator, or a general.

Original Authorities.—Roger of Wendover, *Flores Historiarum*; Matthew Paris, *Historia Major* (with its *Additamenta*), and *Historia Minor*; William Rishanger, *Continuation* of Matt. Paris, and *De duobus Bellis*, &c.; the *Annals* of Burton, Dunstable, Tewkesbury, Waverley, Melrose, and other places; Thomas Wikes, *Chronicon*; Nicolas Trivet, *Annales*; Walter of Gisburne (or Hemingburgh), *Chronicon*; Bracton, *De Legibus Angliæ*; Robert of Gloucester, *Chronicle*; *Royal Letters* (ed. Shirley); *Letters of Grosseteste* (ed. Luard); *Monumenta Franciscana* (ed. Brewer); *Liber de Antiquis Legibus* (Camd. Soc.); *Political Songs* (ed. Wright).

Modern Authorities.—Pearson's *History of England*, vol. ii.; Blaauw's *Barons' War*; Prothero's *Life and Times of Simon von Montfort*; Pauli's *Simon de Montfort*; Brewer's *Preface* to *Monum. Franciscana*; Luard's *Preface* to *Letters of Grosseteste*. (G. W. P.)

HENRY IV. (1366–1413), king of England, only son of John of Gaunt and Blanche, daughter of Henry, duke of Lancaster, was born in 1366. At the age of fifteen he married Mary Bohun, and in 1385 was made earl of Derby. Two years later he was one of the five lords appellant who impeached the earl of Suffolk and others, and took part in the proceedings of the Merciless Parliament. He acquiesced, however, in Richard's return to power, supported the king in his *coup d'état* of 1397, and became duke of Hereford. His quarrel with the duke of Norfolk led to his banishment shortly afterwards, and on his father's death Richard denied him the succession to his title and inheritance (1398). Next year he took advantage of Richard's absence in Ireland to reassert his rights. He landed in Yorkshire, took Bristol, and seized Richard (August 19) near Conway Castle. At a parliament which met on September 30th, he claimed the throne on the ground of his descent from Henry III., the right of conquest, and the necessity of reform. He was accepted by the parliament; Richard was forced to abdicate; and Henry was crowned (October 13, 1399). The last of his three claims gives the explanation of his policy. He had won the favour of the church by pledges in favour of orthodoxy; the circumstances of his accession and the difficulties of his government forced him to make concessions to the House of Commons, which raised that body to a position it did not again attain for more than two centuries. The first part of his reign was occupied with the suppression of the revolts, not only of the defeated party, but also of his own discontented adherents. These troubles were complicated by hostile relations with

France, Scotland, and Wales. Charles VI. was induced to take up the cause of his daughter Isabella, wife of Richard II., and on the death of the latter (February 1400) demanded her and her dowry back. The duke of Albany in Scotland was hostile to Henry, and Owen Glendower raised a national revolt in Wales. The first attempt at insurrection was made by the earls of Richard's party early in 1400, but their plans were discovered, and their forces crushed piecemeal. Most of the leaders fell victims to popular vengeance. A more serious rebellion was that of the Percies (1403), hitherto Henry's staunchest supporters. Hotspur and his father thought themselves ill requited for their services, and made common cause with Glendower and other malcontents. A junction of the northern army with the Welsh was prevented by the battle of Shrewsbury (July 21, 1403), in which Hotspur was killed. Northumberland submitted and was pardoned. But the danger was not over. The north was still in a state of ferment, the war in Wales went on, and a French fleet ravaged the southern coast with impunity. Henry's vigilance and activity were, however, equal to the task. A plot to carry off the young earl of March (January 1405) was foiled, and a fresh outbreak in the north was crushed. Scrope, archbishop of York, and Mowbray, earl marshal, who led the rebels, were taken and executed. The king had already got into his power the son of the duke of Albany; he now captured James, the heir-apparent to the Scotch crown, as he was on his way to France; and the murder of the duke of Orleans removed his chief enemy in that country. Thus secured from danger abroad, he put down a final rebellion in the north, drove Glendower back into his mountains, and henceforward had no trouble at home (1408). The late crisis had, however, compelled him to make important concessions to the House of Commons. He promised (1407) to act solely by the advice of a council nominated with their approval, and submitted to the appropriation of his revenue and to other limitations. Throughout his reign he was hampered by want of money, and the regular exercise by parliament of the right to withhold supplies gave that body great control over his actions. He had seized the crown as the champion of orthodoxy. He had therefore to pay for ecclesiastical support by persecuting Lollards against his will, while he did not dare to act upon the suggestion of the Commons that church property should be converted to purposes of state. Thus limited, his foreign policy was not energetic. He had enough to do at first to defend his coasts, and though he afterwards seized the opportunity afforded by civil war to invade France (1411), his efforts were in general confined to strengthening his dynasty by foreign marriages. In his later years he was a confirmed invalid, and had to entrust much power to his eldest son, with whom he was not always on the best of terms. He died on March 20, 1413, and was buried at Canterbury. A cautious, crafty, resolute man, naturally inclined to fair dealing and clemency, but on occasion unscrupulous and cruel, he was successful in the great enterprise of his life and has the credit of seeing that the power he had usurped could only maintain itself by [illegible] a constitutional basis.

HENRY V. (1387-1422), king of England, eldest son of Henry IV. and Mary Bohun, was born on [illegible], 1387. Early trained to arms, his first military [illegible] was not [illegible] the age of [illegible] an [illegible] to Wales [illegible] defeated [illegible] Glendower. Three years later he was present at the battle of Shrewsbury, and in 1405 he received [illegible] Glendower by driving him back to [illegible]. At the same time he took part in the council, at the head of which he appears after 1410, and [illegible] political ability. The stories of his youthful [illegible] and dissoluteness are unfounded, and, as the above facts show, improbable. Although his father appears to have been jealous of his popularity, he was practically at the head of affairs for some years before the death of Henry IV. Three weeks after that event he was crowned (April 9, 1413), and entered upon his inheritance with the good-will of all classes of the nation. So unanimous was the support he met with in parliament that constitutional affairs cease to have any interest during his reign. In his ecclesiastical policy he followed the lines laid down in 1401, with much greater heartiness than his father had shown. His persecution of heretics caused a conspiracy to surprise him and his brothers, which was discovered and put down with some severity (January 1414). Sir John Oldcastle, the head of the Lollards, was condemned to be burnt, and though he escaped for the time, he was again taken in 1417, and put to death. Henry's orthodoxy brought him into connexion with the emperor Sigismund, then engaged in settling the affairs of the church at the council of Constance, and his assistance was very instrumental in the healing of the great schism. But the great work of his life was the conquest of France. It was with this object that he issued a kind of general amnesty on his accession, and appealed to the nation as a whole to support him. War was resolved on by parliament, and Henry laid claim to the French crown. This demand was afterwards reduced to one for all the districts which the English kings had ever held in France. Such claims as these, of course, precluded all negotiation. The expedition was not delayed by a conspiracy to carry off the earl of March, which was discovered before it was ripe, and on August 14, 1415, the English army landed at Havre. Harfleur was soon taken, but the English losses were so great that Henry resolved to retreat to Calais. On October 25th the French army that opposed his march was cut to pieces at Agincourt. The next two years were spent in preparations for continuing the war. In 1417 Henry again invaded France, took Rouen (1419), and with the assistance of the Burgundian party forced Charles VI. to grant his demands. By the treaty of Troyes (1420) it was arranged that he should marry Catherine, take the government in hand at once, and succeed on Charles's death. This disgraceful treaty had, however, the effect of reviving the national party in France, and during Henry's absence in 1421 the English began to lose ground. He hurried back to France, but before he had had time to recover his position, he died at the castle of Vincennes, August 31, 1422. A great soldier, an able politician, a skilful diplomatist, a generous, pure, and high-minded man, he was one of the noblest and most popular of English kings. Yet these good qualities should not blind one to the fact that he was a religious persecutor, and that he plunged his country into an unjust and hopeless war.

HENRY VI. (1421-1471), king of England, only son of Henry V. and Catharine of France, was born on December 6, 1421, and was therefore only eight months old at his father's death. He can hardly be said ever to have reigned, for [illegible] passed into another kind of tutelage. [illegible] of his wife and favourites prepared the way for civil war. Ten years of anarchy culminated in his dethronement, and ten years more of wandering and imprisonment fill the interval between this event and his death. The chief interest of the first thirty years of his reign lies in watching the decay of England's power in France; that of the last twenty is to be found in the civil war which resulted from the misgovernment of the preceding period. Although the English had lost some ground towards the end of Henry V.'s reign, their position, when the duke of Bedford undertook the task of continuing his brother's work, was very favourable. They held the north and centre of France, while Burgundy held the eastern districts. The alliance with Duke Philip was strengthened by a marriage between his sister Anne and the duke of Bedford. The Scotch king, James I., was released from captivity, in order that England might be relieved from danger on that side. Thus strengthened, Bedford was able to apply himself vigorously to the conquest of France, towards which the battle of Verneuil (1424) was an important step. But the English cause had already received its first great blow in the marriage of the duke of Gloucester with Jacqueline of Hainault, which destroyed the good understanding between Burgundy and England. Bedford for the time managed to stave off the quarrel, and after renewing his union with Burgundy, laid siege to Orleans, the key of southern France. The capture of the town seemed certain, when the appearance of Joan of Arc turned the scale. The relief of Orleans (1429) was followed by other French successes, and by the coronation of Charles VII. at Rheims. The capture of Joan did little for England, for the spirit she had inspired survived her loss, and her death (May 1431) only nerved the French to fresh efforts. It was in vain that Bedford had Henry crowned at Paris (December 17, 1431). The young king remained in France nearly two years (April 1430 to February 1432), but his presence did not turn the tide of French success. On the side of England the supply of men and money was falling short, while on that of France a new type of commanders was coming to the front, who were not inclined to repeat the disastrous blunders of Crécy and Agincourt. The death of Bedford's wife (November 1432) broke the link that bound Burgundy to England, and negotiations for peace were set on foot. These culminated in a great congress at Arras (July 1435), but the demands of the two countries were found incompatible, and the war was renewed. Bedford's death (September 14, 1435) finally destroyed all hope of recovery in France. Burgundy at once made peace with Charles VII., and the English commanders who succeeded Bedford were constantly defeated. Paris was retaken, Normandy overrun. Repeated efforts on the part of England led only to further exhaustion. Meanwhile negotiations for peace had been continued at intervals, and led in 1444 to a truce, during which Henry was married (April 22, 1445) to Margaret, daughter of René of Anjou. It was hoped that this marriage, together with the cession of Anjou and Maine, would lead to a permanent peace, and save Normandy and Guienne. But though Anjou and Maine were actually surrendered in 1448, the truce was broken next year, and before the end of 1450 the whole of Normandy was lost. In 1451 Guienne was reconquered by the French, and in 1453 Calais alone remained to England. The war was practically at an end

Its conclusion coincides with the period when the two parties that divided England were just about to appeal to arms. The civil war was in great measure the result of the defeats abroad, as those defeats themselves were in part the consequence of discord at home. Quarrels between the chief members of the reigning house were the origin of its weakness; financial embarrassment, a divided foreign policy, and a feeble administration brought disgrace on the king and his advisers; family feuds and a long tale of mutual injuries added bitterness to political differences. Eventually an outburst of popular discontent kindled the train so long prepared, and the champion of order and good government began a struggle in which the original objects were soon lost sight of, and which ended only with the death of the king whose innocent imbecility had caused the disorder. To check the rivalry of Henry's uncle, the duke of Gloucester, and his great-uncle, Cardinal Beaufort, was beyond the power of the council. Bedford alone could appease the quarrel, and Bedford's presence in England meant disaster in France. The quarrel between them and their adherents was complicated by the existence of the Lollards, and the question of peace or war. In both matters Gloucester, as persecutor of the Lollards and head of the war-party, appears to have taken the more popular side. The coronation of the young king at Westminster (November 6, 1429) put a formal end to the regency of Bedford and Gloucester, but not to the intrigues of the latter. The House of Commons was unable to interfere with any effect; the Lords were mostly engaged on one side or the other. The death of Bedford removed the only guarantee of peace, and Gloucester attacked Beaufort with more virulence than ever after his brother's death. In the midst of these troubles Henry VI. came of age (1442). Had he been a great statesman, he would have found an almost hopeless task before him. But, unfit as he felt himself to be, he naturally shrunk from politics, and was much more intent on completing his foundations at Eton and Cambridge than on healing the disorders of his country. The work of government was left mainly in the hands of Cardinal Beaufort and the earl of Suffolk, who did their best to secure peace with France. On the other side the dukes of Gloucester and York headed the opposition, and took up the cry of reform, with the object of infusing vigour into the government at home and abroad. Suffolk, however, won a great victory in the truce with France (1444); and through the young queen Margaret, whose marriage was chiefly due to his exertions, he obtained complete influence over the king. The suspicious death of Gloucester (1447), followed in six weeks by the death of his rival Beaufort, together with the appointment of York to the governorship of Ireland, left Suffolk master of the situation. But such a position could not be long maintained in the face of the odium which always attaches to a favourite, and the complete failure of his foreign policy brought about his fall (1450). The king in vain attempted to save him, and by so doing shared his unpopularity, while the partial concessions he made to the demands of the rebels under Jack Cade only postponed the inevitable outbreak. The duke of York now made himself the mouthpiece of popular discontent. When the final loss of France had exhausted the country's patience, and the birth of an heir to the throne had destroyed his hope of the succession, he took advantage of Henry's mental derangement to claim the protectorate (1453). It was granted him early next year, but in 1455 the king recovered his senses, and York was deprived of power. Unable to endure this he marched on London, and on May 22, 1455, the Wars of the Roses began in the battle of St Albans. The effect of the battle was to bring the queen to the front as the leader of the royalists, and to make the quarrel between her and York irreconcilable. During the four years of uneasy quiet which followed the first collision, Henry tried hard to keep the peace. But all his efforts were vain. When the struggle broke out anew, and the Yorkists won the battle of Northampton, he was forced to consent to an arrangement by which his son was excluded from the succession and York recognized as heir to the kingdom (1460). The settlement was of short duration. York himself lost his life at Wakefield, but his son seized the crown and was acknowledged king (March 4, 1461). The battle of Towton brought the struggle to an end for ten years, and the capture of Henry in 1465 seemed to secure Edward IV. on the throne. Five years later a sudden revolution hurled him from it, and restored the wretched prisoner for a while to liberty, but the battle of Barnet destroyed his hopes again. He had time to know that his son had died at Tewkesbury, that his wife was a prisoner, and that his cause was finally lost, before death released him from captivity on May 21, 1471. Gentle, pure, and generous, full of good intentions, enthusiastic in the cause of religion and learning, he was utterly without the qualities which were indispensable to a mediæval king, and he paid the penalty of incapacity in a miserable death and in the destruction of his house. But this very incapacity was an element of the utmost importance in the history of his time. The weakness of his character made him the puppet of contending factions, and his well-meant but misguided efforts to govern England as a constitutional king led only to anarchy and the temporary downfall of the constitution.

Original Authorities for the above three reigns.—Thomas of Walsingham, *Hist. Anglicana*, and *Ypodigma Neustriæ*; *Annales Henrici Quarti*; *Continuatio Eulogii Historiarum*; *Chroniques de Waurin*; *Annales of St Alban's Abbey*, by John of Amundesham and John Whethamstede; *Royal and Historical Letters* (*Henry IV.*), Capgrave's *Chronicle of England*, and *Liber de Illustribus Henricis*; *Memorials of Henry V.* (Redman, &c.); *Letters, &c., illustrative of the reign of Henry VI.*; *Political Poems*. All the above are published in the Rolls series. Also, *Henrici V. Reg. Angl. Gesta* (Eng. Hist. Soc.); lives of Henry V., by T. Livius Forojuliensis and Thomas Elmham (ed. Hearne); *English Chronicle of the reigns of Henry IV.*, &c., and *Letters of Margaret of Anjou*, &c. (both in Camd. Soc.); *Chronicles* of Hardyng, Otterbourne, Adam of Usk, Fabyan, Hall; the *Paston Letters* (ed. Gairdner); *Original Letters illustrative of Eng. Hist.* (ed. Ellis); *Rolls of Parliament*; *Proceedings, &c., of the Privy Council* (ed. Nicolas).

Modern Authorities.—Besides those already given above, Nicolas's *History of the Battle of Agincourt*; Gairdner's *Preface* to the *Paston Letters*. (G. W. P.)

HENRY VII. (1456–1509), king of England, was the founder of the Tudor dynasty. On his mother's side Henry belonged to the illegitimate branch of the house of Lancaster, being descended from John of Gaunt and Catherine Swinford, and it was only in the absence of nearer heirs that he was accepted as the representative of that house. On the father's side he was sprung from the marriage of Owen Tudor, a Welsh gentleman, with Catherine, widow of Henry V., and this family name became the name of the line of kings which he founded. On the complete overthrow of the Lancastrians, especially after Richard had won the throne by putting his nephews out of the way, Henry, under the name of the earl of Richmond, appeared as the centre of the opposition. From his exile in Brittany or France he schemed for the overthrow of Richard, and made an expedition to England to support the unsuccessful rising of Buckingham. The increasing unpopularity of Richard gave him greater success in his second enterprise. He landed at Milford Haven in order to profit by the good will of his kinsmen the Welsh, and marching into Leicestershire defeated Richard at the battle of Bosworth, thus ending the Wars of the Roses (1485). Soon after he married Elizabeth daughter of Edward IV., and so the White Rose and the Red were united. Henry, however, was not allowed to enjoy the crown in peace. Two pretenders, one after another, led a rising against him. Lambert Simnel, personating the earl of Warwick, son of the duke of Clarence, gathered the Yorkists about him in Ireland, and landing in Lancashire advanced as far as Stoke in Nottinghamshire, where he was defeated and made captive (1487). Next came Perkin Warbeck, a Fleming, who, pretending to be one of the princes murdered by Richard in the Tower, received much countenance abroad and in Scotland, and had many supporters among the discontented at home. But when he ventured to land in Cornwall, he was captured and soon executed (1499). These risings troubled the peace of Henry, but did not shake his throne. He ruled with a firm hand, he took care to repress the nobles, already almost exterminated in the civil war, in the same manner as the policy of Edward IV.; he put down the practice of maintenance, by which they kept bodies of retainers ready to support them in battle, and in every way [illegible] the power of the [illegible]. Henry was a [illegible] and calculating ruler, who avoided war, gained by diplomacy what other sovereigns attempted by force, kept a well-filled treasury, and made two brief expeditions into France the occasion of amassing additional wealth. His avarice led him even to revive old and forgotten statutes, and to exact heavy fines from those who had transgressed them, in which evil work he was assisted by the two well-known lawyers Empson and Dudley. His reign is marked also by two marriage arrangements which had great influence on subsequent history. His son Arthur was wedded to Catherine of Aragon. When Arthur died in 1502, a few months after the marriage, Catherine remained in England in order to be united to the younger son Henry, though the nuptials did not take place till after his accession to the throne. The other marriage was that of the young princess Margaret to James IV. of Scotland (1503), which a century after resulted in the union of the crowns. Henry VII. died in 1509, leaving, it is said, a treasure of two million pounds to his successor. He was by no means an amiable or popular sovereign, but did great service in settling and consolidating the kingdom after the long troubles.

The authorities for Henry VII. are—*Memorials of Henry VII.* (with which is published Bernard's *Historia de Vita Henrici VII.*), and *Letters and Papers illustrative of Henry VII.*, both edited by Gairdner; and Bacon's *History of Henry VII.*, edited by Spedding.

HENRY VIII. (1491–1547), king of England, was born in 1491, being the second son of Henry VII. and of his wife Elizabeth of York. On the death of his elder brother Arthur in 1502, he became heir apparent to the throne. As younger son Henry had been educated for the church, and it is said that his interest in theology was due to these early studies; but as he was only eleven when his brother died, they could not have been either extensive or profound. His training under the severe and methodical Henry VII. must have been a very careful one; he was deeply interested in the new learning, and was a most accomplished scholar. During his father's lifetime we hear nothing of the young king except as the destined husband of Catherine of Aragon, the widow of his brother Arthur, a lady six years older than himself. It suited the plans of the old monarchs, their parents, that Catherine should be wedded to Henry, and so she remained in England during the seven years of her widowhood. Henry was only eighteen when the death of his father (1509) left the throne of England vacant, as well as set him free to shape his own career. His first important act was to fulfil the contract imposed upon him by his father to marry Catherine. His ministers, almost without exception, were in favour of the marriage. Henry expressed himself highly delighted with his wife. Catherine was fond of him to excess. The disparity of years was not so marked at that early period. Catherine was amiable, accomplished, of the bluest blood in Europe, closely connected with the most powerful dynasties, a queen of whom England with her then diminished prestige might well be proud. For the time all went well, and no one saw in such a simple event the seeds of a great revolution.

England was not in the mood to anticipate evil at the accession of Henry. In the young king all the conditions requisite for a prosperous reign seemed to be combined in a rare degree. To the dull monotony, varied only by Yorkist rebellions, to the greed, suspicion, and gloom which made the dark side of the previous reign, succeeded a court of splendour and enjoyment in which every taste and [illegible] should have free scope. As Henry united in his own person the lines of the White Rose and the Red, there was no likelihood of a revival of the old broils. Those who grudged to see his Lancastrian father on the throne were well pleased to see it occupied by a son of Elizabeth of York. The hoarded treasure of Henry VII. had provided means for the popularity of his successor; and to Henry VIII. fell the easy and generous rôle of squandering the treasure which his father had amassed. Nor was this the only respect in which the young Henry entered on the fruit of other men's labours. In the Wars of the Roses, and by the policy of Edward IV. and Henry VII., the old feudal nobility had been brought very low. When nothing more was to be feared from that quarter, it was Henry VIII.'s easy task to gather round him the broken remnants, to attach them to his person, and to make them the ready instruments of his will, in short, to convert the representatives of a haughty feudal baronage into submissive courtiers. In character the young Henry was a king according to the people's heart; even in his faults he was exceptionally fortunate. He was handsome, frank, extravagant, of vast muscular strength, accomplished in all the manly exercises of the time and in the new learning; he was vain, thirsting for popularity, eager to retrieve the old renown of England, the enemy of France, and dreamt always of renewing the conquests of the Henrys and Edwards. It is not surprising that Henry excited the highest expectations in all classes of his subjects, for his varied character offered an attractive side to all of them. The men of the new learning were charmed by his love of letters. Ecclesiastics saw with pleasure his punctual performance of the duties of religion. All good men were delighted with the excellence and purity of his private life. Statesmen were struck by his capacity for business; his gaiety and frankness captivated the courtiers; the prospect of French conquest inspired the warlike and the ambitious. From the description of Henry by the Venetian ambassador, Giustiniani, in 1519, we can easily perceive what impression he must have made on England at his accession:—"His Majesty is twenty-nine years old, and extremely handsome. Nature could not have done more for him. He is much handsomer than any other sovereign of Christendom,—a good deal handsomer than the king of France,—very fair, and his whole frame admirably proportioned. On hearing that Francis I. wore a red beard, he allowed his own to grow; and as it is reddish, he has now got a beard that looks like gold. He is very accomplished, a good musician, composes well, is a most capital horseman, a fine jouster, speaks good French, Latin, and Spanish, is very religious, hears three masses daily when he hunts, and sometimes five on other days. He hears the office every day in the queen's chamber,—that is to say, vesper and compline. He is very fond of hunting, and never takes his diversion without tiring eight or ten horses, which he causes to be stationed beforehand along the line of country he means to take; and when one is tired he mounts another, and before he gets home they are all exhausted. He is extremely fond of tennis, at which game it is the prettiest thing in the world to see him play, his fair skin glowing through a shirt of the finest texture." When we take all these facts into consideration, when we remember also that erelong he had raised England from a third-rate position to a level with the greatest powers of Europe, and that for twenty years nothing serious occurred to break the harmony of his reign, we cannot be surprised that Henry was a most popular king.

The reign of Henry falls naturally into two periods, separated by the question of the divorce. During the first period Henry is the splendid and jovial king at home, abroad a figure of the first magnitude in the wars and international diplomacies of the time. Both in home and foreign affairs, but particularly the latter, Wolsey was the right hand man of the king, ready, as occasion served, either to transact the whole business of the government, or to be the humble instrument of the king, when the royal hand did actively interfere. In point of fact Henry always was master, and took a keen interest in business. The events of the first period were concerned chiefly with the foreign wars. At home, with the exception of the execution of Empson and Dudley, the instruments of his father's extortion, who suffered, however, on a trumped-up charge of treason, nothing important occurred. There were Christmas revels, May festivals, tilting matches, in which Henry always shone victorious, and in which he squandered the treasures of his father. But the serious endeavours of the time were directed abroad; Henry joined his relatives Ferdinand and Maximilian in a league against France. Though Henry took a personal share in the campaign in France of 1513, and won the easy Battle of Spurs, and though Surrey, his general, gained the great victory of Flodden, no substantial result was attained by the war. Henry was duped and then abandoned by his allies. When he was undeceived, he made peace (1514) with France, which was cemented by the marriage of his youthful sister Mary to the old and worn-out Louis XII. Soon after, when Louis was succeeded by Francis I. (1515), and Charles V. entered on the government of his hereditary dominions (1516), the three monarchs who figure so conspicuously as the contemporaries of the Reformation, and whose doings constitute so much of the history of the 16th century, found themselves face to face. With these two and with the successive popes Henry had to do during the rest of his life. Their relations at first were chivalrous and even friendly. Henry never had any chance of success in his canvass for the imperial crown. When it fell to Charles, it made him beyond a doubt the first monarch of the age; his success placed him in open rivalry to France; but to Henry, fortunate again, it gave the desirable prospect of being courted by the two rivals, and even of acting as arbiter in their disputes. Henry, however, descended from this lofty position to engage in quarrels which had no concern with the true interests of England. The chimera of French conquest again fascinated him and his people, so that when the false chivalry of the Cloth of Gold had degenerated into war, Henry took the side of Charles. In the campaign of 1523 the English forces advanced to within eleven leagues of Paris, but the war led to no durable and satisfactory result as far as Henry was concerned. The people grew sick of the heavy contributions they were called upon to make, and threatened revolt. After the battle of Pavia (1525), where the French were completely overthrown and their king made prisoner by the armies of Charles, the policy of Henry was completely disturbed. Till that event it had been clear enough. The commercial interests of the country, which were bound up with the Flemish dominions of Charles; the ambition of Wolsey, who founded his hope of the papal crown on the good-will of the emperor; the hereditary enmities and warlike instincts of the people, as well as the inclination of the king, coincided conveniently in requiring the imperial alliance. But now France was down, and the balance of power, already a working conception in politics, was destroyed, while Charles in his triumph ignored the claims of Henry, and had more than once disappointed the ambition of Wolsey. Under these circumstances English policy was forced out of its old groove, and an alliance was made with France. In a short time, moreover, interests and passions of a far more momentous nature emerged. The dilettante politics of Henry's early career were to be superseded by occupations of a tragically earnest nature. Adventurous enterprises abroad were to give place to real interests at home, and the jovial young king was to be transformed into the stern, self-willed, and often cruel revolutionary. The serious and important part of Henry's life therefore is still to come: but before leaving the earlier period it is well to remark that it lasted twenty years, or more than half of his reign; that during these years Henry was popular in the highest degree; and especially that he had gratified the national pride of his subjects by restoring England to a leading position in Europe. This should not be forgotten during the troubled and more questionable events that were to follow.

The year 1528 may justly be fixed as the turning-point of Henry's life. By that time the divorce had become a national and even a European question, and Henry had decisively committed himself to the course which was to result in the separation from Rome. It is not clear when the plan of a divorce began to take shape in Henry's mind; it was the slow result of a variety of causes which were not clear to the king himself. We know, however, that Anne Boleyn returned to the court of England in 1522; that she made quite a sensation there as soon as she appeared; and that among other admirers, married and unmarried, Henry soon expressed a decided preference for her. On the other hand, he seems to have been alienated from Catherine long ere the question of divorce became public; if we may trust a statement of his own, he had abstained from her bed since 1524, and his coldness for her increased with his love for Anne. That his scruples regarding his marriage awoke about the same time was certainly a very convenient coincidence. The danger, however, of a disputed succession in the absence of male heirs was a real one. The situation probably justified such an extraordinary measure as a divorce, though we must recollect that the raising of a second family, rival to Mary the daughter of Catherine, might precipitate the very crisis which men feared. Still we must admit on the whole that the national interest and the inclination of Henry coincided, and that concern for his kingdom probably had a large part in the mixed motives which urged him to seek a divorce.

When the demand for a divorce was first formally laid before the pope in 1527, no one anticipated that it would encounter so many difficulties. The great opponent of it was Charles V., who loyally supported his aunt, and who, as the event proved, had the pope entirely in his power. But for the emperor, Clement would soon have arranged everything to the satisfaction of the English court. As it was, he sought safety in delay. Thus he declined giving any decisive answer himself, and when he delegated the case to Wolsey and Campeggio, he managed still further to defer the question and then to revoke it to Rome (1529). By that time Henry's patience was exhausted. As early as 1528, and as if sure of a speedy decision in their favour, the king and Anne were living familiarly together under the same roof. Their disappointment was natural, and Henry soon began to take more active measures. He appealed from the pope to the universities. Notwithstanding his life-long services Wolsey was discarded, because he was supposed not to have been sufficiently earnest about the divorce. The same year (1529) a parliament was called, which proved to be the ready auxiliary of the king in his new policy. This parliament, which sat at intervals from 1529 to 1536, had little independent or substantive power; it was made up largely of the nominees and creatures of the court, and seldom moved but at the royal initiative. Still it was well that the old forms should be recognized in the great changes that were coming, and significant that the strong-willed Tudor felt it safe to have the nation at his back. The changes themselves were gradual, and were by no means disagreeable to the advanced and influential part of the nation. Only a very small minority had any sympathy with the Lutheran movement; but many wished to see the church reformed, to have her power curtailed, and that England should take up a more independent attitude towards the pope. Under these circumstances Henry found it easy to carry the majority, especially the active and progressive part, of the nation with him. In no case was the parliament of 1529 conscious of its destiny; what it contemplated was not a revolution but only some necessary reform; it, as well as Henry, would have been astonished to hear that they were working on the side of Luther. Yet the parliament soon proceeded to take some very decisive steps. In 1529 the probate duties and mortuaries (or burial fees) exacted by the church were curtailed; the clergy were prohibited from following secular employments; residence was enforced, and pluralities forbidden. In 1531 the clergy were laid under the charge of præmunire, which they bought off by the payment of £118,000, and the acknowledgment that the king was supreme head of the church. In 1532 the abuses of "Benefit of Clergy" were reformed, annates abolished conditionally, and the independent legislative power given up by convocation. Soon after the king took a step which precipitated the crisis; he married Anne Boleyn, an event which was quickly followed by the publication in Flanders of a threat of excommunication from Rome. After this the Act of Appeals was passed, forbidding appeals from the English ecclesiastical courts to Rome, and Cranmer, in a court at Dunstable, declared the marriage with Catherine null and void. In the following year (1534) the papal authority in England was annulled, and by the Act of Supremacy Henry was declared supreme head of the English Church. The next step was a sad one; but it convinced the world that the king was in earnest. Sir Thomas More and Fisher, bishop of Winchester, the noblest champions of the old faith, two of the best and noblest Englishmen of the time, were executed for refusing to accept the Supremacy Act (1535). Such an event produced a deep sensation in Europe, but it was decisive; when the pope drew up the Bull of Deposition in 1536, which, however, was not published till 1538, the rupture with Rome was complete. In the same year (1536) the first Articles of religion, ten in number, were drawn up; in effect they were a great simplification of the old creed, though they gave little encouragement to Lutheranism. At the same time the Act for the dissolution of the smaller monasteries, which was based upon the report of a commission of inquiry, was passed, being the final important measure of the first Reformation parliament. With such events as the abolition of the papal power in England and the dissolution of the monasteries modern England begins; they inaugurate a fundamental change in the national policy and in the structure and habits of society. While the purpose, real or ostensible, of Henry had been merely to marry a younger woman and provide for the succession, he had effected the greatest revolution which England has undergone.

Henry had indeed succeeded in the task to which he had applied himself nine years before; but the enemies he had raised were formidable, and he was destined to many a bitter disappointment. He had excited the hostility of the pope and the emperor; worst of all, he had seriously hurt the feelings and prejudices of a large class of his subjects. The danger of foreign invasion was greatly increased by the discontent both in the north and west of England, where the love of use and wont in the church and in the national habits was strongest. The death of Catherine had indeed greatly relieved him, as it made reconciliation with the emperor practicable, and deprived the English opposition of a common centre. The rising in Ireland was suppressed without much difficulty, but the discontent in the north which broke out in the Pilgrimage of Grace was a formidable danger (1536). It was averted more by skilful statesmanship upon Henry's part than by open show of force. The opposition in the west was nipped in the bud by the execution of its leaders, the marquis of Exeter and Lord Montague (1538). These measures of the king and of his minister Cromwell sometimes appear cruel and unjustifiable, but they kept the country united. Charles was convinced of the futility of an invasion; and the thunderbolts of the pope fell harmless to the ground. In all this crisis, when a wrong step or the appearance of vacillation might have occasioned a religious war, in which the conservatism at home would have been seconded by the armies of Spain, the energy and the commanding sagacity of Henry did more than aught else to save the country. To him the praise is chiefly due that this great revolution was comparatively free from blood and havoc.

Henry had defied the emperor and the pope, and he had suppressed the conservative Catholic discontent at home with a high hand; but he was never disposed to be a Protestant. Instead of following the lead of the advanced Reformers he impressed upon the English Church his own moderate and substantially Catholic theology. At thirty he had defended the seven sacraments against Luther; he was thirty-six when he took up the question of divorce, and he was forty ere his relations to the pope had hardened into alienation and hostility. All his life he was orthodox from conviction as well as from traditional assent. Such a man could not be a revolutionary in theology. He repressed with a firm hand all excess in innovation, showing equal aversion to the iconoclastic mob and to iconoclastic preachers. The bill of the Six Articles, passed in the same year that saw the final dissolution of the monastic system of England, was the most remarkable exemplification of this spirit of Henry. It also proves that innovation in theology was a new thing to the mass of the English nation, and its penalties too clearly illustrate the fact that religion was not considered an individual and private matter, but a national interest, the violation of which was a capital offence. It is to the honour of Henry that the victims of the Bloody Statute were so few. Five hundred arrests were made by the eager Catholic party in a single fortnight after the passing of the bill; but the king interposed in time, and only twenty-eight suffered under the statute during the whole reign.

In the meantime Henry had been less fortunate in the matrimonial scheme which had been the occasion of all the changes and dangers we have noted. A few months after the death of Catherine, Anne Boleyn was sent to the scaffold. Anne may have been guilty of the crimes laid to her charge, but Henry himself had taught her to cast aside all feminine reserve and self-respect, and his fickle heart had been captivated by another, long before the disclosures which were the ground of her death. Henry married his new love, Jane Seymour, the day after the execution of Anne (1536). The birth of Edward in the following year gratified the king's desire for a male heir; but the early death of Jane left him again without a queen. After an interval of more than two years Cromwell undertook to procure a suitable wife at the Protestant courts of Germany; but his ruin was not less complete than that of his patron Wolsey on a similar occasion ten years before. Anne of Cleves found no favour in the king's eyes; she was divorced and pensioned off, while the enemies of Cromwell succeeded in sending him to the scaffold. Anne's place was occupied by Catherine Howard, till she, really guilty, was also executed (1542). For his sixth and last queen Henry married (1543) Catherine Parr, who proved a patient wife and an excellent nurse. During the last few years of Henry's reign home affairs and the question of the religious revolution ceased to be the exclusive subject of interest. England and the neighbouring powers were constrained to acquiesce for the time being in Henry's arrangement of things. Even the emperor cultivated his alliance. His foreign politics ended very much as they began—with a war against Scotland and France. The former arose out of certain border quarrels; the Scots were beaten at Solway Moss, but defeated an English force at Ancrum Moor. After the death of James V. Henry's course was to arrange a marriage of the infant queen of Scots with his own son Edward. The plan failed through Henry's self will, and Scotland was ravaged to no purpose. The war with France (1543–46) was equally fruitless. Its chief feature was a threatened invasion by a formidable French fleet, which for some time was master of the Channel.

At home the most important point of interest was the struggle between the two factions, Protestant and Conservative, which had now for some years confronted each other—Norfolk and Bishop Gardiner of Winchester being the leaders of the latter, while the queen, Cranmer, and the earl of Hertford, uncle of young Edward, were at the head of the former. Cromwell had already fallen under the machinations of the Conservative party. Cranmer and even the queen were not quite safe from its attacks. The heads of that party now suffered at the close of the reign. Surrey was executed, and Norfolk was saved only by the death of the king. The effect of such measures was to make the prospects of Edward secure by confirming the power of his uncle Hertford.

Henry was anxious to arrange affairs for the accession of his son, as he felt his own life waning away. Though only in his fifty-sixth year he was unwieldy with disease and corpulency, and required to be wheeled from room to room; an ulcer in the leg had troubled him for many years. In this as in so many other respects the contrast between the beginning and end of his career is striking: the young athlete is transformed into a helpless invalid; the joviality, the enthusiasm, and the unanimity of his earlier reign gave place to a long period of gloom and contention, repressed only by the savage and imperious hand of the king. He died on the 28th of January 1547.

The character of Henry has long been a stumbling-block to historians, and will always be a puzzle to such as classify mankind under the two heads of good and bad without recognizing the intermediate gradations to which the vast majority belong. To many it is all the more inexplicable, because the contrast between his youth and declining manhood is so apparently complete. Yet it was a perfectly consistent, though a mixed character, and the later phases of it are only a natural development of the earlier. He was always strong-willed to excess, capricious, and fickle, with the sensuous part of his nature predominating. In his youth his baser tendencies were controlled by his love of popularity, his regard for his excellent wife, his own sense of duty, and the vigorous animal spirits which found congenial play in physical exercise and in foreign war. In his maturer years he was more self-reliant and therefore less dependent on popularity; after losing his regard for Catherine he fell into baser companionship; as his health began to fail, his boisterous spirits declined. Worst of all, his constitutional fickleness took the form of disloyalty to his successive wives, and to his friends and ministers. In the time of Henry there was no acuter man than Sir Thomas More. His verdict may be accepted as final on this aspect of the king's character. In the height of his favour with the king, after walking an hour with him in the garden at Chelsea, the king holding his arm about his neck, More confessed that he had "no cause to be proud thereof, for if my head would win him a castle in France it should not fail to go." Such may have been the repulsive side of Henry. Much more important, however, than the consideration of his personal character is the question as to the nature and tendency of the historic work in which he took the initiative. Was that the outcome merely of misguided self-will concealing itself under the guise of duty, or was it the true and durable expression of the claims and aspirations of the time? The passions of Henry had certainly too much to do with it; the work he did was, like his character, mixed with baser elements. But the best answer to such a question is to be found in the modern history of England. That history in its progressive spirit, in its gradual approximation to a sounder and better state of society, and in its liberal openness to the influence of truth, is only the continuation and development of the work of Henry. In his rupture with the pope, in his abolition of an idle and antiquated monasticism, and in his endeavour to establish a purified and simplified Catholicism as the permanent creed of England, he was fighting on the side of truth and light and progress. The English Reformation was too much alloyed with baser elements to serve as an ideal example of a great historic change; yet it succeeded better than any other in appropriating the good both of the old and the new, in avoiding a violent rupture with the past, in keeping the nation unanimous, and in escaping those fatal religious wars which desolated Europe for nearly a century and in Germany delayed the progress of civilization for a century more. This desirable consummation was due first of all to Henry, whose sagacity and unfaltering resolution baffled the enemies of reform both at home and abroad, who repressed the hasty movements of either fanatical extreme in England, and who, with his real reverence for the teaching of the past, had a hearty contempt for its abuses. He was no hero, no ideal man or king; he shared fully in the coarseness and indelicacy of the age; he was fickle in his personal attachments, and did not shrink from destroying those who crossed his plans; but he had a real and lofty sense of his duty as a king; he had a true insight into the men and things he had to deal with, and helped to lead the country into a new era.

Sources for the Life and History of Henry VIII.—*State Papers during the reign of Henry VIII.* (Record Commission); *Calendars of State Papers*, with introductions by Brewer, down to 15[illegible] (Rolls series); Giustinian's *Four Years at the Court of Henry VIII.*, 1515-15[illegible]; Erasmus's *Letters*; Legrand's *Histoire du Divorce*; Cavendish's *Life of Wolsey*; Roper's *Life of More*; Hall's *Chronicle*.

Important Historical Works treating of Henry VIII.—Froude's *History of England*, vols. i.-iv.; Lingard's *History of England*; Hallam's *Constitutional History*, vol. i.; Burnet's *History of the Reformation*; Seebohm's *Oxford Reformers*, and his *Era of the Protestant Revolution*. T. K.

German kings and emperors.

HENRY I. (876-936), German king, was born in 876 in Saxony, of which his father, Otto, was duke. He distinguished himself in early youth by the courage and energy with which he warred against the Slavonic tribes to the east of his native duchy. Otto, who died in 912, appointed Henry his successor, not only as duke of Saxony but as lord of Thuringia and part of Franconia. Conrad I., stimulated by certain ecclesiastical advisers whom Henry's independent temper towards the church had deeply offended, resisted the claims of the young duke; but he was ultimately left in possession of all the lands his father had ruled. After Conrad's death Henry was chosen king by the Franconian and Saxon nobles, and he had not much difficulty in securing the acknowledgment of the rest of Germany. For some years Lotharingia or Lorraine had held an uncertain position between the kingdoms of the East and the West Franks, as Germany and France were then called; but at this time Duke Giselbert, who was an old friend of Henry, quarrelled with Charles the Simple, and transferred his allegiance to the German king. For eight centuries afterwards Lorraine remained a part of Germany. From the time of Louis the Child, Germany had been tormented by the Hungarians, who were still a savage race, and who had the advantage of fighting on horseback, while the Germans [illegible] them on foot. In 924 a Hungarian chief was captured, and his people were compelled to purchase his release by agreeing to a nine years' truce, on condition that Henry should during that time pay an annual tribute. In the northern duchies the Germans had hitherto lived for the most part in small villages or in separate settlements, after the fashion described in the *Germania* of Tacitus. Henry, perceiving that so long as they continued thus exposed to attack they could never be safe, began the building of cities throughout Saxony and Thuringia, and in the other duchies his example was extensively followed. He also trained his vassals to meet the enemy on horseback, thus giving a strong impetus to the movement which resulted in the institutions of chivalry. When his arrangements were complete he tried his new force in a contest with the Danes and with some Slavonic tribes, whom he utterly defeated. In 933 the Hungarians demanded as usual the tribute which had till then been punctually paid, and when it was refused invaded Thuringia with a great army. Henry twice defeated them, and they were so overwhelmed by this misfortune that they did not enter Germany for some years, and were never again seen in the northern duchies. Having thus broken the power of all the chief enemies of his country, Henry took precautions for the future by establishing the marches of Schleswig, of Meissen, and perhaps of Brandenburg. In his home government he acted with great caution and judgment. The dukes had become so powerful that there was some danger of their altogether overshadowing the throne. Instead of directly meeting this peril by forcing them into submission, as was afterwards done by his son Otto, he attached them to his interests by confirming them in many of their rights and by acting as a mediator in their disputes. Towards the close of his life his position was so secure that he resolved to go to Rome and claim the imperial crown. In the midst of his preparations he died in 936 at Memleben, and was buried in St Peter's church at Quedlinburg. He was one of the wisest and most energetic of the German kings, and through his encouragement of municipal life, and his powerful defence of Germany against her foreign enemies, his reign marks an epoch of the highest importance in early mediaeval history. By his first wife, Hatburg, he had a son Thankmar, who gave Otto I., his successor, much trouble. After she was put away he married Matilda, the daughter of a Saxon count; and the gentle and noble character of this lady, who was universally beloved, was of essential service to him in his rule.

See Waitz, *Jahrbücher des Deutschen Reichs unter Heinrich I.* (Berlin, 1837; 2d ed., 18[illegible]).

HENRY II. (972-1024), Holy Roman emperor, was born in 972. He was the son of Henry the Wrangler, duke of Bavaria, a grandson of King Henry I. In 995 he succeeded to the duchy of Bavaria, and six years afterwards went to Rome with the young emperor Otto III., to whom he rendered important services. When Otto III. died, Henry, as the chief surviving representative of the house of Saxony, took possession of the insignia of the empire, and was crowned German king at Mainz on the 7th of June 1002. Encouraged by disturbances in Germany, a rebellious party of nobles in northern Italy raised Margrave Harduin of Ivrea to the throne of Lombardy; but Henry advanced against them, and, like his immediate predecessors, made himself master of the iron crown. His most determined enemy during the greater part of his reign was Boleslaus II. of Poland. This ambitious and strong-willed prince annexed Bohemia, and during the king's absence in Italy broke into Lusatia and Meissen. Henry hurried back, defeated Boleslaus in 1005, and granted Bohemia in fief to Jaromir, son of the previous duke. Boleslaus, however, continued the war, which was not ended till 1018, when Henry was obliged to conclude peace on terms that were much more favourable to the Polish king than he would have voluntarily granted. In the course of the struggle he had to make war on Adalbero, his wife's brother, who seized the archbishopric of Treves, and was protected in his claim by another brother of the empress, the duke of Bavaria. Both were overcome and deprived of their dignities, although Bavaria was ultimately restored to the elder of the two brothers. Henry also put down rebellions in Flanders and Meissen, and he concluded an important treaty with Rudolf III. of Burgundy, whereby after Rudolf's death the country was to be united to Germany. In 1013 Henry went for the second time to Italy, where Harduin had again raised himself to the throne. The usurper was displaced, and in 1014 Henry was crowned emperor at Rome by Benedict VIII., whom he had confirmed in the papal see in opposition to the antipope Gregory. At the request of Benedict the emperor returned to Italy in 1022 in order to drive back the Greeks, who were steadily pressing northwards. In this enterprise he associated himself with the Normans, who thus became one of the most important factors in the political life of Italy. Henry's health, which was always feeble, rapidly declined after this third visit to his southern dominions, and in 1024 he died. He was canonized by Pope Eugenius III., and at a later time his wife, Cunigunde, was also ranked among the saints. It was natural that they should be thus honoured, not only because of their fervent piety, but because the church has rarely had a more splendid benefactor than Henry II., whose ruling policy was to balance the power of the great nobles by increasing that of the spiritual princes. He also founded the bishopric of Bamberg, which was placed under the immediate jurisdiction of the pope, and to which he left by will all his treasures and his magnificent allodial possessions.

See Hirsch, *Jahrbücher des Deutschen Reichs unter Heinrich II.* (Berlin, 1862-75).

HENRY III. (1017-1056), Holy Roman emperor, was the son of Conrad II., the founder of the Franconian dynasty. He was born in 1017, and his father, anxious to make the succession secure and to strengthen the authority of the crown, caused him to be elected German king in 1026, creating him in 1027 duke of Bavaria, and in 1038 duke of Swabia and king of Burgundy. He became the reigning sovereign of Germany in 1039, at the age of twenty-two. Of an upright and resolute temper, he soon made his power felt both in church and state. The policy he pursued was that which had been followed by Otto I. during the early part of his reign: that is, he granted as many of the duchies as possible either to members of his own family or to vassals on whose loyalty he could rely. Duke Gottfried of Lower Lorraine, who laid claim to Upper Lorraine also, was the only prince who gave him serious trouble, and even this impetuous opponent could not effectually resist the great emperor. Henry was as distinguished in his wars as in his home government. Duke Bretislaus of Bohemia, who gave signs of aspiring to an independent position, invaded Poland, plundered its chief cities, and as a mark of his triumph carried away the body of St Adalbert from Gnesen to Prague. Henry proceeded against him in 1041, and forced him to appear in the following year at Ratisbon in penitent's garb, and to accept Bohemia in fief of the German crown. Having overcome this difficulty, he began in 1042 a series of campaigns in Hungary, where for the first time he asserted the supremacy of Germany. In Italy he was equally successful, not only maintaining his right to the Lombard crown, but establishing supremacy over the Normans in Apulia and Calabria. At this time the moral condition of the church was regarded with regret and concern by every earnest nature, and Henry, who was of a deeply religious temper, associated himself heartily with the movement for reform which proceeded from Cluny. At a council of prelates in Sutri in 1046, he caused the rival popes, Benedict IX., Sylvester II., and Gregory VI., to be deposed, and raised to the papal see as Clement II., Suitger, bishop of Bamberg. Three other German bishops, one after the other, were appointed to the same position; and as all of them were devout men and energetic administrators, they did much to purify the ecclesiastical system of Europe. During their rule the papacy was held in strict subjection to the empire; but the very earnestness with which Henry applied himself to the task of making the church worthy of its mission created grave dangers for the state, since it was improbable that a pope of proud and independent spirit would be content with a subordinate position. The magnitude of the peril soon revealed itself when Hildebrand became pope during the reign of Henry IV., Henry III.'s son and successor. Henry died in the prime of life in 1056 at Botfeld.

See Steindorff, *Jahrbücher des Deutschen Reichs unter Heinrich III.* (Leipsic, 1874).

HENRY IV. (1050-1106), Holy Roman emperor, son of Henry III., was born in 1050, and crowned German king at the age of four during his father's lifetime. After the death of Henry III. in 1056, the government was undertaken by the empress Agnes, the young king's mother. Henry III.'s vigorous rule, while it had secured the prosperity of the nation as a whole, had excited bitter discontent among the great nobles, and immediately after his death they began to make attempts to recover some portion of the independence he had taken from them. Agnes, who was of too refined a temperament to contend with them, sought to win their support by important concessions; and the evil effects of a feeble central authority were soon felt in every part of Germany. At last, in 1062, Anno, archbishop of Cologne, succeeded in gaining possession of the king by enticing him on board a boat on the Rhine. Agnes then resigned her position, and Anno ruled in her stead. He was a harsh, bigoted, and despotic prelate, and excited Henry's bitter hatred by the sternness of his discipline. In Adalbert, archbishop of Bremen, who was of an exactly opposite disposition,—gay, worldly, and good-humoured,—Anno had an influential rival. This prelate was at first entrusted with some share in the training of Henry, but ultimately completely gained his affections and became his sole guardian. In his fifteenth year Henry was declared, in accordance with the Ripuarian Code, to have reached his majority, but the royal authority was really exercised by Adalbert, who aroused the jealousy of the princes both by his splendid style of living and by his opposition to their usurped powers. At a diet held in Tribur he was compelled to yield the first place once more to Anno. Trained under these diverse influences Henry became passionate and wilful; but he was endowed with considerable intellectual gifts, and when thoroughly aroused could pursue an object with unquenchable ardour. In order, if possible, to check the excesses of his private life Anno caused him to marry Bertha, the daughter of the margrave of Susa, to whom he had for some time been betrothed. At first he regarded her with strong dislike; but after she had borne him a son in 1071 she succeeded in gaining his affections, and was afterwards his most trusted friend and companion.

Henry's reign was one of the most troubled in German history. His chief anxieties began in consequence of Otto of Nordheim, duke of Bavaria, being charged with an intention of murdering him. Otto was declared to have forfeited his titles, and his lands were seized and overrun. Supported by Duke Magnus of Saxony he rebelled, but both princes were quickly subdued. A new rebellion was organized by Otto of Nordheim, who suddenly, at the head of 60,000 men, appeared before the Harzburg, a strong Saxon fortress in which Henry resided. He escaped, but he was looked upon so coldly by the princes that he found it expedient to yield nearly all the demands of his enemies.

An opportunity of revenge was, however, created for him by the violence of a body of peasants, who destroyed a chapel connected with the Harzburg and violated the graves of the king's brother and infant son. He had then no difficulty in obtaining an imperial army, and after defeating the rebels at Hohenburg in 1075, he imposed on them his own terms, and seemed to be on the point of asserting the ascendency which had been exercised by Henry III.

Meanwhile Hildebrand had become pope as Gregory VII., and had already indicated his design of making the papacy supreme over all earthly authorities. Henry appealed to him to degrade those prelates who had associated themselves with the rebels. Instead of responding favourably to the appeal, Gregory called upon the king to answer to certain charges preferred against him by his subjects. Failing to realize how much power the papacy had acquired through the reforms effected by his father, Henry summoned a council of German prelates at Worms in 1076, and declared the pope deposed. The reply was a sentence of excommunication. Henry's adherents so rapidly fell away that a reconciliation with the pope was soon perceived to be absolutely necessary. Escaping from his enemies he crossed the Alps in the depth of winter, accompanied only by his wife and child and by a few faithful attendants. The nobles of Lombardy were not unwilling to take up his cause, but he preferred to hurry forward to the castle of Canossa, where Gregory was residing with his friend the Countess Matilda. There occurred the famous scene in which Henry, the highest of secular potentates, stood for three days in the courtyard of the castle, clad in the shirt of a penitent, and entreating to be admitted to the pope's presence. No historical incident has more profoundly impressed the imagination of the Western world. It marked the highest point reached by papal authority, and presents a vivid picture of the awe inspired during the Middle Ages by the supernatural powers supposed to be wielded by the church.

The ban was removed; nevertheless the German princes elected Duke Rudolf of Swabia as their king, and they were soon openly supported by the pope, who resented Henry's persistent opposition to his great scheme for the deliverance of the clergy from the system of feudal investiture. Henry renewed his sentence of deposition against Gregory, and raised Guibert, archbishop of Ravenna, to the papacy as Clement III. After the death of the anti-king Rudolf in 1080 he went to uphold his rights in Italy, and in 1084 he gained possession of Rome, where Clement III. crowned him emperor. In Germany Count Hermann of Luxembourg had been chosen as successor to Rudolf, and in 1085 he defeated Henry near Würzburg; but in 1087 he voluntarily resigned his position, and soon afterwards died. A third anti-king, Margrave Eckbert of Meissen, also died in 1089, and had Henry had no enemies outside his native kingdom there would then have been peace. But Victor III. and Urban II., the successors of Gregory VII. (who died in 1085), continued to oppose him, and in 1090 he was compelled to proceed to Italy for the third time to support Clement III., his own antipope. While engaged in this struggle he learned that his son Conrad had been induced by the papal party to rebel against him. Stunned by this unexpected blow, the tired emperor withdrew in disgust to a remote fortress, where he remained inactive for several years. In 1096 he recovered his energy, returned to Germany, and by timely concessions managed to overcome the opposition of his leading enemies. A diet at Mainz decided that Conrad had forfeited his right to the throne, and his brother Henry was proclaimed the emperor's successor. Pope Urban II., the antipope Clement III., and Conrad, all died within two years, and Henry had reason to hope that he would be able to end his life in quiet. But Paschal II., pursuing the policy of his predecessors, once more excommunicated the emperor, who was driven to despair by the fact of his son Henry putting himself at the head of the pope's supporters. The aged monarch, deceived by false promises, fell into his hands, and was detained as a prisoner. He ultimately fled to Liége, where he might still have been able to bring an army together; but in 1106 he was relieved from his heavy cares by death. The bishop of Liége buried him with a splendour becoming his position; but his enemies carried the body to Spires, where it was laid in an unconsecrated chapel; and it was not properly interred until, after a delay of five years, he was delivered from the ban of excommunication.

Henry holds an honourable position in history because, notwithstanding many personal faults, he resisted the excessive pretensions both of the papacy and of the ambitious feudal lords of Germany. He was unable, however, to make good his claims. Centuries passed before the secular power of the Romish see was seriously weakened, and amid the confused struggles of the time the princes obtained secure possession of rights which they had formerly held by an uncertain tenure.

See Giesebrecht, *Geschichte der Deutschen Kaiserzeit* (3d ed., vol. iii., part 1, Brunswick, 1869); Floto, *Heinrich IV. und sein Zeitalter* (2 vols., Stuttgart, 1855); Mueckwitz, *Die Busse Kaiser Heinrichs IV. zu Canossa vor dem Papste Gregor VII.* (2d ed., Leipsic, 1873). (J. SI.)

HENRY V. (1081-1125), Holy Roman emperor, son of Henry IV., was born in 1081. In 1098, his elder brother Conrad having forfeited his right to the throne by rebellion, he was appointed his father's successor. Six years afterwards he himself rebelled against the emperor, towards whom he played the part of a thorough traitor. The papal party, with which he allied himself, took for granted that when he mounted the throne church and state would be instantly reconciled; but their hopes were disappointed. The main point for which Henry IV. had contended was the right of investing the bishops with ring and staff. When Henry V. succeeded him in 1106, Pope Paschal II. demanded that this right should be given up, but he replied that he could not resign powers which had been exercised by his predecessors, and the loss of which would imply that the ecclesiastical lands of Germany would be removed from secular control. In 1110 he entered Italy at the head of 30,000 men. Alarmed by this display of force, Paschal withdrew his claims, and a day was appointed for the coronation of Henry as emperor. The opposition of the Roman prelates made it impossible for the pope to proceed with the ceremony, whereupon he and his cardinals were made prisoners. Paschal then formally recognized the right of investiture, and Henry received the imperial crown. When the Germans had recrossed the Alps Paschal renounced the treaty he had concluded, and the emperor was excommunicated. As many of the princes were pleased to find this opportunity of rebelling, Germany again became the scene of confused contests like those which had brought misery upon it during Henry IV.'s long reign. In 1116 the emperor went a second time to Italy and drove Paschal from Rome, and after Paschal's death he caused Gregory VIII. to be appointed pope. The extreme papal party, however, selected Gelasius II., who renewed the sentence of excommunication against Henry. The latter returned to Germany in 1119, and at a diet in Tribur succeeded in allaying the hostility of the more important among his enemies. Pope Calixtus II., who succeeded Gelasius in 1119, now found it necessary to offer a compromise, and the controversy between the empire and the papacy was for the time closed by the concordat of Worms, which was concluded in 1122. By this treaty it was agreed that [illegible] the emperor should have the right of being present, either in person or through a representative, and that the chosen bishop, before being consecrated, should receive his lands and secular authority in fief of the crown. So far the advantage rested with the emperor; but the papacy gained by being recognized as a power which had the right of negotiating with the empire on equal terms, and by the acknowledgment of the claim of the church to nominate its own rulers. Notwithstanding this settlement Germany did not long enjoy peace, for a number of petty wars broke out which Henry was not strong enough to quell. He died at Nimeguen in 1125, and with him was extinguished the Franconian dynasty.

See Giesebrecht, *Geschichte der Deutschen Kaiserzeit* (3d ed., vol. iii., pt. 2, Brunswick, 1869); Gervais, *Geschichte Deutschlands unter der Regierung Heinrichs V. und Lothars* (Leipsic, 1841-42); Kolbe, *Erzbischof Adalbert I. von Mainz und Heinrich V.* (Heidelberg, 1875).

HENRY VI. (1165-1197), Holy Roman emperor, the son of Frederick I., was born in 1165, and received the German crown in 1169. When his father started for Palestine at the head of the third crusade, Henry was made imperial vicar, and he succeeded to the throne after the news of his father's sudden death reached Germany in 1190. He shared the intellectual culture of his time, and was distinguished for the splendour of his political schemes; but he was of a stern disposition, and in order to attain his ends was sometimes guilty of horrible cruelty. Henry the Lion, who had been banished to England by Frederick I., returned to Germany after the departure of the latter for the Holy Land. Henry resisted him, but on becoming the reigning sovereign he concluded peace, and hastened to Rome, where he was crowned emperor in 1191. Through his wife Constantia he had a right to the throne of Sicily; but the Sicilian nobles had made Count Tancred, an illegitimate son of Constantia's brother, king. After receiving the imperial crown Henry advanced against Tancred, and the whole of southern Italy except Naples was quickly in his possession. Before Naples his army was struck by pestilence, and he was forced to return to Germany. There he suppressed various private wars, and compelled Henry the Lion to acknowledge his supremacy. The great ransom which he received from Richard I. of England enabled him to fit out a fine army, and with this he descended upon Italy in 1194, and without much difficulty conquered the Sicilian kingdom. Tancred was dead, but he had left a number of relatives, who were so barbarously treated that the people were seized with terror, and not even a sentence of excommunication which the pope pronounced against Henry could induce any one to express dissatisfaction with his rule. On his return to Germany it was easy for him, with the prestige he had now acquired, to enforce submission; and so great was his authority that, in 1196, he made attempts to secure that the crown should be declared hereditary in his family. He might have succeeded had he lived some years longer; but in 1197 he died at Messina. Before his death he was engaged in checking disorder which had arisen during his absence in Sicily; and he even obliged the Byzantine emperor Alexius to pay him tribute.

See Toeche, *Jahrbücher des Deutschen Reichs unter Heinrich VI.* (Leipsic, 1867); Mucke, *Kaiser Heinrich VI.* (Erfurt, 1876).

HENRY VII. (1282-1313), Holy Roman emperor, was born in 1282. He was the son of Henry II., count of Luxembourg, and was elected king in 1308, seven months after the murder of Albert I. He owed his election partly to the fact that he was comparatively unimportant, which led the electors to suppose that under him the powers of the princes would be exposed to no great danger. When he came to the throne Bohemia was subject to Henry of Carinthia, whom the people extremely disliked. The king at once displaced him, and enriched his own family by granting Bohemia, at the request of the Bohemians themselves, to his son John, whose claims were rendered secure by his marriage with Elizabeth, the daughter of Wenceslaus II. For some time no German king had sought the imperial crown; but Henry, who was of an imaginative temperament, could not forget the splendid dignities to which the wearer of the crown of Germany was entitled. He therefore resolved to revive the traditions which had begun to die out, and with a view to this result did what he could to compose the differences of the nobles and to gain their allegiance. At this time there were signs of rapid progress among the cities, and had a strong king devoted himself to their interests, he might have established his throne on a solid basis. Unfortunately the easiest way in which Henry could obtain immediate power for his plans in Italy was to ally himself with the princes against the cities; and this was in most instances the course which he adopted. His visit to Italy was looked forward to with eagerness by the Ghibellins, whose hopes were expressed in words of glowing eloquence by Dante. He held aloof at first from both the great parties in the state, and was in consequence liked by neither. In 1312 he was crowned emperor in Rome, having previously received the iron crown in Milan. But while he was in Rome, Robert of Naples was there also with a strong army, and in order to obtain adequate support it was necessary for Henry to declare himself on the side of the Ghibellins. He then resolved to conquer Naples, but while advancing on this expedition he died at Buonconvento, on the 24th of August 1313. It was generally believed at the time that he had been poisoned by a Dominican monk, but this is not proved by satisfactory evidence.

See Donniges, *Acta Henrici VII.* (Berlin, 1840-41); and *Geschichte des Deutschen Kaiserreichs im 14ten Jahrhundert* (Berlin, 1841); Thomas, *Zur Konigswahl des Grafen Heinrich von Luxemburg im Jahre* 1308 (Strasburg, 1875); Pohlmann *Der Romerzug Kaiser Heinrichs VII.* (Nuremberg, 1875).

HENRY I. (1005-1060), king of France, son of King Robert and Constance of Aquitaine, and grandson of Hugh Capet, came to the throne in 1031. On his accession his mother, who favoured her youngest son Robert, allied herself with the chief feudal nobles, and drove Henry to take refuge at the court of Duke Robert II. of Normandy. With the duke's help he soon broke up her league. Constance died in 1032, and Henry, by granting him the duchy of Burgundy, secured the goodwill of Robert his brother, who thus became head of the first house of Burgundy. After the death of Robert "the Devil," Henry, who had first supported William the Bastard, in 1053 and 1054, tried to weaken the power of the Normans. Leaguing himself with the count of Anjou, and calling his brother Eudes into the field, he invaded Normandy from Evreux. When, however, Eudes had been defeated at Mortemer, Henry drew back in haste, and left the Normans to themselves. In 1059 he had his eldest son Philip crowned as joint-king, and died in 1060. He was an active prince, with his sword rarely in the scabbard, being little more than a great feudal chief, who enjoyed the feudal pastime of petty war. Henry's acts and character did little to strengthen the monarchy in its relations with its feudal neighbours. His political horizon was very narrow. The Normans were independent of him, with their frontier barely twenty-five miles west of Paris; to the south his authority was really bounded by the Loire; in the east the count of Champagne was little more than nominally his subject. Henry's first wife (if indeed she was more than affianced to him) Maud, daughter (or niece) of Conrad the Salic, died childless; his second, Anne, daughter of Jaroslav, grand-duke of Russia, bore him two sons,—Philip his successor, and Hugh, count of Vermandois.

See Rodolf Glaber's *Chronicle*; *Chron. Andegavense*; *Historia de Henrico I.*; *Epist. Deoduini*; Dom Bouquet, *Recueil*, tom. xi

HENRY II. (1519–1559), king of France, the second son of Francis I. and Claude, succeeded to the throne in 1547. When only seven years old he was sent by his father, with his brother the dauphin Francis, as a hostage to Spain in 1526, whence they returned after the conclusion of the peace of Cambray in 1529. Henry was too young to have carried away any abiding impressions, yet throughout his life his character, dress, and bearing were far more Spanish than French. In 1533 his father married him to Catherine de' Medici, from which match, as he said, Francis hoped to gain great advantage, even though it might be somewhat of a misalliance. He did not then think that the dauphin would die so soon, and Catherine thereby become queen of France. Italian manners and politics entered with her into France, and long affected the history and fortunes of the country. Henry gathered round him a court which contrasted strongly with that of his father. Francis, with all his grave faults and selfishness, had fostered learning, had treated his people kindly, and had rarely checked even the Reformers. But Henry, under the influence of Diana of Poitiers, headed the strict Catholic movement; the escape of the learned from Paris to Geneva at his accession showed that not merely Huguenot doctrines but Renaissance studies were in peril. His court underwent an immediate change: the old officers were dismissed, and men whom Francis had disliked or banished returned. Immorality did not take flight, for Diana of Poitiers and Catherine de' Medici were at court, but it ceased to be gay and bright; men must be grave and severe, even in their vices. At first Diana of Poitiers and the grim old soldier Anne of Montmorency swayed the king; later, the two brothers Francis, duke of Guise, and Charles, cardinal of Lorraine, rose to power, with the marshal St André; everything was done and given through one or other of these men. Catherine de' Medici was as yet completely in the background.

The final union of Brittany with France marks the opening year of the reign. In 1548 Henry won a great diplomatic triumph over the ministers of Edward VI. of England, by getting possession of Mary queen of Scots, then only six years old; he had her educated in France, and eventually married to his son the dauphin Francis. In 1549 he appeared in Paris for the first time, and marked his presence by a great burning of Calvinists; and soon after he claimed back Boulogne, which had been promised to Francis I. by Henry VIII. After a successful campaign, he made the English Government, then extremely weak, cede Boulogne, and Henry entered the place in May 1550.

Hitherto he had not come into collision with Charles V.; the time was now approaching when he would enter into contest with him, and permanently advance the borders of his kingdom, while he inflicted a great blow on the emperor. Though early in his reign he had dealt with the German Protestants, and with the Ottoman power, he had taken no active steps, till the league of German princes, headed by Maurice of Saxony, offered an opportunity not to be missed; Henry made a compact with the Swiss and Turks, and concluded a secret treaty (September 3, 1551) with the German princes; in 1552, by the treaty of Chambord, he undertook to seize the three bishoprics, Metz, Verdun, and Toul. And so while Maurice drove the emperor from Innsbruck, Henry and Montmorency took Lorraine. The bishoprics were won almost without a blow, and Henry was able to indulge in [illegible]. [illegible] an attempt at recovering [illegible] the siege of Metz by Charles V. to the [illegible] of the duke [illegible], French-speaking, though formerly [illegible] the [illegible] remained in French hands,—Metz till 1870, Toul and Verdun to this day.

In 1556 Henry, supporting the anti-Spanish policy of the "Theatine" pope, Paul IV., again made war with Spain. Francis of Guise was sent early in 1557 into Italy to oppose the duke of Alva. Anne of Montmorency went to the northern frontier; Gaspard of Coligny, who commanded in Picardy, was ordered to begin hostilities. These led to the disastrous battle of St Quentin, in which the French were utterly defeated (August 10, 1557); it was followed by the fall of the town, at that time the chief bulwark of France to the north. Francis of Guise, recalled in haste from Italy, redressed the balance at the expense of England by the capture of Calais (January 1558), and the triumph of the house of Guise seemed complete when Mary Stewart was married to the dauphin in the same year; their niece, with her claims on the Scottish and English crowns, would now ascend the throne of France. The defeat of the French at Gravelines, the desire of Montmorency to escape from captivity, the wish of the High Catholics to have leisure to extirpate heresy, the sympathy of Philip with that aim, the accession of Elizabeth of England,—all these things made peace necessary, and the treaty of Cateau Cambresis (April 1559) closed the war. As a sequel to the peace high feast was held at Paris to celebrate the marriage of Henry's two daughters; in a tournament he received his death-wound from the captain of his Scottish guards, Montgomery. So ended Henry II., in his forty-first year. Handsome, brave, and cold, he left little mark on his age; he is all but forgotten in the stormy days which followed. By Catherine de' Medici he had ten children, three of whom succeeded to the throne,—Francis II., Charles IX., and Henry III. The legislation of his reign was slight; he reduced the number of secretaries of state to four, and arranged their functions afresh; he issued an edict in behalf of a better coinage, reserved to himself the exclusive sale of salt, and permitted the foundation of the university of Rheims. In 1555 we find the first French Reformed churches established at Paris; these were quickly followed by others. The reign saw the close of the struggle between the crowns of Spain and France.

See *Mémoires de Montluc*; *Mémoires de Tavannes*; *Mémoires de Vieilleville*; *Mémoires de Villars*; *Archives curieuses [illegible]*, series i., tom vi.; Brantôme, [illegible]; *Commentaires de François de Rabutin*; Thuanus, *Hist.* [illegible] I.–XXII. (G. W. K.)

HENRY III. (1551–1589), king of France, third son of Henry II. and Catherine de' Medici, succeeded to the throne of France in 1574. In his youth, as duke of Anjou, he was warmly attached to the Huguenot opinions, as we learn from his sister Margaret of Navarre; but his unstable character soon gave way before his mother's will, and both Henry and Margaret remained as choice ornaments of the Catholic Church. Henry won two brilliant victories at Jarnac and Moncontour (1569), and thereby attracted the eyes of the Polish nobles, who elected him their king in 1573. He went to Warsaw, but, on the death of his brother Charles IX. in 1574, came back to France and assumed the crown. He returned to a wretched kingdom, torn with civil war. Now began that "reign of favourites" which has made his career a byword. His mother, ever balancing between parties, first favoured the favourites, then went with the Huguenot chiefs. In those days the famous League was [illegible] (1576), and Henry declared himself its head in 1576. He took but a feeble part in the sixth and seventh civil wars, and was little in earnest till, in 1584, the death of his younger brother, Francis, duke of Anjou, made Henry of Navarre next heir to the throne, and excited to the utmost the fierce passions of the Guises and the League. The

Parisian development of the League under the "sixteen" (1585), with its devotion to Henry, duke of Guise, and its determination to exclude the heretic of Navarre, to depose the wavering Henry III., and to make Cardinal Bourbon king,—this, as well as the menacing attitude of Philip II. of Spain, forced Henry III. to draw towards his distant cousin Henry of Navarre. And so he was driven to desperation by the commanding position assumed by the house of Guise; and in 1588 Henry of Guise and his brother the cardinal were assassinated by his orders. Henry III. now found himself powerless; early in 1589 he again joined Henry of Navarre, and with him laid siege to Paris. There he was murdered by one Jacques Clement, a priest. With Henry III. ended the direct line of the house of Valois. In his young days he had been enthusiastic for learning and the new religious opinions; as he grew older he grew worse; and the last of the sons of Catherine de' Medici was perhaps the most debauched of the kings who hitherto had sat on the throne of France.

See *Mémoires de Tavannes*; *Mémoires de Vieilleville*; *Mémoires de Castelnau*; Brantôme, *Des illustres François*; *Mémoires du Duc de la Force*; Thuanus (De Thou), *Hist. sui temp. Libri CXXV.*; *Journal de l'Estoile*; *Mémoires de la Ligue*; *Art de vérifier les dates*, sér. ii. tom. vi.

HENRY IV. (1553-1610), king of France, was born in the castle of Pau in 1553, being son of Antony of Bourbon, king of Navarre and duke of Vendôme, and Jeanne of Albret. By his father he was tenth in descent from Saint Louis, and only a very distant cousin to his predecessor, Henry III. His mother, a grand and noble lady, brought him up as a Calvinist. His education was rough and hard, and fostered that originality of character which so marked his life; his military training was under the great captain, Gaspard of Coligny. In 1571 he was wedded to the daughter of Catherine de' Medici, Margaret of Valois; and on his mother's death in 1572 he became king of Navarre.

The massacre of St Bartholomew found him in Paris; but his life was spared on his making a profession of Catholicism, which lasted till he succeeded in escaping from court in 1575. Thenceforward he became acknowledged head of the Huguenots, and by his dashing bravery kept life in their dispirited forces. No man was better fitted for such work; he had all the qualities of a guerilla leader, though he was not a great general. His success at Coutras (1587) and the joyousness and generosity of his character endeared him to his followers, while it secured the respect even of his opponents. After the death of Henry III. he was recognized as king of France by only a portion of the army then besieging Paris (August 4, 1589); the Catholic "Politiques" in the army stood aloof and disbanded; the Huguenots formed the only sound nucleus of his power. At Arques (1589) and Ivry (1590) he brilliantly defeated the Leaguers, and resumed the siege of Paris; Alexander of Parma, however, prevented him from taking Rouen (1592); much less could he take Paris. Finding affairs hard, and desiring to be a king and not a guerilla-captain, in 1593 Henry allowed himself to be converted to Catholicism. By this step he struck a deadly blow at the League and made powerless the intrigues of Philip II. For between the fanatical Catholics on one side and the Huguenots on the other lay the great bulk of Frenchmen; the "Politique" party had become more and more powerful, until at length it was felt to be the true national party. The only thing which kept it from Henry was the difference of faith; that barrier removed, all France at once joyfully accepted him as king. The Leaguers became almost a foreign body; the Huguenots gloomily accepted his triumph, bought, as they held, at cost of principle. After the battle of Fontaine-Française in 1595 the Spanish and Leaguers were driven out of Burgundy, and the recovery of Amiens from the Spaniards in 1596 secured Picardy and the northern frontier. The *Satire Ménippée*, published in 1593 and 1594, had already condemned the Leaguers as hirelings of the Spanish king; and in April 1598 by the edict of Nantes Henry assured their position to his old Huguenot followers, while by the peace of Vervins (May 1598) he ended the Spanish war and took from the League its last source of strength.

After 1598 the energies of Henry IV. were given to the restoration of his country, which in nearly forty years of civil war had suffered terribly; the organizing genius of Maximilian of Bethune, duke of Sully, restored the finances; agriculture, manufactures, and commerce made marvellous advances. Henry also upheld the authority of France; in 1601 he acquired Bresse, Bugey, and Valromey from Savoy. He supported the Netherlands against Spain, and he was preparing a great army, which, in combination with the Dutch under Maurice of Nassau, was to interfere in the tangled Cleves-Juliers question, when he was assassinated by Ravaillac on the 14th of May 1610. For his character see FRANCE, vol. ix. p. 566.

Henry IV. left no children by his first wife Margaret of Valois; by his second, Marie de' Medici, he had three sons and three daughters,—Louis, who succeeded him as Louis XIII.; a child who died in 1611; Gaston, duke of Orleans, the meanest of the race; Elizabeth, wife of Philip IV. king of Spain; Christine, wife of Victor Amadeus, duke of Savoy; and lastly Henriette Maria, queen of England, spouse of Charles I. He also left behind him several natural children, of whom the most celebrated was César, duke of Vendôme, son of the famous Gabrielle d'Estrées.

See Pierre l'Estoile, *Journal du règne de Henri IV.*; Péréfixe, *Histoire du roi Henri le Grand*; Xivrey, *Recueil des lettres missives de Henri IV.* (1839-53); Palma Cayet, *Chronologie novennaire*; *Mémoires de Tavannes*; *Mémoires de Vieilleville*; *Mémoires de Castelnau*; Sully, *Œconomies royales*; Cimber and Danjou, *Archives curieuses*; *Art de vérifier les dates*, série ii. tom. vi. The reader is also referred to the documents cited by Von Ranke in his *Französische Geschichte*, and to Olivier de Serres's *Théâtre d'agriculture et mesnage des champs*. (G. W. K.)

Of Portugal.

HENRY I. (1512-1580), king of Portugal, born at Lisbon, January 31, 1512, was the third son of Emanuel the Fortunate, was destined for the church, and in 1532 was raised to the archiepiscopal see of Braga. In 1542 he received the cardinal's hat, and in 1578 when he was called to succeed his grandnephew Sebastian on the throne, he held the archbishoprics of Lisbon and Coimbra as well as that of Braga, in addition to the wealthy abbacy of Alcobaza. As an ecclesiastic he was pious, pure, simple in his mode of life, charitable, and a learned and liberal patron of letters; but as a sovereign he proved weak, timid, and incapable. On his death in 1580 after a brief reign of seventeen months the male line of the royal family which traced its descent from Henry, first count of Portugal (*c.* 1100), came to an end; and all attempts to fix the succession during his lifetime having ignominiously failed, Portugal became an easy prey to Philip II. of Spain.

Of Castile.

HENRY I. (*c.* 1207-1217), king of Castile, son of King Alphonso "the Noble," by Eleanor, daughter of Henry II. of England, succeeded his father in 1214, and was killed by the falling of a tile in 1217, after a reign of only two years and nine months. He was succeeded by Ferdinand III., son of his sister Berenguela.

HENRY II. (1333-1379), king of Castile, surnamed *el Bastardo* or *de la Merced*, was one of the six illegitimate sons of King Alphonso "the Avenger," and consequently half-brother to Pedro the Cruel who legally succeeded to the throne of Castile in 1350. His mother was Leonora de Guzman. The extraordinary series of cold-blooded murders which earned for Pedro his unenviable surname encouraged Henry, then known as count of Trastamara, to lead repeated rebellions, in which, with the aid of the French under Du Guesclin, and in spite of the opposition of the English under the Black Prince, he was ultimately successful in 1369. He immediately proceeded to direct his arms against the most formidable of his numerous enemies, King Ferdinand of Portugal, and by four campaigns, during the last of which he forced his way to the very gates of Lisbon (March 1373), succeeded in establishing a favourable peace. At the same time he entered into a treaty with the king of Navarre, which subsisted, however, for only three years; in 1375 friendly relations with the king of Aragon were formed, which were cemented by the marriage of the daughter of the latter to Don Juan of Castile. The reign of Henry II., which was devoted rather to defensive than to aggressive warfare, was not marked by any of the usual exploits against the Moors, but it is distinguished in the annals of Castile by some noteworthy improvements in legislation and reforms in the administration of justice, sanctioned in the cortes of Toro in 1369 and 1372; and Spanish historians also mention with special pride the defeat of the English by the Spanish fleet at Rochelle in 1372. Henry died, of poison it is supposed, on May 30, 1379, and was succeeded by his son John (Juan) I.

HENRY III. (1379–1406), king of Castile, surnamed *el Doliente* (the sickly), succeeded his father John I. in 1390, when only eleven years of age. During his minority, the question of the regency not having been very clearly settled by his father, the kingdom was in a constant state of disturbance, bordering upon civil war; unable to satisfy the rival claims of Don Fadrique, Don Alonso, and the archbishop of Toledo, Henry at last resolved, minor as he was, to take the reins of government entirely into his own hands (1395). By energetic measures he succeeded within two years in quelling the turbulence of his nobles, in establishing his own popularity with the body of the people, and thus in effecting the pacification of his kingdom. The only foreign war during this reign was that with Portugal, which terminated in the peace of 1399; a great expedition against the kingdom of Granada, for which extensive preparations had been made, and for which large grants from the cortes held in Toledo in 1406 had been obtained, was brought to an abrupt termination by the death of Henry at that city on December 25 of the same year. It was during this reign that the sovereignty of the Canary Islands was assumed by Castile; and an interesting indication of at least a widening interest in foreign affairs was afforded by the mission of a solemn embassy to Tamerlane in 1401. Henry III. was succeeded by John II., his eldest son by Catherine of Lancaster, whom he had married in 1393. See Davila, *Historia de la Vida y Hechos del Rey Don Henrique Tercero de Castilla* (1638).

HENRY IV. (1425–1475), king of Castile, surnamed *el Impotente* (the impotent) and sometimes *el Liberal* (the spendthrift), the eldest son of John II. by his first wife Maria of Aragon, was born at Valladolid on January 6, 1425. As prince of Asturias he took a prominent and generally an unfilial part in most of the disturbances of his father's reign; in 1445 a pitched battle between the king and the prince was prevented only at the last moment by the intervention of the clergy and some of the nobles; and peace was not finally secured until 1450 when Pope Nicholas V. issued his bull of excommunication against all those in the peninsula who, by perplexing the affairs of the sovereign, were directly helping the cause of the infidels. In 1440 Henry had in accordance with a treaty signed in 1436 been united to Blanche of Aragon: but this marriage, which had not been happy and which had given cause to many scandalous reports, he dissolved in 1453 shortly before his accession to the throne on his father's death in July of that year. He began his reign with a great show of energy against the Moors; but the boldness of his intentions contrasted strangely with the feebleness of his execution; and the unsatisfactory character of the results attained tended greatly to bring to a head the discontent which his indolent inattention to home affairs, his reckless extravagance, and the disorders of his private life had not failed to create. In 1465 occurred at Avila the extraordinary scene, so often described, of the king's deposition in favour of his brother Alphonso; this was followed in 1468, shortly after Alphonso's death, by the election of his sister Isabella, who, however, declined to accept the proffered crown. In the same year Henry was forced to repudiate his wife Joanna of Portugal and to disinherit her daughter Juana (la Beltraneja) whom he had unsuccessfully attempted to put forward as also his; and thus the succession became fixed in favour of Isabella, who was married to Ferdinand of Aragon in the following year. Henry died at Madrid on December 12, 1474.

For the events of the reign of Henry IV. the contemporary authorities are Alonso de Palencia and Diego Henriquez del Castillo, each of whom has left a *Cronica del Rey Don Enrique Quarto*; the best and at the same time the most accessible modern English account is to be found in Prescott's *History of the Reign of Ferdinand and Isabella*, part i., chaps. iii. and iv.

HENRY I. (*c.* 1210–1274), king of Navarre, surnamed *le Gros*, third count of Champagne, was the youngest son of Theobald I. of Navarre by Margaret of Foix, and succeeded his eldest brother Theobald II. in December 1270. His proclamation at Pamplona, however, did not occur till March of the following year, and his coronation was delayed until May 1273 After a brief reign, characterized it is said by dignity and talent, he died in July 1274, suffocated, according to the generally received accounts, with his own fat. In him the male line of the counts of Champagne, kings of Navarre, became extinct. He was succeeded by his only legitimate child Joanna, born in 1270, by whose marriage to Philip le Bel in 1284 the crown of Navarre became for a time united to that of France.

HENRY II. (1503–1555), or Henri d'Albret, titular king of Navarre, born at Sanguessa in April 1503, was the eldest son of Jean d'Albret by Catherine of Navarre; and on the death of the latter in exile in June 1516 succeeded his parents in all their claims against Ferdinand the Catholic, assuming under the protection of Francis I. of France the title of king of Navarre. After the ineffectual conferences at Noyon (1516) and at Montpellier 1518, an active effort was made in 1521 to establish him in the *de facto* sovereignty; but the French troops which, under André de l'Esparre, had seized the country were ultimately expelled by the Spanish viceroy, the duke of Najera. Henry, who along with Francis was taken prisoner at the battle of Pavia (1525) but afterwards contrived to escape, married Margaret, the only sister of the latter, in 1526, and by her became the father of Jeanne d'Albret, the mother of Henry IV. of France. He died at Pau on May 25, 1555.

HENRY III. of Navarre. See HENRY IV. of France.

HENRY, PRINCE (1394–1460), of Portugal, surnamed "the Navigator," to whose enlightened foresight and perseverance the human race is indebted for the maritime discovery, within one century, of more than half the globe, was born at Oporto, on the 4th of March 1394. His father was João I., under whose reign Portugal first began to recover from her subjugation by the Moors, and to assume a prominent position among the nations of Europe; his mother was Philippa, daughter of John of Gaunt. Prince Henry and his elder brothers, Duarte and Pedro, were sent put in 1415 on an expedition against the important Moorish city of Ceuta, which, after much hard fighting, they succeeded in taking in one day. All the princes distinguished themselves at the siege, but Prince Henry so pre-eminently that, but for his own entreaties, his father would have knighted him in precedence of his brothers. His renown after this became so high that he was invited severally by the pope, the emperor, and the kings of Castile (Juan II.) and England (Henry V.) to take the command of their respective armies. The prince, however, had set his mind on other and larger plans, involving no less than the hope of reaching India by the south point of Africa. To this end he had several encouragements: the geographical position of Portugal was in his favour; the large revenues of the order of Christ, of which he was grand-master, provided him with means; and he had contrived to gather important information from the Moors with regard to the coast of Guinea and the populous nations of the interior of Africa. Accordingly in 1418–19 he took up his abode on the extreme south-western point of Europe, the promontory of Sagres, in Algarve, of which kingdom he was made governor in perpetuity, with the purpose of devoting himself to the study of astronomy and mathematics, and to the direction and encouragement of the expeditions which he proposed to send forth. There he erected an observatory, the first set up in Portugal, and at great expense procured the services of one Mestre Jacome from Majorca, a man very skilful in the art of navigation and in the making of maps and instruments, to instruct the Portuguese officers in those sciences. An account has already been given of his principal explorations in the article GEOGRAPHY, vol. x. p. 180 (*q.v.*). At first his efforts seemed to be crowned with little success, and his various expeditions called down upon him much obloquy from the nobles, who complained of such an amount of useless expenditure; but on the prince vituperation fell harmless. The king died in 1433, and the troubles which followed occupied Prince Henry until 1440. In the following year Cape Branco was reached, and in 1443 intercourse was established with negro states in Senegal and Gambia. In 1442–3 Henry VI. of England conferred on the prince the riband of the order of the garter. In 1444–5 were discovered the river Senegal, Cape Verd, Cape St Anne, Cabo dos Mastos, and the Rio Grande. During the later years of his life Gomez and others made important voyages of discovery in Prince Henry's service (see vol. x. p. 180). He died November 13, 1460, in his town on Cape St Vincent, and was buried in the church of St Mary in Lagos, but a year later his body was removed to the superb convent of Batalha. His great-nephew, King Dom Manuel, had a statue of him placed over the centre column of the side gate of the church of Belem. On July 24, 1840, a monument was erected to him at Sagres at the instance of the Marquis de Sà da Bandeira.

The glory attaching to the name of Prince Henry does not rest merely on the achievements effected during his own lifetime, but on the stupendous subsequent results in maritime discovery to which his genius and perseverance had lent the primary inspiration. The sovereigns loyally continued what the prince had begun. The marvellous results effected within a century from the rounding of Cape Bojador in 1433 formed one unbroken chain of discovery, which originated in the genius and the efforts of one man. They were the stupendous issue of a great thought and of indomitable perseverance, in spite of twelve years of costly failure and disheartening ridicule. As Mr Major, in his *Life of Prince Henry*, has justly said, "Had that failure and that ridicule produced on Prince Henry the effect which they ordinarily produce on other men, it is impossible to say what delays would have occurred before these mighty events would have been realized; for it must be borne in mind that the ardour, not only of his own sailors, but of surrounding nations, owed its impulse to this pertinacity of purpose in him."

HENRY THE LION (1129-1195), duke of Saxony and Bavaria, son of Henry the Proud, was born in 1129. After the death in 1139 of his father, who had been deprived of his possessions by Conrad III., the bravery and energy of his mother Gertrude and his grandmother Richenza secured to him the duchy of Saxony. Shortly after coming of age he at the diet of Frankfort in 1147 demanded also the restoration of Bavaria, but was refused, upon which, along with his uncle Welf VI., he made an unsuccessful attempt to seize it by force of arms. In 1154 he, however, received from Frederick I. the formal recognition of his claims to its possession, and in 1156 Henry Jasomirgott was compelled to deliver it up to him. Besides distinguishing himself in the wars of Frederick in Italy, Henry now devoted his energies to establishing his power in his own dominions, both by conquest and by encouraging agriculture and trade. He extended the boundaries of Saxony beyond the Elbe by successful battles against the Slavs, founded Munich in Bavaria, colonized Mecklenburg and Holstein, and fostered the growth of Hamburg and Lübeck. His ambitious projects and his arrogant bearing awakened, however, the hostility of several of the secular and ecclesiastical potentates, who in 1166 concluded a league against him at Merseburg, and a stubborn contest of two years' duration ensued, which was finally ended by Frederick in 1169 deciding at the council of Bamberg in Henry's favour. In February 1168 Henry, having previously divorced Clementia of Zahringen, married Matilda, daughter of Henry II. of England; and, elated by such an influential alliance and by the increasing resources of his dominions, he shortly after his return from a pilgrimage to the Holy Land in 1172 began to manifest a tendency to treat the emperor with coldness and to revive the traditional rivalry of his race with the Hohenstaufens. He took no part in the Italian expedition of 1174, and in 1176 his sudden desertion of Frederick in the crisis of his struggle with the Lombard cities resulted in the disaster at Legnano. On Frederick's return from Italy in 1177 Henry was summoned to appear before him at the diet of Worms, and declining to do so he was placed under the ban of the empire, and his lands were divided among other princes. For more than a year he endeavoured to resist the execution of the imperial decree, but he found it necessary at last, in November 1181, to give in his submission to Frederick, who, on condition that he remained three years in England, agreed to reinstate him in the possession of Brunswick and Lüneburg. Having in 1189 refused to accompany Frederick on his crusade, he was again compelled to withdraw to England, but shortly after Frederick's departure he returned, and, concluding an alliance with the archbishop of Bremen, made a second attempt to recover his territories; but, though at first he gained several important victories, he was ultimately compelled in July 1190 to conclude a peace at Fulda, which secured to him scarcely any advantages from the contest. Emboldened by the hostile alliance formed against the emperor Henry VI. in 1192, he again renewed the struggle; but after Richard of England fell into the hands of the emperor in the following year, he found it necessary again to give in his submission; and shortly afterwards a pledge of amity between the two houses was given through the marriage of the eldest son of Henry the Lion to Agnes, niece of Frederick I., and cousin of the reigning emperor. Henry died 6th August 1195 at Brunswick, and was buried in the church of St Blaise. Otto, his second son, became emperor under the title of Otto IV. A colossal statue of Henry was unveiled at Brunswick 4th July 1874. Though ambitious, headstrong, and pugnacious, Henry showed that while he possessed no small skill in the art of war he could appreciate the arts of peace, and he gave a powerful impetus to the development of many important cities, and furthered with judicious sagacity the material prosperity of his kingdom.

See Bottiger, *Heinrich der Löwe*, Hanover, 1819; Prutz, *Heinrich der Löwe*, Leipsic, 1865; Weiland, *Das Sächs. Herzogthum unter Lothar und Heinrich dem Löwen*, Greifswald, 1866; Philippson, *Geschichte Heinrichs des Löwen*, Leipsic, 2 vols., 1867-8; and the various biographies of Frederick I.

HENRY THE DEACON,—variously called of Cluny, because he was at one time a monk of that rule, of Lausanne, because he is believed to have first appeared as a preacher of repentance there, and of Toulouse, because his later years were passed in that city and neighbourhood,—founder of the anti-sacerdotal sect of *Henricians*, was of Swiss or Italian extraction (his birthplace is unknown), and was born towards the end of the 11th century. About the year 1115 he abandoned the cloister, where he had entered the diaconate, and, burning with righteous indignation against the dead mechanical ceremonialism of the dominant church and the hideous moral corruption of its clergy, began to go about as an itinerant preacher. The neighbourhood of Lausanne was probably the scene of his earliest appearances, but he soon betook himself to France, where the soil had been prepared for him by Peter of Bruis (leader of the Petrobrusians), and where he at once began to attract adherents. About the beginning of Lent in 1116 he asked and received permission of the bishop Hildebert of Le Mans (Cenomani) to visit that city; the fact that he was not only tolerated but received with some degree of honour at this time shows that he had not as yet fallen under serious suspicion of heretical pravity. Soon the extraordinary fascination of his character began to make itself felt; and the rude but convincing eloquence with which he exposed the immorality of the clergy rapidly alienated the people of the town from their spiritual guides; remonstrances and inhibitions by the local ecclesiastical authorities were equally vain; and when Hildebert, who had been absent in Rome, returned to his diocese, he found his episcopal blessing treated with contempt, and was bluntly told by his flock that they had found "a father, a priest, an intercessor, more exalted in authority, more honourable in life, more eminent in knowledge." From the confused accounts of Henry's life and labours which have reached us it does not appear that even then he had come forward as the teacher of any new or strange doctrine; his efforts as a reformer of public and domestic morals are chiefly insisted on, especially the measures he took for the reclamation of fallen women, for the encouragement of early and honourable marriage among the laity, and for the promotion of a higher standard of purity among the nominally celibate clergy. It was not as a heretic but merely as a somewhat inconvenient agitator that he was ordered by Hildebert at last to leave Le Mans. We next read of Henry as conspicuously active in Provence, especially after the burning in 1124 of Peter of Bruis, with whose peculiar views he is alleged, upon evidence which has not reached us, to have entirely sympathized. In 1134 he was arrested by the bishop of Arles and taken to the council of Pisa, where he was declared to be a heretic, and condemned to imprisonment. This captivity, however, does not appear to have lasted long. The scene of the third and concluding chapter of the recorded life of Henry is laid at Toulouse, where after ten years of uninterrupted activity with the result complained of by Saint Bernard (*Ep.* 241)—"the churches are without flocks, the flocks without priests, the priests are nowhere treated with due reverence, the churches are reduced to the level of synagogues, the sacraments are despised, the festivals are neglected"—it was found necessary by Pope Eugenius III. to take active measures for the suppression of the heresy. With this view the cardinal bishop Alberic of Ostia was sent in 1147 to the disaffected districts, and with him was associated Bernard of Clairvaux. Their efforts were ultimately successful; Henry died an obscure death in prison about the year 1148, and his sect soon afterwards ceased to have any separate existence.

The original authorities upon this subject are the *Acta Episcoporum Cenomanensium* ("Gesta Hildeberti"), which have been published in Mabillon's *Anal. Vet.*, and Bernard's letter (*Ep.* 241) to Count Ildephonso of St Gilles, written in 1147. From these sources the distinctive tenets of Henry and the Henricians (if distinctive tenets there were) cannot be gathered with any clearness. The probability is that Henry and his disciples had not any definite system of doctrine to oppose to that of the church, but were antisacerdotalists pure and simple, "insurgents, who shook the established government, but did not attempt to replace it by any new form or system of opinions and discipline." See Milman, *History of Latin Christianity*, bk. ix. c. 8; and Hahn, *Geschichte der Ketzer im Mittelalter* (1845).

HENRY OF GHENT. The scholastic writer generally known by this name was born probably about 1217 in the district of Mude, near Ghent. His family name seems to have been Goethals, but he is always described as Henry of Mude or of Ghent. Little is known of the details of his life. He studied at Ghent and then at Cologne under Albertus Magnus. After obtaining the degree of doctor he returned to Ghent, and is said to have been the first to lecture publicly in that city on philosophy and theology. Like most of the great doctors of the age, he was drawn to Paris by the fame of the university there. In 1247 he is known to have taught at Paris; and he was distinguished by the title of *doctor solennis*. He took an active part in some of the many disputes between the orders and the secular priests, and warmly defended the latter. He died at Tournay, of which place he was archdeacon, in 1293. His most important works, *Quodlibeta Theologica* and *Summa Theologiæ* have been printed, the first in 1518, the second in 1520. Several other writings remain in MS. Henry of Ghent occupies a somewhat remarkable place in the history of scholasticism. A contemporary of the great Aquinas, he opposed several of the dominant theories of the time, and united with the current Aristotelian doctrines a strong infusion of Platonism and mysticism. Only a few of the salient points of his doctrine can here be given; the line of thinking by which they are reached is elaborate and complex. He distinguishes between knowledge of natural objects and the divine inspiration or intuition by which we cognize the being and existence of God. The first, according to Henry, throws no light upon the second. Individuals are not constituted by the material element in them, but by the fact of their independent existence, i.e., ultimately by the fact that they are created as separate objects. Universals must be distinguished according as they have reference to our minds or to the Divine mind. In the divine intelligence exist exemplars or types of the genera and species of natural objects. On this subject, however, Henry is far from clear; but it deserves notice that he defends Plato against the current Aristotelian criticism, and endeavours to show that the two views are in harmony. In psychology, his view of the intimate union of soul and body is truly remarkable. The body he regards as forming part of the very substance of the soul; through this union the soul is more perfect and complete.

There is a monograph on Henry by Fr. Huet, *Recherches historiques et critiques sur la vie, les ouvrages, et la doctrine de Henri de Gand*, Ghent, 1838. See also Werner, *Heinrich von Gent als Repräsentant des christlichen Platonismus im 13ten Jahrh.*, Vienna, 1878, vol. 41, [illegible]; Jourdain, *Phil. de St Thomas d'Aquin*, [illegible]; *Histoire littéraire de la France*, xx. 144 sq.; also Hauréau, [illegible], and the general histories.

HENRY OF HUNTINGDON, an English chronicler of the 12th century, born, it is likely, between 1080 and 1090, was the son of an ecclesiastic named Nicholas, who probably held the office of archdeacon of Huntingdon, to which Henry himself afterwards attained about 1120. The celibacy of the clergy not being enforced in England till 1102, this paternity was considered no disgrace, and our author in several passages of his writings refers to his father with much filial respect. Received as a mere child into the household of Robert of Bloet, bishop of Lincoln, Henry not only continued to enjoy the advantages of its culture and affluence till the bishop's death in 1123, but he also secured the patronage and friendship of Alexander of Blois, who next succeeded to the see. There is reason to believe that he accompanied Alexander to Rome, probably in 1125 and 1144, and it was to him that he dedicated his *Historiæ Anglorum*, which was issued four times during the author's life, and in the last form came down to the accession of Henry II. (1154). The date of the author's death has not been preserved, but it is probable that the close of his life is approximately marked by the close of his history.

Henry of Huntingdon's *Historia* was first printed by Savile, *Rerum Anglicarum Scriptores post Bedam* (London, 1596), and it was republished at Frankfort in 1603. Books i., ii., iv., v., and vi. were edited by Mr Petrie for the Record Commission Collection, vol i., 1848, and the whole work has been prepared for the Rolls Series by T. Arnold, 1879. An English translation by Thomas Forester forms a volume of Bohn's Standard Library (1853). We have besides from Henry's pen an Epistle to Henry I. on the succession of the Jewish, Assyrian, Persian, Macedonian, and Roman kings and emperors (written in 1130); an Epistle to Warin (one of his friends) containing an epitome of the British History of Geoffrey of Monmouth, which he had discovered at Bec in Normandy; and, better known than either, an Epistle to his friend Walter *On Contempt of the World, or on Bishops and other Illustrious Men of the Age* (written in 1135, and edited by Wharton in his *Anglia Sacra*, 1691). Nor must Henry's poetical pieces be forgotten, as they speak well for his culture and taste. Two MS. copies of his complete works preserved at Lambeth deserve to be specially mentioned; and the British Museum possesses several important manuscripts of the History. See Wright, *Biogr. Brit. Litt., Anglo-Norman Period*, 1846; Forester's Preface; James Gairdner, *Early Chroniclers of Europe: England* (1879), and Arnold's elaborate introductions.

HENRY, Joseph (1797–1878), an eminent American physicist, was born in Albany, the capital of the State of New York, on the 17th of December 1797. He received his education at an ordinary school, and afterward at the Albany academy, which enjoyed considerable reputation for the thoroughness of its classical and mathematical courses. On finishing his academic studies he contemplated adopting the medical profession, and prosecuted his studies in chemistry, anatomy, and physiology with that view. He occasionally contributed papers to the Albany institute, in the years 1824 and 1825, on chemical and mechanical subjects; and in the latter year, having been unexpectedly appointed assistant engineer on the survey of a route for a State road from the Hudson river to Lake Erie, a distance somewhat over 300 miles, he at once embarked with zeal and success in the new enterprise. This diversion from his original bent gave him an inclination to the career of civil and mechanical engineering; and in the spring of 1826 he was elected by the trustees of the Albany academy to the chair of mathematics and natural philosophy in that institution. In the latter part of 1827 he read before the Albany institute his first important contribution, "On some Modifications of the Electro-Magnetic Apparatus." Struck with the great improvements then recently introduced into such apparatus by Mr William Sturgeon of Woolwich, he had still further extended their efficiency, with considerable reduction of battery-power, by adopting in all the experimental circuits (where applicable) the principle of Schweigger's "multiplier," that is, by substituting for single wire circuits, voluminous coils (*Trans. Albany Institute*, October 10, 1827, vol. i. pp. 22, 23). In June 1828 and in March 1829 he exhibited before the institute small electromagnets closely and repeatedly wound with silk-covered wire, which had a far greater lifting power than any then known. Henry appears to have been the first to adopt insulated or silk-covered wire for the magnetic coil; and also the first to employ what may be called the "spool" winding for the limbs of the magnet. He was also the first to demonstrate experimentally the difference of action between what he called a "quantity" magnet excited by a "quantity" battery of a single pair, and an "intensity" magnet with long fine wire coil excited by an "intensity" battery of many elements, having their resistances suitably proportioned. He pointed out that the latter form alone was applicable to telegraphic purposes. A detailed account of these experiments and exhibitions was not, however, published till January 1, 1831 (Silliman's *Am. Jour. Sci.*, xix. 400–408). Henry's "quantity" magnets acquired considerable celebrity at the time, from their unprecedented attractive power,—one (August 1830) lifting 750 pounds, another (March 1831) 2300, and a third (1834) 3500.

Early in 1831 he arranged a small office-bell to be tapped by the polarized armature of an "intensity" magnet, whose coil was in continuation of a mile of insulated copper wire, suspended about one of the rooms of his academy. This was the first instance of magnetizing iron at a distance, or of a suitable combination of magnet and battery being so arranged as to be capable of such action. It was, therefore, the earliest example of a true "magnetic" telegraph, all preceding experiments to this end having been on the galvanometer or needle principle. About the same time he devised and constructed the first electromagnetic engine with automatic polechanger (Silliman's *Am. Jour. Sci.*, July 1831, xx. 340–343; and Sturgeon's *Annals Electr.*, 1839, iii. 554). Early in 1832 he discovered the induction of a current on itself, in a long helical wire, giving greatly increased intensity of discharge (Silliman's *Am. Jour. Sci.*, July 1832, xxii. 408). In 1832 he was elected to the chair of natural philosophy in the New Jersey college at Princeton. In 1834 he continued and extended his researches "On the Influence of a Spiral Conductor in increasing the Intensity of Electricity from a Galvanic Arrangement of a Single Pair;" a memoir of which was read before the American Philosophical Society, February 6, 1835 (*Trans. Am. Phil. Soc.*, v. 223–231, n.s.) In 1835 he combined the short circuit of his monster magnet (of 1834) with the small "intensity" magnet of an experimental telegraph wire, thereby establishing the fact that very powerful mechanical effects could be produced at a great distance by the agency of a very feeble magnet used as a circuit maker and breaker, or as a "trigger"—the precursor of later forms of relay and receiving magnets. In 1837 he paid his first visit to England and Europe. In 1838 he made important investigations in regard to the conditions and range of induction from electrical currents,—showing that induced currents, although merely momentary, produce still other or tertiary currents, and thus on through successive orders of induction, with alternating signs, and with reversed initial and terminal signs. He also discovered similar successive orders of induction in the case of the passage of frictional electricity (*Trans. Am. Phil. Soc.*, vi. 303–337, n.s.). Among many minor observations, he discovered in 1842 the oscillatory nature of the electrical discharge, magnetizing about a thousand needles in the course of his experiments (*Proc. Am. Phil. Soc.*, i. 301). He traced the influence of induction to surprising distances, magnetizing needles in the lower story of a house through several intervening floors by means of electrical discharges in the upper story, and also by the secondary current in a wire 220 feet distant from the wire of the primary circuit. The five numbers of his *Contributions to Electricity and Magnetism* (1835–1842) were separately republished from the *Transactions*. In 1843 he made some interesting original observations on "Phosphorescence" (*Proc. Am. Phil. Soc.*, iii. 38–44). In 1844, by experiments on the tenacity of soap-bubbles, he showed that the molecular cohesion of water is equal (if not superior) to that of ice, and hence, generally, that solids and their liquids have practically the same amount of cohesion (*Proc. Am. Phil. Soc.*, iv. 56, 57, and 84, 85). In 1845 he showed, by means of a thermo-galvanometer, that the solar spots radiate less heat than the general solar surface (*Proc. Am. Phil. Soc.*, iv. 173–176).

In December 1846 Henry was elected secretary and director of the Smithsonian Institution, then just established. While closely occupied with the exacting duties of that office, he still found time to prosecute many original inquiries,—as into the application of acoustics to public buildings, and the best construction and arrangement of lecture-rooms, into the strength of various building materials, &c. Having early devoted much attention to meteorology, both in observing and in reducing and discussing observations, he (among his first administrative acts) organized a large and widespread corps of observers, and made arrangements for simultaneous reports by means of the electric telegraph, which was yet in its infancy (*Smithson. Report* for 1847, pp. 146, 147). He was the first to apply the telegraph to meteorological research, to have the atmospheric conditions daily indicated on a large map, and to utilize the generalizations made in weather forecasts, and the first to embrace a continent under a single system,—British America and Mexico being included in the field of observation. In 1852, on the reorganization of the American lighthouse system, he was appointed a member of the new board; and on the resignation of Admiral Shubrick as its chairman, Henry, in 1871, became the presiding officer of the establishment—a position he continued to hold during the rest of his life. His diligent investigations into the efficiency of various illuminants under differing circumstances, and into the best conditions for developing their several maximum powers of brilliancy, while greatly improving the usefulness of the line of beacons along the extensive coast of the United States, effected at the same time a great economy of administration. His equally careful experiments on various acoustic instruments also resulted in giving to his country the most serviceable system of fog-signals known to maritime powers. In the course of these varied and prolonged researches from 1865 to 1877, he also made important contributions to the science of acoustics; and he established by several series of laborious observations, extending over many years and along a wide coast range, the correctness of Professor Stokes's hypothesis (*Report Brit. Assoc.*, 1857, part ii. 27) that the wind exerts a very marked influence in refracting sound-beams. The complex conditions of such acoustic refraction he found to be exceedingly variable and curious (*Report American Lighthouse Board*, 1874, 1875, and 1877). From 1868 Henry continued to be annually chosen as president of the National Academy of Sciences; and he was also president of the Philosophical Society of Washington from the date of its organization in 1871.

Henry was by general concession the foremost of American physicists. He was a man of varied culture, of large breadth and liberality of views, of generous impulses, of great gentleness and courtesy of manner, combined with equal firmness of purpose and energy of action. He died at Washington, May 13, 1878. (S. F. B.)

HENRY, MATTHEW (1662-1714), the author of the well known and justly popular *Exposition of the Old and New Testaments*, was born at Broad Oak, a farm-house on the confines of Flintshire and Shropshire, on the 18th of October 1662. He was the son of Philip Henry, one of the 2000 ministers who were ejected from their livings in 1662 for refusing to conform to the Act of Uniformity. Unlike the majority of his fellow-sufferers, Philip Henry, who through his wife was the possessor of private means, was spared all personal privation or hardship as the consequence of his nonconformity, and was thus enabled to give a good education to his son. Having received his preliminary education from his father and a tutor named Turner, Henry was next removed to an academy at Islington, whence he proceeded to become a student of law at Gray's Inn. His legal studies, however, had not advanced far when he relinquished them for theology, to which he thenceforth devoted himself. In 1687 he became minister of a Presbyterian congregation at Chester, whence in 1712 he was translated to Hackney. Two years later (June 22, 1714), he died suddenly of apoplexy at Nantwich while on a journey from Chester to London. Henry's *Exposition*, the work by which he is now chiefly remembered, is a commentary of a practical and devotional rather than of a critical kind, ranging over the whole of the Old Testament and extending into the New as far as to the end of the Acts. At this point it was broken off by the author's death, but the work was finished by a number of clergymen, whose names are recorded in most editions of the book. In a critical point of view, it may be said to be quite valueless; yet its unfailing good sense, its discriminating thought, its high moral tone, its simple piety, and its altogether singular felicity of practical application, combine with the well-sustained flow of its racy English style to secure for it, and deservedly, the foremost place among works of its class.

Besides the *Exposition*, Matthew Henry wrote a *Life of Mr Philip Henry*, *The Communicant's Companion*, *Directions for Daily Communion with God*, *A Method for Prayer*, and *A Scriptural Catechism*, all of which, along with numerous sermons, have been frequently reprinted, both separately and in complete editions of his *Miscellaneous Works*. His life has been written by W. Tong (London, 1716), by Davies (prefixed to *Exposition*, ed. 1844), by Hamilton [illegible], by C. Chapman (1859), and by J. B. Williams (1828, new ed. 1865).

HENRY, PATRICK (1736-1799), an American statesman and orator, was born at Studley, Hanover county, Virginia, May 29, 1736, the second son in a family of nine children. His father, John Henry, an emigrant from Aberdeen, Scotland, was a nephew of Robertson the historian, and had risen to some eminence in the county, filling the offices of surveyor and presiding magistrate. Patrick Henry was educated at a little school near his home; and, after the age of ten, by his father, who had opened a grammar school at his residence. In early life he showed no marked proficiency in his studies, except perhaps in mathematics, but was noted chiefly for a love of outdoor sports. At fifteen he became clerk in a country store; and at sixteen he entered into partnership as storekeeper with his elder brother, but the business was unsuccessful, and a second attempt at storekeeping ended likewise in failure. Meanwhile the indifference to learning which marked his boyhood was replaced by a love of history, especially that of Greece and Rome; and his habitual indolence was overcome by his admiration for Livy, whose history he thenceforth read through once every year. At twenty-four, by his admission to the bar, Henry entered on the career that eventually brought him fame and fortune, although his income for some years was in keeping with his lack of previous preparation. At twenty-seven he won his first triumph, as counsel for the collector of the county, in what became known as "the parson's cause." His unexpected display of eloquence on the side of the people procured him an extravagant recognition and the title of "the orator of nature." Business poured in upon him, his popularity concealing his deficiencies; and his success was assured. In 1765 he was elected to the House of Burgesses, where he distinguished himself as the author of certain resolutions against the Stamp Act, the last of which,—providing that "the General Assembly of this colony have the sole right and power to lay taxes and impositions upon the inhabitants of this colony,"—though passed by a majority of only one, was the key-note of the struggle for independence. In 1769 he was admitted to practice in the general court, where he attained eminence in criminal cases before juries. In 1773 he was a member of the "committee of correspondence for the dissemination of intelligence between the colonies." In the following year he was chosen delegate to the Virginia convention, which was the first public assembly to recommend an annual "General Congress," and to the "Old Continental Congress"; but his success there as an orator failed to conceal his defects as a practical statesman. In 1775, in the Virginia convention, he delivered a remarkable speech in moving that the "colony be immediately put in a state of defence," and at the head of a body of militia he forced the royal officials to pay £330 for powder clandestinely removed by order of Governor Dunmore. He was appointed by the convention colonel of the first regiment and commander of all the forces to be raised in Virginia, but a misunderstanding with the "committee of safety" led to his resignation. He was a member of the second Continental Congress of 1775, and of the Virginia convention of 1776, which had been elected "to take care of the republic," the royal governor having fled. They framed a new constitution, and elected Henry the first republican governor, on the first ballot. He was re-elected in 1777 and 1778. In 1780 he became a member of the legislature, where he continued until he was again elected governor in 1784. In 1786 he withdrew through the pressure of debt, having "never been in easy circumstances." In 1787 he was chosen a delegate to the "Federal Constitutional Convention," but did not attend. He had resumed his practice to better his fortunes. In 1788 he was a delegate to the Virginia convention for ratifying the Federal Constitution, which he vehemently opposed as dangerous to the liberties of the country. In 1791 he declined re-election to the legislature, continuing, "through necessity rather than choice," the practice of the law, but usually in great and remunerative cases only. Finally, in 1794, having not only paid his debts but secured affluence, he withdrew to private life. In 1795 he declined the position of secretary of state in Washington's cabinet, in 1796 the nomination for governor of Virginia, and in 1797 the mission to France, offered by President Adams. In 1799, however, he suffered himself to be elected to the State legislature, where he wished to oppose what he deemed the dangerous doctrine of the Virginia resolutions of 1798; but he did not take his seat, his death occurring on the 6th June. Henry's manners were plain, his temper cheerful, and his habits temperate. His eloquence, of which some fragmentary specimens have become household words among his countrymen, was vivid and startling. Almost entirely a gift of nature, it was equal to every occasion, and, with the aid of a clear voice and perfect articulation, it was of marvellous power in bringing his hearers to a quick decision.

HENRY, Robert (1718–1790), the author of the *History of Great Britain written on a new plan*, was the son of a farmer, and was born in the parish of St Ninians near Stirling, 18th February 1718. He received his early education at the school of his native parish, and at the grammar school of Stirling, and after completing a course of study at Edinburgh University became master of the grammar school of Annan. In 1746 he was licensed to preach by the Annan presbytery, shortly after which he was chosen minister of a Presbyterian congregation at Carlisle, where he remained until 1760, when he was removed to a similar charge at Berwick-on-Tweed. It was during his stay at Berwick that the idea of his *History* first occurred to him, but the dearth of books and the difficulty of consulting original authorities compelled him to postpone the execution of his design till his removal to Edinburgh, as minister of New Greyfriars, in 1768. The first volume of his *History* appeared in 1771, and the others followed at irregular intervals until 1785, when the fifth was published, bringing down the narrative to the Tudor dynasty. The work was virulently assailed by Gilbert Stuart, but the attack was overdone, and although it for a time hindered the sale, the injury effected was only temporary. For the volumes published in his lifetime Henry realized as much as £3300, and through the influence of Lord Mansfield he was in 1781 rewarded with a pension of £100 a year from George III. In 1784 he received the degree of D.D. from the university of Edinburgh. He died in 1790 before his tenth volume was quite ready for the press. Four years after his death it was published under the care of Malcolm Laing, who supplied the entire chapters v. and vii., and added an index. A life of the author by Sir Henry Wellwood Moncreiff was prefixed to the volume. The novel feature in Henry's *History* was that he combined with the narrative of the great political events of each era an account of the domestic state and social progress of the people within the same period. His researches were conducted with great care, and his work embodies much novel and curious information; but the comprehensiveness of his plan, and the limited character of the historical sources then available, greatly militated against the accuracy of his narrative. Notwithstanding also that the work is well arranged, and written with clearness and simplicity, its defects as an authority are not compensated for by any peculiar excellences of style, by originality or vigour of reflexion, or by any special skill in the delineation of character.

A Continuation of Henry's History to the Accession of James I., by J. Petit Andrews, appeared in 1796. An account of the attack of Gilbert Stuart on Henry is given in Disraeli's *Calamities of Authors*.

HENRY, William (1775–1836), a distinguished chemist, son of Thomas Henry, an apothecary and author of some works on chemistry, was born at Manchester, December 12, 1775. After completing his education at an academy in Manchester, he was for some years private secretary to a physician, and in 1795 he began the study of medicine at the university of Edinburgh. Prudential considerations compelled him, however, to interrupt his studies at the conclusion of his first session, and he did not resume them till 1805, two years after which he received the diploma of M.D. For some time he practised as a physician in Manchester, but on account of delicate health, caused by an accident, he was ultimately compelled to retire from his profession. He nevertheless carried on his original researches in chemistry, for which he found great facilities in connexion with his father's business, and from 1797 till his death he continued to enrich the *Transactions* of the Royal Society with contributions on his favourite science, especially in regard to aeriform bodies. His first communication was an attempt, in opposition to Austin, Beddoes, and others, to establish the title of carbon to rank among the elementary bodies, but discovering afterwards a fallacy in his reasoning he corrected it in a subsequent paper. In 1800 he published in the *Philosophical Transactions* his experiments on muriatic acid gas, made with the view of disengaging an imaginary unknown element supposed to be associated with oxygen in the composition of the gas; but after the discovery of the real nature of the acid by Davy he was one of the earliest converts to the new theory. In 1803 he published his elaborate experiments on the quantity of gases absorbed by water at different temperatures and under different pressures, with the result of establishing the law that "water takes up of gas, condensed by one, two, or more additional atmospheres, a quantity which would be equal to twice, thrice, &c., the volume absorbed under the common pressure of the atmosphere." In 1808 he described in the *Philosophical Transactions* a form of apparatus adapted to the combustion of larger quantities of gases than could be fired in eudiometric tubes. In the same year he was chosen a fellow of the Royal Society; and in 1809, for his valuable contributions to the *Transactions* of the society, he was awarded the Copley gold medal. For the next fifteen years he continued his experiments on the gases, making known the results of them from time to time to the society. In his last communication, in 1824, he claimed the merit of having conquered the only difficulty that remained in a series of experiments on the gaseous substances issuing from the destructive distillation of coal and oil, and proved the exact composition of the fire-damp of mines. But though Henry's experiments had reference chiefly to aeriform bodies, his acquaintance with general chemistry is proved by his *Elements of Experimental Chemistry*, a work which combines great literary elegance with the highest standard of scientific accuracy. He had also collected materials for a history of chemical discovery from the middle of last century, but did not live to carry out the project. It is indeed to be regretted that he did not contribute more to the literature of science. His biographical notices of Priestley, Wollaston, and Davy may be regarded as models in that species of composition. At intervals during his lifetime Henry suffered much from neuralgic pains. These became so severe as to render the extirpation of the principal nerves of the hand necessary, but this failed to afford the expected relief; and ultimately the irritation of the whole nervous system deprived him of sleep, and caused his death on September 2, 1836.

HENRYSON, Robert (*c.* 1425–*c.* 1506), one of the early Scottish poets, and the author of the first specimen of the pastoral poetry of his country, is usually designated schoolmaster of Dunfermline; and according to tradition he was the ancestor of the family of Henryson or Henderson of Fordell, in the county of Fife, one of whom, James Henryson, was king's advocate and justice-clerk in 1494. Of the poet's parentage and early history, however, no certain information can be discovered. From various circumstances known about him he must have been born about the year 1425. He seems to have been educated abroad, as his name does not appear in the registers of the university of St Andrews, the only one then existing in Scotland; and from an allusion in one of his poems, his attention was probably given to the study of law. In 1462 his name appears in the list of members of the newly-founded university of Glasgow as "Magister Robertus Henrysone in artibus licentiatus et in decretis Bachalarius." Henryson seems, in addition to teaching, to have practised at Dunfermline as a notary public. His decease in or shortly before 1506 is alluded to by Dunbar, who, in his lament for the "makaris" or poets, says of Death—

> "In Dunfermline he hes done roun
> Gud Maister Robert Henrisoun."

Of the writings of Henryson that have come down to the present time, his *Testament of Cresseid* may be considered the chief. It was composed as a continuation or supplement to Chaucer's *Troilus and Creseide*, which was one of the most popular poems in the English language. Henryson resumes the story where Chaucer leaves off, and completes it by inflicting a suitable punishment on the false Creseide. This continuation displays so much skill that it has been included in all the early editions of Chaucer, as if it had been the work of that poet himself. Another poem, *Robene and Makyne*, though short, is notable as the first known specimen of pastoral poetry in the Scottish language, while his *Bludy Serk* is amongst the finest examples of ballad poetry. His metrical version of thirteen of the *Fables of Æsop* is perhaps the best known of his works. To each fable is appended an application or moral. In these he alludes to the oppression of the people and the unsettled state of the country during the feeble reign of James III. His classical *Tale of Orpheus*, though a lengthy performance, evinces his familiarity with the [illegible] learning of his time. Several of the poems of Henryson have been preserved in the Asloan MS. in the Auchinleck Library, the Bannatyne MS. in the Advocates Library, Edinburgh, the Maitland MS. in the Pepysian Library, Cambridge, and the Harleian MSS., British Museum. Henryson's *Orpheus and Eurydice* was printed at Edinburgh by Chepman and Myllar in 1508. The *Testament of Cresseid* was printed at Edinburgh by Henry Charteris in 1593. The poems of *Robene and Makyne* and the *Testament of Cresseid* were reprinted for the Bannatyne Club in 1824. The *Moral Fables* were printed at Edinburgh by Lekpreuik in 1570, at London by R. Smyth in 1577, and again at Edinburgh by Andrew Hart in 1621. The last edition was reprinted for the Maitland Club in 1832. A collected edition of the works of Henryson, leaving nothing to be desired, was printed at Edinburgh in 1865, under the editorial care of Mr David Laing.

HENSLOWE, PHILIP, a contemporary of Shakespeare, whose name derives a sort of interest from his intimate association with the history of the theatre during the great dramatist's career. Originally, it would appear, a dyer and afterwards a starchmaker, and ready to turn to any profitable speculation, he probably began his connexion with the stage in 1584 by becoming [illegible] of the Rose theatre on the Bankside, or of the ground on which it stood. From 1591 to his death in 1616 he was in theatrical partnership with the great actor Edward Alleyn, who in 1592 married his step-daughter Joan Woodward. In 1603 he was appointed, jointly with Alleyn, the king's [illegible] to take charge of a bear and mastiffs, after having [illegible] by the [illegible]. Henslowe's [illegible] diary from 1591 to 1609 has happily been preserved in Alleyn's College at Dulwich, and, though evidently the work of an ignorant man, is of great importance for the curious information it gives in regard to the first appearances of plays, the sums paid to the authors, the theatre receipts, and so on. It was edited for the Shakespeare Society in 1845 by J. Payne Collier, who, however, found that the MS. had suffered considerable mutilation at the hands of unscrupulous autograph hunters since the time when it was employed by its original discoverer Malone. See ALLEYN.

HENZADA, a district in Pegu division, British Burmah, lying between 16° 49′ and 18° 30′ N. lat., and between 94° 51′ and 96° 7′ E. long., with an area of 4047 square miles. It is bounded on the N. by the Prome district, on the E. by the Pegu Yomas, on the S. by Rangoon, Thonkhwa, and Bassein districts, and on the W. by the Arakan Yoma range. Henzada district stretches from north to south in one vast plain, forming the valley of the Irawadi, and is divided by that river into two nearly equal portions. This country is protected from inundation by immense embankments, so that almost the whole area is suitable for rice cultivation. The chief mountains are the Arakan and Pegu Yoma ranges. The greatest elevation of the Arakan Yomas in Henzada, attained in the latitude of Myan-oung, is 4003 feet above sea-level. Numerous torrents pour down from the two boundary ranges, and unite in the plains to form large streams, which fall into the chief rivers of the district, viz., the Irawadi, Hlaing, and Bassein. The forests comprise almost every variety of timber found in Burmah.

The inhabitants of Henzada district in 1876 numbered 501,213. The number of immigrants into the district during the ten years ending 1876 was 90,797. The chief occupation of the people is agriculture. Nearly all the large towns are on the right bank of the Irawadi. The chief towns have populations as follows:—Henzada, [illegible]; Kyankhoung, 8761; Myan-oung, [illegible]; and Mengyee, on the left bank of the Irawadi, [illegible]. The staple crops of the district are rice, sesamum, cotton, and tobacco. The total area under cultivation in 1876 was 363,048 acres. The other products are cotton, indigo, oil-seeds, pease and pulses, [illegible] and betel nuts, pan vine, &c. The revenue in 1876-77 was £132,7[illegible]3. In 1876 the police force consisted of [illegible] men.

The district was once a portion of the Talaing kingdom of Pegu, afterwards annexed to the Burmese empire in 1753, and has no history of its own. During the second Burmese war, after Prome had been seized, the Burmese on the right bank of the Irawadi crossed the river and offered resistance to the British, but were completely routed. Meanwhile, in [illegible], or the country east of the Irawadi, and in the south of Henzada, much disorder was caused by a revolt, the leaders of which were, however, defeated by the British, and their gangs dispersed.

HEPATICA. See LIVERWORT.

HEPHÆSTION, son of Amyntor, a Macedonian of Pella, is celebrated as the friend of Alexander the Great. The two, according to Quintus Curtius (iii. 12), were companions in childhood, but beyond this old standing connexion we find no evidence of such qualities in Hephæstion as deserved the passionate attachment of Alexander. The king, however, seems never to have been blind to his real character, and to have made a marked distinction between him, as the friend of his private life and his leisure hours, and such men as Craterus, whom he could entrust with important enterprises. We do not hear again of Hephæstion till 334 B.C., when he accompanied the king on his visit to Troy. Many tales are told of the close intimacy subsisting between them; for example, Plutarch says that, when a letter of very delicate and private nature from Olympias was handed to Alexander, Hephæstion according to his custom was reading it over his shoulder, when Alexander without uttering a word took his ring off his finger and pressed it on his friend's lips. In the later campaigns of Alexander in Bactria and India, we find Hephæstion charged with important commands. He was rewarded with a golden crown and the hand of Drypetis, the daughter of Darius and sister of Alexander's own wife Statira (324 B.C.). In the end of the same year he died very suddenly at Ecbatana. Alexander tried to relieve his grief by paying the most extravagant honours to his friend. A general mourning was ordered over Asia; at Babylon a funeral pile was erected at a cost of 10,000 talents; and temples were erected to him as a hero.

HEPHÆSTION, a grammarian of Alexandria, author of a work on Greek metres called Ἐγχειρίδιον περὶ μέτρων. This work is most valuable as the only complete work on the subject that has been preserved. The author is probably the same as the grammarian that acted as tutor to the emperor Verus about 150 A.D.

HEPHÆSTUS, a word of uncertain derivation but certainly pre-Greek in formation (Kuhn, *Zeitschr.*, v. 214), denotes among the Greeks a god who represents the power of fire and its appliance in the operations of daily life, corresponding to the Latin Vulcan. A clear distinction must be drawn between the Hellenic god and the deity worshipped by the Pelasgic races. Though the word Hephæstus is used by Homer in the sense of fire, yet in the Hellenic god no elemental idea is at all prominent. The Hellenic religion had raised itself far above such conceptions of the divine power, and its gods were moral powers. Zeus, the ruler of the world, whose will, according to the finest Hellenic conception, is fate, is surrounded by a court in which Hephæstus appears as the divine artificer, an object rather of laughter than of respect to the other gods. No worship was paid him, for his altar at Olympia seems not to have been an ancient institution. The fire of the hearth, as the centre of family and city unity, is now personified under a purely Greek name, Hestia; but here again it is not the elemental but the moral conception that is the predominant idea in the goddess (see HESTIA). The similarity between the divine artificer of the Greeks and the Finnish Ilmarine or the German Wieland, who has degenerated finally into the Wayland Smith of Scott's *Kenilworth*, has been often pointed out, and the starting-point of them all is the smith who makes the new sun every morning (see Mannhardt *Zeitschr. f. Ethnol.*, 1875, p. 221). The round disk of the sun has in poetic treatment become the shield of Achilles, whose fabrication is the great deed of Hephæstus in the *Iliad*. This artificer is naturally represented as married to the dawn, Aphrodite or Charis (see GRACES), as Wieland marries the Swan maiden; and the girdle of Aphrodite which Hephæstus made is the halo of rays that heralds the rising sun. All wonderful works came to be attributed to the divine smith; in particular the house of the gods has been made by Ilmarine and by Hephæstus; and they also, like Wieland, have made metal figures that move and almost equal living beings. In general the art of working metals by the hammer is under his patronage—a fact which points out this art as one of the very oldest known to the race (Conze, *Götter- und Heroen-Gestalten*, &c.). In local traditions a set of elfish creatures like the Idæan Dactyls or the dwarfs in German legend were often put in place of this divine smith. The belief which in Lipara and Strongylo was associated with Hephæstus, that any one that put a lump of iron in a certain spot at night found next morning the article he wished ready made, provided he paid the required price, is in some parts of Germany attached to a corresponding set of dwarfs. An ill-omened character often attached to the works of Hephæstus, as to that of the Telchines or the German dwarfs. Other points in the Hellenic Hephæstus can be explained only by a reference to the worship of the older Pelasgic tribes. When Homer (*Il.*, i. 593) says that he was hurled by his father Zeus down to the earth, the reference to the lightning is unmistakable (Welcker, *Gr. Gött.*, i. 661). Again the weak legs always attributed to Hephæstus remind us of the serpent legs of his son Erichthonius, and serpents occur often as symbols of lightning. Homer (*l.c.*) says that Hephæstus fell on Lemnos, whose inhabitants tended him; he evidently considers that the Hellenic deity was identical with the Pelasgic god. Wherever a Pelasgic race is most certain, there the god is found, associated with the Cabiri: he is the Cabirus *par excellence* (Herod., iii. 37). Among these tribes the power of fire was considered the life-giving and reproductive power of nature, and the deity in whom it was embodied became the chief object of their worship. Hence on the coins of Imbros an ithyphallic Hephæstus appears. As Greek influence prevailed among the kindred Pelasgic tribes, their native worship survived in the form of mysteries, and their proper gods, whose nature was revealed to the initiated, became in popular tradition heroic or demoniac figures who were the founders of the mysteries (v. HARMONIA, and comp. Lenormant in D'Aremberg's *Dict. des Antiquités*, art. "Cabeiri"). This Hephæstus or Cabirus is the lightning that has descended to earth and become there the origin of all life, and according to Pindar (*Fr.* 162) the first man. The original conception, vague and wide like all primitive ideas, is that the heavenly and the subterranean fire are identical with the fire on earth. In both thunderstorm and dawn the fire of the sun is relighted after being for a time extinguished. In both the alternation of light and darkness was the prominent fact. In the thunderstorm the sparks emitted from the sun descend as the lightning to earth. This original power of fire has been developed in various ways; the higher thought of the Greeks rejected such a naturalistic deity as the Pelasgic found congenial, while in Athens, where the Pelasgic element was very strong, Hephæstus occupied a correspondingly high place, and is in close relationship with Athene. In many ceremonies, as the Lampadephoria, they were associated; and at the Apaturia honour was paid to Zeus Phratrius, Athene, and Hephæstus. In the oldest traditions they were perhaps married, and their son Erichthonius was the parent of the Athenian people. When the Hellenic conception of the maiden-goddess Athene prevailed, this connexion was transformed into an unsuccessful attempt of Hephæstus at a union with Athene. But the marvellous birth of Erichthonius is an ancient feature, as it occurs in Vedic tradition (Kuhn, *Zeitschr.*, i. 443).

Small images of Hephæstus stood on every hearth at Athens, and the Amphidromia round the hearth-fire was the rite whereby the newly-born child was adopted into the family. In the oldest Greek art Hephæstus is a bearded man fully clad, carrying a hammer. This hammer, which the Cabirus of Thessalonica carries, is doubtless in its origin, like the hammer of Thor, the thunderbolt or hammer with which was shattered the tower where the sun was hid during the winter darkness. An undignified and comic character is, however, often apparent, when he wears short, workman's clothes, and wants the dignity proper to a god. The ruling type in later art is a bearded man with a certain resemblance to Zeus, wearing a close cap, carrying the traditional hammer, and clad in a short, girt tunic which leaves the left shoulder free. (W. M. RA.)

HERA, a word of which many different derivations have been proposed, is the name of a Greek goddess, corresponding to the Latin Juno, who according to the conventional type is the wife of Zeus and queen among the gods of Olympus. In the literature of the Greeks Hera fills a very conspicuous place—the strong, haughty, and rebellious character, full of intense hatreds and likings, which was associated with her, made her a picturesque and dramatic figure. According to this conception of her, she was daughter of Cronus and Rhea, and at once sister and wife of Zeus. She was always the bitter enemy of all the heroines who were the successive objects of her husband's love, and her persecution of them and of their children often forms the theme of poets from the *Iliad* (xxiii. 119) downwards. This type, which is the familiar one in all literature, had never any real existence in religion; but had been gradually elaborated by poets from the actual deity worshipped in various parts of Greece, and from the legends transmitted to the Greeks from earlier races.

The most characteristic and fundamental point in the worship of Hera is the *ἱερὸς γάμος*, her marriage with Zeus; and from this any explanation of the conception involved in the goddess must start. Again in Greek legend we learn that a close connexion exists between Hera and the cow, and that probably she was originally thought to have the form of a cow. These facts at once direct us to the ancient Aryan idea, described in detail by Gubernatis (*Zoolog. Mythol.*, i.), that the divine power as the origin of all life is embodied in a pair of gods male and female, whose fertility leads to the conception of them as a bull and a cow. This pair, the bull and the cow, appear in various fantastic developments in Greek legend. For example, Zeus himself in the form of a bull carries off Europa; and we learn from Hesychius that Europia is an epithet of Hera. Looking at the matter from this point of view, we find that the question so much disputed among mythologers, whether the naturalistic conception out of which the Greek goddess has developed be earth or moon, is a mere matter of words, and that there is no real discrepancy between the two views. The free and vague conceptions of primitive men refuse to be shut into the precise circumscribed terminology of modern thought. Ideas which to us are very different were once expressed by the same root (see Curtius, *Grundz.*, iii. 284, No. 415). Thus we have in the *Rig Veda*, vi. 51, 5, a clear trace of the view so common in all mythologies, whether in the theogony of Hesiod or of the New-Zealanders, that Heaven and Earth are the primitive pair of deities, parents of all existence and first of the gods. This view is of peculiar importance in old Roman religion (*cf.* Schwegler, *Röm. Gesch.*, i. 328, 422, &c.), and also among the older Pelasgic tribes of Greece. But this same divine power the primitive Aryans beheld in all the great operations of nature; in each they saw the prototype of all earthly works, and in seeking here the origin of life, they found it in the same divine pair, the bull and the cow. In particular, the various alternations of light and darkness appealed to their minds most strongly, and occupy great part of their mythology. In the transitions between light and darkness, and especially in the struggle between night and day, the idea of a pair is not so prominent; and in legends the marriage of moon and sun does not figure very conspicuously. Yet we sometimes find the marriage of the moon and sun described exactly in the way of this ἱερὸς γάμος. In *Rig Veda*, x. 85, it is the type of all earthly marriage (see Weber, *Ind. Stud.*, v. 178). A Slavonic story makes the marriage of moon and sun annual: they part every winter and meet again in the first days of spring; and a Lettish song makes the marriage of moon and sun in spring (Mannhardt in *Zft. f. Ethnol.*, 1875, p. 316). The moon too is often symbolized as a cow. The mystic union takes place in the spring when life returns to the earth, and the voice of the cuckoo is heard in the land. Hence in the legend Zeus, enamoured of his sister Hera, is said to have flown to her in the form of a cuckoo dripping wet, and to have been in pity received into her bosom. In various parts of Greece where traces of the ruder tribes are strongest, there remains a coarser conception of this union, and in the popular accounts the marriage customs of the country are reflected (see Welcker, *Gr. Götterl.*, i. 364 *ff.*). Lectum in the Trojan Ida and Ocha in Eubœa, on the summits of which this union is placed by the legends of the countries, received their names from it. As we might expect, this idea is too purely naturalistic to form any part of the moral Olympian religion. Hera appears there as the wife of Zeus, but all deeper meaning has disappeared. The old tale remains in the mythological legends, which always cling as a degrading appendage to this religion, and we find it in Homer (*Il.*, xiv. 294) transformed into an incident of the Trojan war. In the popular religion, however, Hera, as first the virgin, then the sacred bride, and finally the lawful wife of Zeus and the patron of all marriage, is a very prominent figure. Every year the festival of Hera was celebrated with special reference to this union in Argos, Samos, Elis, Platæa, and many other parts of Greece. The festival took place in a month named Γαμηλιών at Athens, Ἡραῖος in some other parts of Gre Hence we have such epithets of Hera as Νύμφη, νυμφευομένη, τελεία, γαμηλία; and the bridal veil is one of her most frequent attributes. Hera was married to Zeus in early youth, and knew no other marriage. Hence she is the patron goddess of all married women, the protectress of the sanctity of marriage; and she demands the utmost purity from her votaries. In this respect Hera approaches closely to Demeter Thesmophoros. As the winter is a time of barrenness and separation, so we have in Arcadian, Argive, and Samian legend the angry Hera, the widow Hera, separated from her husband.

Other points in Hera again point directly to the moon. Like all other forms of the moon-goddess (see HECATE), she presided over child-birth, and under the epithet εἰλείθυια was invoked by women in labour. This idea arises from the moon's use as measurer of time and numberer of the months. Then the epithet became gradually developed as a daughter, or set of daughters, of Hera, named Eileithyiæ. Beauty is another characteristic of all moon-goddesses, and of Hera also. In her festival at Lemnos prizes were assigned after a contest to the most beautiful woman. Large eyes were part of the artistic type, and βοῶπις is one of her most constant epithets in literature.

Eubœa, the very word being an epithet of the goddess, was one of the chief seats of the worship of Hera. So in Bœotia, her temples both at Thespiæ and at Platæa were famous. In the *Iliad*, Argos, Sparta, and Mycenæ are the cities which she specially protects and loves. Argos was always one of the chief seats of her worship, and the Heraion there was one of the chief temples of Greece. At Olympia also was a very ancient temple, the Heraion, the ruins of which have been recently brought to view by the German exploring expedition. At the Lacinian promontory Hera was the patroness of the union first of the Achæan cities and afterwards of a wider circle of the Greek colonies. But the Hera of Samos was perhaps the most famous and most characteristic appearance of the goddess. There the Greek goddess was amalgamated with another, who was worshipped by the kindred tribes among whom the Greeks settled, and who is clearly the same as the Artemis of Ephesus or Clazomenæ; and so on coins of Samos we find Hera standing with the sun and moon on either side of her head, exactly like Artemis on coins of Ephesus.

We find such rude images of Hera as a plank at Samos, or a branch at Thespiæ. A very ancient statue by Smilis stood in her temple at Samos, the goddess, veiled, stood erect, clad in a long chiton, holding in each of her outstretched hands a φιάλη. In the earlier vase-paintings she is hardly to be distinguished from Artemis. She appears just like Artemis, carrying torch and bow, and wearing the kalathos or the stephanos; and several figures which others consider to be Artemis, are by Overbeck explained as Hera. In representations of the Judgment of Paris there is often nothing to distinguish her from Aphrodite. Her characteristic symbols are the veil or sceptre, and she often carries a fruit. Numerous vase-paintings, representing a bridal procession, which Förster (*Zeus und Hera's Hochzeit*) believes to represent the ἱερὸς γάμος, are by Jahn and Overbeck shown to be an earthly marriage assisted by deities. Overbeck (*Hera*, p. 171) maintains that only three certain representations of this scene exist. The colossal statue by Polykleitos in the Heraion at Argos showed her enthroned, wearing the crown, holding in one hand a pomegranate and in the other a sceptre, on the top of which was a cuckoo. There is no evidence to determine what was the character of the face, nor what share it had in determining the ideal type of Hera (Overbeck, *Hera*, p. 51). The Farnese bust at Naples represents a type more archaic than the statue of Polykleitos. Praxiteles made three great statues of Hera at Megara, Mantinea, and Platæa. The last, which represented Hera Teleia [illegible], is known to us by some imitations in the Vatican and elsewhere. From the works of these two great artists we may suppose that the highest type of Hera was elaborated in the Athenian school about the middle of the 4th century, and in the famous bust of the Villa Ludovisi it is probable that we have the actual work in which the type was first attained. This bust, which has been so much admired, especially by Goethe, was probably once the head of a colossal seated statue. (W. M. RA

HERACLEA, or **Heracleia** (in French, *Héraclée*), the name of several ancient cities in various parts of the area of Greek colonization, so called in honour of Heracles or Hercules.

I. Heraclea, a city of Magna Græcia, which lay between the rivers Aciris and Siris, not far from the shores of the Gulf of Tarentum, near the site of the modern village of Policoro. It appears to have been a joint colony of the Tarentines and the Thurians, and to have risen after the destruction of the neighbouring city of Siris. That it attained to no small prosperity and became the seat of the great politico-religious assembly of the Italian Greeks is nearly all that can be said of its earlier history. By Alexander of Epirus it was deprived of this privilege in favour of Thurii. Pyrrhus was victorious in its vicinity in the first battle he fought with the Romans, 280 B.C., and two years later the city formed an alliance on advantageous terms with the conquerors. In the time of Cicero it was still comparatively prosperous. The *Tabulæ Heracleenses*, found at Luce near the ruins of the city in 1753, are two bronze tablets, or rather fragments of tablets, containing on one surface a Greek inscription relating to temple domains and on the other surface a copy of the famous Lex Julia Municipalis published by Julius Cæsar in 45 B.C. They are preserved in the Museo Nazionale at Naples, and one of them is distinguished as the *Æs Britannicum* and the other as the *Æs Neapolitanum*. Both inscriptions are given in Mazzocchi, *Commentarii in Regii Herculanensis Musei æneas tabulas Heracleenses* (Naples, 1754-55), and the Latin one will be found in Muratori, *Inscriptiones* (vol. ii.), and Haubold, *Monumenta legalia*. See also Savigny, *Zeitschrift für geschicht. Rechtswiss.* (vol. ix.) and *Vermischte Schriften* (vol. iii., Berlin, 1850).

II. Heraclea, a city of Sicily, at the mouth of the Halycus (the modern Platani), not far from the promontory now known as Capo Bianco. It was distinguished from the other Heracleas by the surname of Minoa, which was explained as referring to its foundation by Minos of Crete. Its name frequently occurs in connexion with the Carthaginian occupation of Sicily, and it was in the neighbouring sea that the Carthaginian fleet was routed by Regulus and Manlius in 256 B.C. The Romans introduced a colony.

III. Heraclea Pontica, a city on the coast of Phrygia in Asia Minor, easily identified with the modern Bender Eregli or Erekli, at the mouth of the Kilidj su on the Black Sea. It was founded by a Megarian colony, which soon subjugated the native tribe of the Mariandynians, and extended its power over a considerable territory. The prosperity of the city, rudely shaken by the Galatians and the Bithynians, was utterly destroyed by Aurelius Cotta in the Mithridatic war. It was the birthplace of Heraclides Ponticus. The modern town is best known for its coal mines, from which Constantinople receives a good part of its supply. See Polsberw, *De Rebus Heracleæ*, Brandenburg, 1833; and O. Kammel, *Heracleotica: Beiträge zur ält. Gesch. der griech. Colonisation im nordl. Klein-Asien* (Progr. des Gymn. zu Plauen, 1869).

IV. Heraclea Sintica, a town in Thracian Macedonia, to the south of the Strymon, the site of which is marked by the village of Zervokhori, and identified by the frequent discovery of local coins.

V. Heraclea, a town on the borders of Caria and Ionia, near the foot of Mount Latmus, whence it is usually distinguished as the Latmian. In its neighbourhood was the burial cave of Endymion. See Rayet and Thomas, *Milet et le Golfe Latmique*, Paris, 1877.

For Heraclea Trachinia see Trachis, and for Heraclea Perinthus see Perinthus.

Heraclea was also the name of one of the Sporades, between Naxos and Ios, which is still called Raklia, and bears traces of a Greek township with temples to Tyche and Zeus Lophites. See Baumeister in *Philologus*, vol. ix.

HERACLEON, a Gnostic who flourished about 125 A.D., probably in the south of Italy or in Sicily, is generally classed by the early heresiologists with the Valentinian school of heresy. In his system he appears to have regarded the divine nature as a vast abyss in whose *pleroma* were æons of different orders and degrees,—emanations from the source of being. Midway between the supreme God and the material world was Demiurgus, who created the latter, and under whose jurisdiction the lower, animal soul of man proceeded after death, while his higher, celestial soul returned to the pleroma whence at first it issued. Heracleon seems to have received the ordinary Christian Scriptures; and Origen has preserved fragments of a commentary by him on St John's gospel, while Clement of Alexandria quotes from him what appears to to be a passage from a commentary on St Luke's gospel. These writings are remarkable for their intensely mystical and allegorical interpretations of the text. The portions of the commentary on St John's gospel have been brought together by Grabe in the second volume of his *Spicilegium*.

HERACLES. See Hercules.

HERACLIDES, surnamed Ponticus, a Greek miscellaneous writer who flourished in the 4th century B.C., was born at Heraclea in Pontus. Removing to Athens, he is said to have been a disciple successively of Speusippus, Plato, and Aristotle. According to Suidas, the second of these philosophers, on departing for Sicily, left his scholars in the charge of Heraclides. The latter part of his life was spent at Heraclea. Of his private history we have few authentic details. He is said to have been vain and fat, and to have maintained such state in Athens that the wits changed his surname into Pompicus, or the Showy. Various idle stories are related about him. On one occasion, for instance, Heraclea was afflicted with famine, and the Pythoness at Delphi, bribed by Heraclides, assured his inquiring townsmen that the dearth would be stayed if they granted a golden crown to that philosopher. This was done; but just as Heraclides was receiving his honour in a crowded assembly, he was seized with apoplexy, while the dishonest priestess perished at the same moment from the bite of a serpent. On his death-bed he is said to have requested a friend to hide his body as soon as life was extinct, and, by putting a serpent in its place, induce his townsmen to suppose that he had been carried up to heaven. The trick was discovered, and Heraclides received only ridicule instead of divine honours.

He wrote on a great variety of subjects, but only one fragment, *On Statecraft*, is now extant. This was published with the *Varia Historia* of Ælian at Rome in 1545; but the best editions are those of Koler (Halle, 1804), Coray (Paris, 1805), and Muller. See Fr. W. Schmidt, *De Heraclida Pontici et Dicæarchi Messenii dialogis deperditis*, Breslau, 1867.

HERACLITUS of Ephesus, one of the most subtle and profound of the metaphysicians of ancient Greece, has only of late years had his true position assigned to him in the history of philosophy. To this the obscure and epigrammatic character of his style and the fragmentary condition of his works have in the main contributed, together with the fact that not only his immediate disciples but also his critics, including even Plato, have systematically laid stress upon those features of his doctrines which are least indicative of his real point of view. The true position of Heraclitus is that of the founder of an independent metaphysical system, which sought to get rid of the difficulty, so prominent in the Eleatic philosophy, of overcoming the contradiction between the one and the phenomenal many, by enunciating, as the principle of the universe, "Becoming," implying, as it does, that everything is and at the same time, and in the same relation, is not.

The descendant of a family of leading importance in Ephesus, Heraclitus was born about 535 B.C. His cast of mind was so intensely aristocratic that, filled with contempt for the councils and capacities of his fellow-citizens, he made over the hereditary office of βασιλεύς, which had fallen to him in right of his birth, in favour of his younger brother, and betook himself to a life of solitary meditation. The date of his death was probably about 475 B.C.

To appreciate the significance of the doctrines of Heraclitus, it must be borne in mind that to Greek philosophy the sharp distinction between subject and object which pervades modern thought was foreign, a consideration which suggests the conclusion that, while it is a great mistake to reckon Heraclitus with the materialistic cosmologists of the Ionic schools, it is, on the other hand, going too far to treat his theory, with Hegel and Lassalle, as one of pure Panlogism. Accordingly, when he denies the reality of Being, and declares Becoming, or eternal flux and change, to be the sole actuality, Heraclitus must be understood to enunciate not only the unreality of the abstract notion of Being, except as the correlative of that of not-being, but also the physical doctrine that all phenomena are in a state of continuous transition from non-existence to existence, and *vice versa*, without either distinguishing these propositions or qualifying them by any reference to the relation of thought to experience. "Every thing is and is not;" all things are, and nothing remains. With Heraclitus the principle of continuity is opposed to the principle of discretion taught by the Eleatics, and consequently for him "Being and Nothing," as well as "Union and Separation," are logically and physically incapable of distinction. This being so, he naturally enough selects Fire, according to him the most complete embodiment of the process of Becoming, as the principle of empirical existence, out of which all things, including even the soul, grow by way of a *quasi* condensation, and into which all things must in course of time be again resolved. But this primordial fire is in itself that divine rational process, the harmony of which constitutes the law of the universe. Real knowledge consists in comprehending this all-pervading harmony as embodied in the manifold of perception, and the senses are "bad witnesses," because they apprehend phenomena, not as its manifestation, but as "stiff and dead." In like manner real virtue consists in the subordination of the individual to the laws of this harmony as the universal reason wherein alone true freedom is to be found. "The law of things is a law of Reason Universal, but most men live as though they had a wisdom of their own." Ethics here stands to sociology, in a close relation, similar, in many respects, to that which we find in Hegel and in Comte. For Heraclitus the soul approaches most nearly to perfection when it is most akin to the fiery vapour out of which it was originally created, and as this is most seen in death, "while we live our souls are dead in us, but when we die our souls are restored to life." The doctrine of immortality [illegible] prominently [illegible] in his ethics, but whether this must not [illegible] with the tentative accommodation to the popular theology of Greece which pervades his ethical teaching, is very doubtful.

The only extant work, purporting to have been written by Heraclitus, which can be regarded as genuine, is the treatise Περὶ φύσεως, which has come down to us in a fragmentary condition. It has been edited by Bywater (*Heracliti Ephesii Reliquiae*, Clarendon Press, 1877). The [illegible] are all probably spurious.

The school of Heraclitus continued to flourish for long after his death, the chief exponent of his teaching being Cratylus. A good deal of information in regard to his doctrines has been gathered from the later Greek philosophy, which was deeply influenced by it.

[illegible]

HERACLIUS (c. 575-641), emperor of the East, was born in Cappadocia about 575. He was brought into notice by his heading a successful revolt against the emperor Phocas in 610, when he usurped the usurper's throne. At that period the eastern provinces of the empire were being ravaged by the triumphant armies of Chosroes (Khosru) II., which in the first twelve years of Heraclius's reign continued their unresisted progress to the Bosphorus and the Nile, plundering Asia Minor and Syria, and reducing Constantinople to the utmost distress by cutting off its Egyptian corn supplies. In 618 the public distributions of grain, which had been carried on since Constantine had instituted them as a bribe to attract citizens to his new city in 330, were suspended; and the [illegible] emperor was hardly dissuaded by the almost imperative prayers of his people from quitting his capital in shame and fear for Carthage. Taking courage, Heraclius appears to have set himself to the task of reorganizing both state and army, a labour which had probably occupied him since his accession. He was menaced on the west by the fierce tribe of the Avars, who were casting longing eyes on the riches of the imperial city; but in 620 he succeeded in making a treaty with them, and interposed a human barrier against their further encroachments by inviting the Serbs and Croats to settle in the intervening regions, which they have never since left. In 621 Heraclius led an army into camp in Asia Minor, and devoted himself with ardour to the drilling of his inexperienced troops. Every military manœuvre, every useful exercise and even hardship, was ordered and shared by the emperor. He kindled the enthusiasm of his soldiers by his stirring words, and excited their admiration and affection by his deeds. Next year he led his forces against Persia, and within five years, in a series of brilliant campaigns that place him side by side with the greatest generals of the world, he overthrew the pride of that empire, drove its monarch a fugitive from his throne, and enriched his exulting troops with untold wealth. Siroes, the son of Chosroes, revolting against his unhappy father, put him to death in 628, and speedily made a peace with Heraclius, according to which the Persian empire retired to its former limits, prisoners were mutually given up, and the true cross, carried from Jerusalem by the Persians, was restored to Christian hands. Heraclius returned in triumph to Constantinople, which had in his absence two years before successfully repulsed a combined assault by the Avars and Persians; and in 629 he proceeded to Jerusalem to restore solemnly the holy relic to its ancient place. But he was not long to enjoy the peaceful fruits of victory. A mighty power had been steadily growing up in the hot sands of Arabia, and was now coming to measure its strength with that of the Roman empire. In 632 the Mahometans invaded Syria; and, overthrowing the armies sent to oppose them, in six years they made themselves masters of the country. Egypt next fell before Islam, and in 640 that fair province of the empire was Mahometan. The people of Asia Minor alone successfully resisted the advancing Saracens. Heraclius seems meanwhile to have sunk into a sort of lethargy, as though his efforts in Persia had completely exhausted him. While his generals and armies were being cut to pieces he was engaged at Constantinople, whither he had retreated in 634, with speculative theological questions. In 638 his *Ecthesis* appeared, which, tinctured with the heresy of Monothelism, was probably drawn up by the patriarch Sergius. The energy of his earlier life never returned, and in 641 he sank under a long-continued disease. He had been twice married, the second time to his niece Martina, an illicit union which he compelled the reluctant Sergius to celebrate. His eldest son, Heraclius, succeeded him, taking the title of Constantine III.

The character of Heraclius is a curious riddle, which it is not easy to solve. Personally brave, and possessed of tried ability as a diplomatist and a general, in his latter years he passively allowed his empire to fall to pieces before his eyes,—presenting in the periods of his life a contrast that would almost seem to argue the possession of not merely contrary but contradictory qualities. But we must not forget that our information regarding the inner details of his latter reign is very imperfect, and that possibly there may be some reason, though hardly an excuse, for his conduct. It would have been better for his fame if he had died immediately after his Persian campaigns.

See Gibbon's *Decline and Fall of the Roman Empire*; Le Beau's *Histoire du Bas Empire*; and the works of George of Pisidia ([illegible]).

HERALDRY

HERALDRY, though etymologically denoting all the business of the herald, has long in practice been restricted to one part of it only, and may be defined as the art of blazoning or describing in proper terms armorial bearings. It treats also of their history, of the rules observed in their employment and transmission, of the manner in which by their means families and certain dignities are represented, and of their connexion with genealogies and feudal rank.

Particular symbols have in all ages been assumed by the various families of mankind, civilized and uncivilized. Such were the lion of the tribe of Judah, the S. P. Q. R upon the standards of ancient Rome and the eagle surmounting them, the tattoo marks of the savages of America and the Pacific, the Danish raven, and the white horse of Saxony, which still remains carved upon the chalk downs of western England.[1] Heraldry, however, is a purely feudal institution, coeval with close armour, devised possibly in Germany, adopted and improved in France, Spain, and Italy, and imported into England by the Norman invaders and settlers. Its figures have little or nothing to do with the older symbols, though these have occasionally been incorporated into its charges, and an apparent connexion thus established between them. These symbols, as has been well said, were the precursors and not the ancestors of heraldic bearings. The supposed connexion, however, misled the credulous heraldic writers of the 16th and 17th centuries, and caused them to attribute coats of arms to the heroes of sacred and profane history, who were certainly as ignorant of heraldry as ever was Adam of genealogy.

"Arms" or "armories," so called because originally displayed upon defensive armour, and "coats of arms" because formerly embroidered upon the surcoat or camise worn over the armour, are supposed to have been first used at the great German tournaments, and to have reached England, though to a very moderate extent, in the time of Henry II. and Cœur de Lion. To "blazon," now meaning to describe a coat of arms, is the German "blasen," to blow as with the horn, because the style and arms of each knight were so proclaimed on public occasions. The terms employed in heraldry are, however, mostly French or of French origin. Though now matters of form and ceremonial, and subject to the smile which attaches to such in a utilitarian age, armorial bearings were once of real use and importance, and so continued as long as knights were cased in plate, and their features thus concealed. At that time leaders were recognized in the field by their insignia alone, and these—both figures and colours—becoming identified with their fame, from personal became hereditary, were subject to certain rules of descent, and to the laws of property and the less certain rules of honour.

Froissart mentions a case in which a knight of the Scrope family could with difficulty be restrained from putting to death a prisoner because he wore the same bearings with himself. The last De Clare owed his death on the field of Bannockburn to his having neglected to wear his cotte d'armes; had he been recognized, his great value as a prisoner would have saved him. Also the loss of the battle of Barnet was in part attributed to the similarity between the royal cognizance of a sun and that of John de Vere, a star with streamers,—Warwick charging Oxford by mistake for the king.

The best if not the only absolutely safe evidence for the origin of armorial bearings is that afforded by seals. Seals were in common use both before and after the introduction of armorial bearings, and they are not so likely as rolls of arms or monumental effigies to be the work of a later age. There are said by Courcelles to be extant, appended to charters of 1030 and 1037 A.D., two seals of Adalbert, duke of Lorraine, which bear on a shield an eagle with wings closed. This however wants confirmation; but Anna Comnena, describing the shields of the French knights who visited Constantinople about 1100, gives their surfaces as of metal only, polished but plain; nor have any decided traces of arms been discovered among the early crusaders. Louis le Jeune, who seems first of the French kings to have used the fleur de lys, caused it to be represented in gold over the azure mantle and chaussures worn by his son at his coronation. Also, in 1180, he seals with a fleur-de-lys, but it is placed in a circle, not upon a shield. Planché cites two seals of Philip, count of Flanders, one plain, in 1157, and another in 1164 charged with a lion, their subsequent bearing. Seton mentions the seal of John de Mundegumbri in 1170 as bearing a fleur-de-lys, which, like that of Louis, has two intermediate flower-stems, as seen on Florentine coins. He also gives the seal of Falconer (1170) as bearing a falcon; and that of Corbet bore two ravens perched upon a fleur-de-lys, while his brother bore them upon a tree. This indeed was at a period when fleurs-de-lys, stars, and various animals were commonly represented as mere ornaments on seals, but the peculiarity of the instances named is that the falcon and the raven, like the fleur-de-lys of France, were afterwards the heraldic bearings of those families. The seals of the close of the 12th century, though not generally heraldic, certainly betray many of the elements of heraldry. No doubt, when once introduced, armorial bearings were felt to supply a real and serious want, and came rapidly into use, but Wace, the poet of the reign of Henry II., although he tells us that

> "N'i a riche home ne Baron,
> Ki n'ait lez li son gonfanon,
> U gonfanon u altre enseigne,"

can scarcely be seriously held to mention armorial bearings.

It is uncertain at what period armorial bearings found their way into England. The Conqueror and his successors certainly did not use them; they do not appear upon their seals, nor are they shown upon the banners of the Bayeux tapestry. The monk of Marmoutier, probably a contemporary, describes Henry I., upon the marriage of his daughter to Geoffrey of Anjou in 1122, as hanging about the bridegroom's neck a shield adorned with small golden lions, "leonculos aureos;" and, making mention of a combat in which Geoffrey was engaged, he describes him as "pictos leones præferens in clypeo." It is true that the number, attitude, and position of these lions on the shield are not specified, but considering that not long afterwards two lions became the arms of Plantagenet, and so of England, this may fairly be taken as their introduction. Stephen is said to have used a centaur, Sagittarius, as an emblem, because he landed in England when the sun was in that sign, but on his great seal his shield is quite plain, save a ridge down the centre, evidently a part of its construction. On the seals of the Conqueror, Rufus, and Henry I., only the hollow or under side of the shield is shown; so there probably was no design upon the front. There is no seal of Duke Robert, but William, earl of Flanders, his son, shows a plain shield on his seal. His monumental effigy (1128) bears a large pavesse shield, and upon it an escarbuncle, apparently a highly ornamented clamp. The seal of Henry II. also shows the hollow of the shield. The first great seal of Richard I. bears a lion rampant, who from his position may be inferred to be fighting with a similar lion upon the sinister and concealed half of the shield, blazoned in a MS. cited by Mr Way as "two lions confrontés."

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[1] The subject of ancient and especially of Greek "heraldry" is discussed [illegible] interesting paper "Wappengebrauch und Wappenstil im Altertham" in the *Abhandlungen der Königl. Akademie der Wissenschaften zu Berlin* (1874). See also article Gems, vol. x. p. 166.

Up to this time the kings, though represented on horseback and in full armour, have the face uncovered, and therefore their persons would be known. The seal of Richard I. in 1189 shows a close helmet, and upon the shield two lions passant gardant in pale, "leones lopardés," as they were then or soon after called. On a later seal, after his return from captivity in 1194, Richard added a third lion. John, while earl of Mortaine, sealed with two lions, but his seal as king bears three, and the coat has so remained. That the two lions were more than a mere ornament is evident from their having been adopted by John's natural son, Richard de Warren, who seals with two lions passant regardant. The seals of the great barons show the growth of the practice. Richard, constable of Chester, contemporary with Stephen, bears a shield covered over with small plates, tegulated, like his armour; but Stephen, earl of Richmond, as early as 1137, seals with seven fleurs-de-lys, a very early heraldic seal. Waleran, earl of Meulan (died 1166), also used an heraldic seal. Duchesne gives a seal of Bouchard de Montmorenci (1182), a contemporary of Louis le Jeune, with a cross between four alerions on his shield, and another in which the cross is charged with roundels. Mathieu, his son, seals also with the cross and alerions, which had evidently become, as they remained, hereditary. In England, William, earl of Essex (died 1190), seals with the escarbuncle of his family. In 1187 Gervase Paganel, a great Anglo-Norman baron, seals with two lions passant, which his family continued to bear.

With the 13th century arms came rapidly into use. The second seal of Mathieu de Montmorenci in 1209 has them introduced upon his horse furniture, but this practice does not appear upon the seals of the kings of England until the second seal of Edward I. Baldwin de Bethune, earl of Albemarle (died 1214), sealed with three martlets in chief, and many other early examples of regular heraldic seals occur at this period attached to extant charters. The earliest roll of arms is of the reign of Henry III.; of a second of the same reign a copy is preserved in the Harleian collection; and a third, in the next reign, is the roll of Caerlaverock, 1300 A.D. So that for the reign of Henry and his son the evidence for armorial bearings is copious and excellent. Other rolls exist carrying the practice through the 14th and 15th centuries, before the middle of which there is no known work on heraldry, nor any trace of heraldic regulations save what may be deduced from recorded practice.

Coats of arms were not at first strictly hereditary, nor even always permanent in the same person. Thus William de Ferrers, 6th earl of Derby (died 1246), seems to have borne "argent 6 fers de cheval or horse shoes, 3, 2, 1, sable." William, his son, in consequence of a match with Peverel, who bore "vair," changed his bearing to "vair, or and gules, on a border azure 8 horse shoes argent." Robert his son, 8th earl (died 1279), dropped the horse shoes, and bore "vair, or and gules."

"[illegible]"

After the match with Quincy, the Ferrarses laid aside their own coat and bore that of Quincy, "gules, 7 mascles conjoined 3, 3, 1, or." [illegible] gules, 7 mascles, 3, 3, 1, or, a canton ermine." Hugh Lupus, earl of Chester (died 1101), is fabled to have borne a wolf's head, and not improbably his surname arose from some such emblem. Richard, his son, is said to have borne "azure, semee of crosslets or, a wolf's head erased argent" Ranulph Meschines, 3d earl (died 1128), was sister's son to the first earl, and to him is assigned "or, a lion rampant gules." Hugh Cyfelioc, 5th earl (died 1180), certainly bore "azure 6 garbs of wheat, 3, 2, 1, or;" and Ranulph Blondevile, his son, bore "azure, 3 garbs or." With him the line failed, but as the wheat-sheaf is a common Cheshire bearing, it is probable that arms came into general use in the palatinate in the time of the last two earls.

Sir Nicholas Carru (died 1283) seals with a tricorporate lion, but at Caerlavrock in 1300 is found with a

"Banière et jaune bien passable,
O treis passans lyons de sable,"

the arms of the Carews of our day. The fess and label of Saher de Quincy, earl of Winchester, in 1170, were changed by Roger his son for the mascles by which they were best known, and which he repeats upon his housings. The fact is that, at the close of the 13th century, arms, though on the whole hereditary, had not quite acquired that fixed character that belonged to them half a century later. That the changes were the exception rather than the rule is, however, clear from the roll of Henry III., and from the arms of the forty great barons which he caused to be painted on the walls of Westminster Abbey, almost all of which, so far as they are on record, are the same with those borne or quartered by their representatives. There exist also in England a few families of Norman origin, the period of whose arrival in England is known, and whose arms are the same with those of the present stock in the parent country. Such are Harcourt of Ankerwyke and D'Aubigny, who therefore bore their arms before the separation from Normandy under Henry III.

Early bearings were usually very simple, the colours in strong contrast, and their form and outline such as could readily be distinguished even in the dust and confusion of a battle. They are mostly composed of right lined figures known in heraldry as ordinaries. The favourite beast is the lion.

The earliest and most valuable records relating to English armorial bearings are undoubtedly the rolls of arms of the reigns of Henry III. and the first three Edwards, which have been well edited by Sir H. Nicolas. That of Henry III. known as Glover's roll, drawn up between 1243 and 1246, describes or blazons 218 coats of arms, and therefore shows very sufficiently the heraldry of the period. Of these coats nearly one half are composed solely of the ordinaries and subordinaries, and other simple lines and figures. About two score of them exhibit lions, chiefly rampant, and leopardes, a form of the same animal. The only other beast is the "teste de sanglier" borne by Swinburne. Of birds there are but the eagle and the papingay, several martlets, and single examples of the raven, the cock, the heron, and the hironde. The luce or pike is the only fish. The cinquefoil and sexfoil, the fleur-de-lys, the rose, and the wheat-sheaf, used very sparingly, represent the vegetable world. For the rest there are annulets, barnacles, crescents, estoiles, escallops, fers de cheval, roundels, and water budgets. There is one ray of the sun and one whirlpool.

The coat of Mortimer "barré, a chef palée, a corner geronné [illegible] d'azur, a un escuchon d'argent," —or, in modern terms, "barry, a chief paly, its corners gyronny or and azure, an escutcheon argent" [illegible] —is the only one at all of a complex character, and this is composed of ordinaries and subordinaries, and though many of the ordinaries bear the smaller charges, or are placed between them, there are very few examples of an ordinary so charged also placed between charges, a common usage in later coats. An exception is Chandos, who bears three estoiles on a pile, which again is placed between six others; but this stands alone.

The roll of Edward II. blazons 957 coats of the bannerets of England, so that the use of arms had increased considerably. The lions have risen to 225, the eagles to 43; and there are 102 crosses of various kinds. Of new beasts, fabulous or real, there are the griffin, the wyvern, the stag, wolf, goat, and greyhound; of new birds, the falcon; of fishes, the dolphin. Of other objects the additions are the millrind, buckle, covered cup, chaplet, gauntlet, arrow, trumpet, hammer, battle axe, palmer's staff, pots, winnowing fans or vans, pens, cushions, and chessrooks. The character of the arms remains very simple, and the blazon employed agrees in the main with that still in use, and is in general perfectly intelligible. These rolls give various examples of changes of coats, either altogether or by the introduction of a difference to distinguish members of the same family; and it is observable that when the figures are altered the colours are usually adhered to, as though it were considered undesirable to change them. Thus Gilbert de Segrave (died 1254) bore "sable, 3 garbs argent." Of his grandsons John and Nicholas, John bore the paternal coat, but Nicholas, at Caerlavrock, had exchanged the garbs for a lion. This afterwards became the family bearing as "sable, a lion rampant argent, crowned or," the colours being retained.

No sooner had the great barons assumed arms for themselves than they began to grant them to their followers. Arms so granted commonly bore some resemblance to those of the grantor, and hence certain charges prevailed in certain districts. Thus the chevron of De Clare was common in South Wales, in the Honours of Gloucester and Clare, and about Tonbridge. The garb or wheat-sheaf was found in Cheshire; the cinquefoils of the Bellomonts in Leicestershire; the annulets of Vipont in Westmoreland; the lion all over England, and the tressure in Scotland, both from the royal arms. Some of these grants remain; others can with certainty be inferred. Stephen Curzon, who held under the earls of Derby, bore "vair, with a border of 8 popinjays argent," and Richard, his brother, bore "vair, on a fess 3 horse-shoes." Hubert, earl of Kent, bore "7 lozenges vair;" and Anselm de Guise, on taking under him lands in Berks and Gloucester, assumed the same coat, with the addition of a canton or, charged with a mullet sable. In 1349 Robert Morle granted to Robert de Corby and his heirs the arms "d'argent, ove un saltier engrailé de sable," which he himself had inherited from Baldwin de Manoirs. In 1356–7 William, baron of Greystock, who bore "barry of 6 argent and azure, 3 chaplets gules," granted to Adam de Blencowe and his heirs for ever "an escutcheon sable with a bend closetted [or barred] argent and azure, with 3 chaplets gules." In 1391–2 Thomas Grendale granted to William Morgne his heirs and assigns, "argent, on a cross azure 5 garbs or," which, as cousin and heir, he himself had inherited from John Beaumeys. Finally, in 1442, Humphrey, earl of Stafford, who bore "or, a chevron gules," granted to Robert Whitgreaves "un escue d'azure, à quatre points d'or, quatre chevrons de gules," to him and his heirs of lineage,—in modern terms "azure, a cross quarter-pierced or, on each limb a chevron gules." A coat of arms was not only heritable, subject to certain heraldic customs, but could be willed or granted away, wholly or in part, like chattel property.

The crusades, by bringing together soldiers of different nations, tended to produce a certain assimilation in their heraldries, but their influence upon the arms themselves has been exaggerated. The stories as to bearings adopted to commemorate feats of arms in Palestine are mostly inventions. The cross no doubt was a crusading bearing, but it was so because it was the emblem of Christianity, and primarily popular as such. The stars, torteaux, water budgets, and other charges attributed to the crusaders, were of earlier date and of independent origin. There is no evidence that the crosses patée of the Berkeleys, or the crosslets of Beauchamp, Clinton, Windsor, and Howard, were added to their simpler bearings in token of services in the Holy Land. The star of De Vere, always attributed to an adventure there, was evidently a mark of cadency, adopted by Robert de Vere, brother of Alberic, 2d earl of Oxford. The fact appears to be that most of the additions to or alterations in the earlier coats of arms were made for some genealogical reason, to commemorate a match with some great family or to distinguish between the several branches from the parent tree. After, usually long after, the period of the crusades, arms were invented for "fabled knights in battles feigned," and but few of the Saracens' heads which figure so formidably in many coats of arms are contemporary with any Saracenic war.

The diversion of the tournament did even more than actual war to promote the glories of heraldry. On these occasions the presence of spectators, and especially of ladies, encouraged all sorts of heraldic display. At a tournament at Calais in 1381 Richard Beauchamp, earl of Warwick, one of the most accomplished knights of the reigns of Richard II., Henry IV., and Henry V., suspended on three shields three several coats of arms, as representing three several knights who professed to be ready successively to meet all comers. Three French knights appeared to the challenge. Against the first the earl came forth as the green knight with a black quarter, bearing "silver, a maunch gules," the arms of De Tony, a maternal ancestor, and so overcame his adversary and retired unknown to his pavilion. On the second day he appeared as the green knight, and bearing "silver, two bars gules," the arms of Mauduit of Hanslape, another ancestor, he met a second knight with equal success. On the third day he appeared in his proper person bearing the arms of Guy of Warwick and Beauchamp on his shield, and those of De Tony and Mauduit on his caparisons, and thus with great honour won the third day also.

The shield, as the most obvious piece of the defensive armour, was that upon which arms were first displayed. The Norman shield was of wood covered with hide, and clamped and stiffened in a fashion which is thought to have given rise to the first simple bearings. It was 3 to 4 feet long, pointed below, and 18 inches broad. This shield is common on early monumental effigies armed in chain mail, and it is unusual to find it with armorial bearings. It was succeeded by the small triangular heater shield, and that, in the reign of Edward III., by a somewhat larger and full bottomed shield, which by degrees ceased to be used in war, and became more and more an architectural ornament. The arms were also displayed upon the breast-plate, and upon the camise or surcoat that covered the armour, and were repeated upon the housings of horses both before and behind the saddle. When the Comte d'Artois fell at Damietta, the Saracens showed in triumph his "cotte d'armes toute dorée et fleur-de-lisée." The emperor Henry of Luxembourg is described in the *Chronicle of Flanders* as bearing "an aigle noir, sur un tornicle d'or qui pendoit jusq' a mi-jambe." Sir Alexander Nevile appeared at Halidon Hill in a surcoat of his own arms, the quarters filled up with the arms of his friends. The fine effigy of William de Valence at Westminster is decorated with small escutcheons of his arms on various parts of his dress and weapons. An actual remnant of the richly embroidered surcoat of William de Fortibus, earl of Albemarle (died 1261), is still preserved. and has been engraved in the

Archæologia. It was against the embroidery of the surcoat that the severe sumptuary enactments of Richard and Philip Augustus were mainly directed.

The importance attached to armorial bearings is strongly shown in the uses to which they were applied. A sovereign who wished to assert his claim to a kingdom placed its arms upon his shield. In 1479 when Alphonso of Portugal resigned his claim to Castile, he was required to lay aside its armorial ensigns. It appears that when Edward III. assumed the French lilies, he at first did so simply as representing his mother, who was an heiress, and placed her arms in his second quarter; when, however, he claimed the kingdom of France in her right, he removed the lilies to the first quarter as representing the more important kingdom. A grant of arms at the hand of a sovereign had great value. Among the more solid bribes which Louis XI. bestowed upon the courtiers of Edward IV. occurs a grant of three fleurs-de-lys to a knight of the Croker family. Thus also when Juan de Orbieta captured Francis I. on the Ticino, he was rewarded by a grant of arms from Charles V., though of so complex a character as to do little credit to Spanish heraldry. In later times John Gibbon, the heraldic author, having a quarrel with two maiden ladies of his name, obtained a licence to convert the scallops in their common coat into the black balls called ogresses,—a most heraldic revenge.

Armorial bearings were largely painted, enamelled, and embroidered upon personal ornaments, furniture, and weapons. The sword of Edward, prince of Wales (died 1483), is a curious example of this; it bears on its pommel the words "aves fortes" and five shields:—(1) England, (2) the duchy of Cornwall, (3) England and France with a label, (4) Mortimer quartering Ulster, (5) the earldom of Chester. In the middle is the cross of St George. The citizens of London were bound to provide their banner bearer, Lord Fitz Walter, with "a saddle with his arms," and the seal of one of that family, about 1300, shows the arms upon the back or rest of his war saddle. The seal of Sir Hugh le Despencer (1292) also so shows his arms. Various bequests of plate and furniture with arms occur in the 14th century. In 1368 William, Lord Ferrars of Groby, bequeathed his green bed "with his arms thereon, and his furniture bearing the arms of Ferrars and Ufford, impaled." In 1380 Edward Mortimer devised "à notre tres cher frere John Gilbert, evesque de Hereford, une plate de argent pour espices et enamillés ove les armes de Mortimer en la table."

Richard, earl of Arundel, in 1392, bequeathed a canopy of the arms of Arundel and Warren quarterly. In 1399 Eleanor Bohun, duchess of Gloucester, had a psalter with her father's arms upon the clasps. In the Decorated and Perpendicular styles of architecture shields of arms are common ornaments. Those of benefactors were set up in church windows in glass, and those of a family in their houses. In the Scrope roll is a list of sixty-six churches in which the Scrope arms were set up, and the histories of Dugdale and Burton show us that nearly every church in Warwickshire and Leicestershire had a multitude of arms in its windows. Those still remaining in the east windows of Bristol cathedral are early and good examples of the arms of great barons, Berkeley, Clare, and Warren. They are also seen upon floor tiles of the same period.

As arms became hereditary, and their use ceased to be confined to the battle-field, but was largely extended to seals and ornaments, it was natural that some notice should be taken of the arms of females, and that the wife's coat should be combined in some way with that of the husband, especially when she was the last of, and represented, her family. This seems first to have been managed by giving the wife a separate shield. The kings of France so bore the arms of Navarre after the marriage with the heiress of that kingdom. Another very early plan was to form a composite coat. Thus the old coat of Willoughby was fretty, but on their marriage with Bec of Eresby they adopted the coat of Bec, and Sir John Willoughby (13th Edward III.) bears the cross moline of Bec, but the wings of his crest are fretty for Willoughby, and on either side is a buckle taken from the arms of Roscelin, his wife. Rose of Kilravock bore "or, 3 water budgets sable," but on a marriage with the heiress of Chisholm they added "a boar's head couped gules" from her arms. So also Halyburton of Pitcur, who bore "or, on a bend azure 3 lozenges of the field," after a marriage with another Chisholm heiress, added to their coat "3 boars' heads erased sable." Bohun, who bore "azure, a bend argent, cotised or, between 6 lioncels rampant of the third," is thought to have added the bend on the occasion of a marriage with Maud, daughter and heir of Milo, earl of Hereford. As this, however, led to complexity and indistinctness in the bearings, and the introduction of a second shield was obviously inconvenient, the method of impalement was devised, by which the sinister half of the shield was appropriated to the lady's arms, at first under the process known as dimidiation. When, however, the lady was an heiress, a different plan was adopted which ultimately led to quartering or the marshalling of many coats in one shield, a practice, when pushed to any extent, quite inconsistent with the original use of coat armour. This also led to a corresponding alteration in the shape of the shield, which was expanded to contain the arms of each heiress who had married into the family, together with such other heiresses as her family had previously been allied with, so that when a Percy heiress married a Seymour, she added her heiress ancestors' arms with her own arms to those of her husband, expanded in a similar fashion by the previous matches of his family. Thus the great shield of a family became a compendium of the family pedigree which, to those who could read its language, conveyed a considerable mass of semi-historical information. The defect of this system was that it only took account of heiresses, and did not provide for the purity of the whole descent, so that under it the children of a man of no birth who married a great heiress, would display all her quarterings, and no account would be taken of the absence of any on his side; and further, if it happened, as was actually the case in the last century with the Rodneys of Rodney Stoke, that a family, though ancient, had never intermarried with an heiress, they could display no quarterings.

In France and Germany and to some extent in Scotland a far more perfect system was pursued. There the genealogical escutcheon included the arms of every ancestor and ancestress, whether an heiress or not; thus one generation gave two coats, two generations four coats, and so on. "Seize quartiers" gave evidence of pure blood for four generations, and thirty-two quarters, the qualification for a canon of Strasburg, for five.

As the combinations out of which the early coats were formed were limited, it occasionally happened that two persons of the same nation bore the same arms, and this gave rise to disputes which, as matters connected with military discipline, came under the jurisdiction of the earl marshal. One of the earliest of these disputes is mentioned in the roll of Caerlaverock:—

"Le beau Bryan de Fitz Aleyne,
De courtoisie, et de honneur pleyn,
I vi o baniere barree,
De or et de goules bien parée,
Dont le chalenge estoit la pointe,
Par entre lui et Hue Poyntz,
Ki portoit tel ne plus ne mains,
Dont merveille avoit meinte et meins."

Cases of a similar character were decid

Harding and St Loo in 1312, Warburton and Gorges in 1321, and Sytsylt and Fakenham in 1333, when Sir William Fakenham disputed the arms, "le champ de dise barretz argent et azure, supportez de cinq escocheons sables, chargez ovesque taunt de lyons primers rampant incensés gules." They were adjudged by a commission to Sytsylt. Hugh Maltby and Hamon Beckwith had a similar dispute in 1339. But by far the most celebrated dispute of this nature arose in 1384 between Sir Richard Scrope of Bolton and Sir Robert Grosvenor, for the right to bear the arms "azure, a bend or." The greatest men in the country, including John of Gaunt, gave testimony on one side or the other, and it was shown that each family had used the coat beyond the memory of man. It was finally adjudged to Scrope, and Grosvenor was directed to bear "les ditz armes ove une playne border d'argent." Grosvenor, however, declined to accept the arms so differenced, and assumed "azure, a garb or," retaining his colours and marking his connexion with the old earls of Chester. It was proved, incidentally, that an ancestor of Grosvenor's had granted his coat, with a difference, to William Coton of Coton. It is remarkable that both disputants are still represented in the male line, and continue the arms as then settled. Both families had previously had disputes with other parties, and the Scropes long afterwards had a quarrel with the Stanleys for the right to bear the arms of the Isle of Man. The matter was compromised by Edward IV. The Hastings and Grey de Ruthyn case, which rises to the rank of a tragedy, illustrates still more forcibly the value attached to a coat of arms. On the death, childless, in 1389, of John de Hastings, earl of Pembroke, a dispute arose for his heirship between Reginald Grey, his heir general, and Edward Hastings, the heir male and of the name, but of the half-blood. A court military decided in favour of Grey. Pending the trial Hastings had ceased to difference his arms as a cadet, and assumed them unbroken. He was, however, ordered to bear them with a label, and for contumacy was imprisoned for sixteen years. A suit for arms was decided as lately as 1720 in Blount *versus* Blount, in the earl marshal's court.

The same necessity that made it important to prevent the use of similar bearings by different families in the same country made it also necessary to distinguish between the bearings of different members of the same family, all of whom had a right to the paternal coat. As this right was strongest in the eldest son he alone bore the paternal arms unaltered (in French heraldry "sans brisure"); and the other sons were obliged to introduce some sufficient change, called in heraldry a "difference." This was at first managed by inverting the colours or substituting one ordinary or one inferior charge for another, as a bend for a fess, martlets for mullets, and the like; and sometimes by the use of a coat compounded of the paternal bearing with that of an heiress. A multitude of these early differences occur in the rolls of Henry III. and Edward II., and in various early lists of arms. The family of Grey, always numerous, differenced their cadets in at least fourteen different ways, almost all preserving in some tangible form the paternal coat; and this was also the case with the very numerous family of Basset. Generally no rule is followed, save that on the whole some reference is retained either to the charges upon, or the colours of, the paternal coat. Very frequently, even in the earliest times, the eldest son differenced his father's coat by a label. In the roll of Henry III. the label occurs fifteen times, though not always as a difference. Gradually, however, it came to be used almost entirely for that purpose, and finally a set of marks, called of cadency, were devised for each of the sons, the label being the mark of the eldest during his father's life.

All these rules and alterations were, however, the growth of a later age, and came into use as the bold and simple heraldry of the 13th and 14th centuries began to be overlaid with florid fancies. So long as heraldry represented a real want, its expressions were simple and intelligible, but as "villainous saltpetre" came into use and closed helmets were laid aside, and as skill and strategy rather than personal valour became the attribute of a leader, armorial bearings fell into disuse in war, and were no longer worn upon the person, or upon the horse trappings. But though armorial bearings ceased to be of actual use, they continued to be emblems of rank and family, and a mark of gentle blood. They became, however, exceedingly and often absurdly complex, partly because simplicity was no longer necessary, and partly because it was scarcely practicable, owing to the enormous increase in the number of the gentry, which produced a demand for new combinations.

The glories of heraldry reached their zenith in the reign of Richard II., with "youth at the prow and pleasure at the helm" of the vessel of the state, but it was not till the reign of Richard III. that it was thought necessary to place under specific control the whole heraldry of the kingdom; and this, in close imitation of the example of France, was done by the incorporation of the heralds into a college placed under the presidency of the earl marshal.

The office of the herald as the messenger of war or peace between sovereigns or between contending armies in the field is of far earlier date than the introduction of armorial bearings, but as these came into use they were gradually placed under his charge, and he took his specific name sometimes from that of the noble or leader who employed him, sometimes from one of his castles or titles of honour, and sometimes from one of his badges or cognizances, which the herald wore embroidered upon his dress and by which he was known. In the pages of Froissart and other chroniclers frequent mention is made of heralds-at arms and their attendants the pursuivants, and we read of Somerset and York, Windsor, Chester, and Lancaster heralds, Clarencieux, Arundel, Fleur-de-Lys, and Leopard, and of pursuivants, Antelope, Blanch Lion, Falcon, Portcullis, and many more. At an early period the principal heralds, and especially those attached to sovereigns, were called kings-at-arms, and as early as Edward I. an officer, called from his jurisdiction, Norroy, was placed in charge of the heraldries north of the Trent. It is probable that a herald was always attached to each order of chivalry, as Toison d'or to the Fleece, and Garter to the chief English order. Garter, however, was only officially appointed by Henry V., when he seems to have been recognized as the principal king-at-arms—"Principalis rex armorum Anglicanorum." At the institution of the college, or soon afterwards, it was decided that its officers should be Garter, principal king-at-arms; Norroy and Clarencieux, provincial kings north and south of Trent; six heralds, Windsor, Chester, Lancaster, Richmond, Somerset, and York; and four pursuivants, Rouge Croix, Blue Mantle, Rouge Dragon, and Portcullis; who constitute the present establishment, though some special officers have since been appointed, as a king-at-arms to the revived order of the Bath, and some others, not members of the college.

It became the duty of the new incorporation to take note of all existing arms, to allow none without authority, and to collect and combine the rules of blazoning into a system. To effect a supervision of the armorial bearings throughout the kingdom, it was necessary to visit the several counties. Such a commission of visitation seems to have been issued by Henry IV. as early as 1412, but the first regular commission acted upon was issued by Henry VIII., 1528–9, and the last early in the reign of James II. The visitations were taken about every thirty years, and for contemporary events are most valuable records. The provincial king, either personally or by deputy, visited the capital town of each county in his division, and summoned the surrounding gentry to record their pedigrees, and show a title to their armorial bearings. The earl marshal's court survived the fall of the house of Stuart, and a few causes relative to a right to particular arms were decided in the course of the last century, but its powers fell into disuse, and not long since it was finally abolished, and with it fell any pretence on the part of the college to regulate, by compulsory authority, the heraldry of the kingdom. At present, however, notwithstanding the democratic tendencies of the age, armorial bearings are in greater demand than ever in England, and more or less coveted in the United States, and a good deal of the proper business of heraldry is still transacted within the college of arms, and a good deal more, irregularly and improperly, outside it. A considerable number of persons still bear arms derived from an ancestor who bore them before the institution of the college; others bear them under grants and patents from that body; and others still more numerous, who or whose fathers have risen from obscurity, have assumed arms according to their fancy, or under the uninstructed advice of some silversmith or finder of arms. The Smiths, said a distinguished member of the family, had no arms; they sealed their letters with their thumbs. It is to avoid so inconvenient a signet that the new men have recourse to the demi-lions and demi-griffins now so much in vogue, and possibly because they are not aware that Garter and his colleagues are still willing to grant arms, crest, and motto, on terms within reach of almost every aspirant to chivalry.

There is no college or corporation of heralds in Scotland or Ireland; but in Scotland heraldry has been to the full as much considered, and at least as well regulated as in England. "Lyon-king at arms," "Lyon rex armorum," or "Leo fecialis," called from the lion on the royal shield, is the head of the office of arms in Scotland. When first the dignity was constituted is not known, but Lyon was a prominent figure in the coronation of Robert II. in 1371. The office was at first, as in England, attached to the earl marshal, but it has long been conferred by patent under the great seal, and is held direct from the crown. Lyon is also king at arms for the national order of the Thistle. He is styled "Lord Lyon," and the office has always been held by men of family, and frequently by a peer. His powers have been declared by statute, and extend to fine and imprisonment. He is supreme in all matters of heraldry in Scotland. Besides the "Lyon depute," there are the Scottish heralds, Islay, Rothesay, Marchmont, Albany, Ross, and Snowdown, with precedence according to date of appointment; and six pursuivants, Kintyre, Dingwall, Carrick, Bute, Ormond, and Unicorn. Heralds and pursuivants are appointed by Lyon.

In Ireland also there is but one king at arms, Ulster. The office was instituted by Edward VI. in 1553. The patent is given by Rymer, and refers to certain emoluments as "proficuis officio . . . . ab antiquo spectantibus." There existed an Ireland king at arms mentioned in the reign of Richard II. and superseded by Ulster. Ulster holds office by patent, during pleasure; under him are two heralds, Cork and Dublin; and four pursuivants, Athlone, and St Patrick Nos. 1, 2, and 3. Ulster is king at arms to the order of St Patrick. He held visitations in parts of Ireland from 1568 to 1620, and these and other records, including all grants of arms from the institution of the office, are kept in the Bermingham Tower, Dublin, under the charge of the present most courteous and learned Ulster, Sir B. Burke. The precedence of the three chiefs has been the subject of dispute, but is now generally arranged, Garter being followed by Lyon, and he by Ulster.

Heraldry should be studied with reference to the period in which it was a useful art, and in the simple examples of the 14th and 15th centuries. Before that period it was in a changing and elementary state; after it, it became merely ornamental, and its examples are complicated and debased. In a general treatise on the subject notice must of course be taken of the later as well as the earlier conditions of the art, but the greater number of the illustrations in the following pages are taken from the earlier and best examples.

A curious evidence of the vitality of heraldry, and of the desire of all mankind for ancestral distinctions, is afforded by its extension among the republics of the New World. The United States boast some excellent genealogical societies, and a great and very general desire is shown by individuals to trace their pedigrees to the stocks of the Old World, and to assume the arms proper to their name. The national emblem of the stars and stripes, now so widely and honourably known throughout the world, has been traced back to the paternal coat of the first and greatest president, George Washington, whose English ancestors bore "argent, 2 bars gules, in chief 3 mullets of the second." In Canada, Australia, and other English colonies, the assumption of arms by individuals and by the community is not less general; and the republics of South America, of Spanish origin, almost all have adopted coats of arms. The Peak of Teneriffe, the Beaver, the Red Indian, contribute to the list of charges, and the clear firmament of Chili is indicated by a star. "Coupé d'azur sur gules, à une étoile d'argent en abîme."

DIVISIONS OF ARMS.

Armorial bearings may be conveniently divided into those of dominion, of a community, of office, of concession, family or paternal arms, and arms of alliance. To these may perhaps be added arms of attribution. There is also another division, or rather peculiarity, called canting arms, of which many of the former divisions present examples.

1. *Arms of Dominion* are those of a kingdom or a feudal lordship. The origin of such arms is often obscure. Those of the Isle of Man are three legs conjoined in triangle at the thigh (fig. 116), probably borrowed from the emblem of Sicily, the ancient Trinacria, found upon Greek vases. The Irish harp is an emblem probably allusive to the instrument of Brian Boroimhe. The origin of the lion of Scotland is also obscure, and of the tressure equally so, though fabled to be

"First by Achaius borne."

Not unfrequently the arms of kingdoms were those of an early sovereign, adopted by succeeding dynasties to the exclusion of their own coat. The lions of England were certainly personal to the Plantagenet kings, if not to Henry I.; but they have become national to the exclusion of the arms of the Tudor, Stuart, Brunswick, and Saxon dynasties, just as neither the arms of Baliol, Bruce, nor Stuart ever became the arms of Scotland. The lion rampant azure, crowned gules, so long borne by the head of the German empire, belonged originally to the house of Hapsburg, and was not used by such of the early emperors as were not members of it; and the bend and alerions of Lorraine only became a part of the arms of the empire after the marriage of Francis of Lorraine with Maria Theresa. It seems indeed to have been the custom of elected sovereigns, as those of the empire and of Poland, to place their paternal arms on a shield of pretence over those of the dominion. Cromwell so placed his arms over those of the commonwealth, and William of Nassau over those of England, but they disappeared with the individual who introduced them. On the other hand the arms of kingdoms and lordships are sometimes continued to be used as personal arms by the descendants of their former lords. The great shield of Mary of Burgundy quarters the arms of a number of duchies and provinces. Simon de Montfort thus used the arms of the Honour of Hinkley. Richard de Monthermer (who married the countess of Gloucester, and was, by courtesy, earl of that name) at Caerlaverock, while he bore on his shield his own arms, "or, an eagle displayed vert," on his banner displayed "or, three chevrons gules" for the earldom. So also Humphrey, duke of Gloucester, (died 1446), used a seal bearing the three fusils of Montacute, because he held lands which belonged to that barony. The *Book of St Albans* says that, if the king grant a lordship to a yeoman entitling him to bear arms, he may take those of that lordship.

Under this head may be described the armorial shield of Great Britain (fig. 1). The arms, gules 3 lions passant in pale or, are for England, and are so borne by the kings of England till the reign of Edward III., who in 1340 quartered with them, in the first quarter, the arms of France, azure, semee of fleurs-de-lys or. Thus they continued till the latter part of the reign of Henry IV., when the fleurs-de-lys were reduced to *three*. No alteration occurred in the royal achievement during any of the succeeding reigns till the accession of James VI. of Scotland to the throne of England, when that sovereign introduced the royal arms of Scotland into the second quarter, and the arms of Ireland into the third quarter. The royal arms were thus borne by all the monarchs of the house of Stewart till the reign of Anne, though William III. bore over the quarterings of the royal arms those of his Dutch dominions—the house of Nassau. In the reign of Anne a change again took place, occasioned by the union of England and Scotland, and the arms of these countries were impaled in the first and fourth quarters (England on the dexter, Scotland on the sinister); France was removed to the second; and Ireland retained its former position. On the accession of the house of Brunswick in 1714, the fourth quarter in the royal shield gave place to the arms of his Majesty's German dominions, an arrangement which continued till 1st January 1801, when, upon the Union of Great Britain and Ireland, the arms of France were excluded, England occupied the first and fourth quarters, Scotland the second quarter, and Ireland its old position in the third quarter; while over all, on an escutcheon of pretence, were placed the arms of Hanover, ensigned with the electoral bonnet, in 1816 exchanged for the Hanoverian crown. On the death of William IV. Hanover passed away, and its arms were withdrawn, and the present arrangement introduced. In Scotland, and in Scotch official documents, the Scottish coat is placed in the first quarter. It bears "or, a lion rampant, within a double tressure flory counterflory, gules." There is no positive authority for any early coat of arms being used for Ireland, though the bearing "azure, 3 crowns in pale or" granted by Richard III. to De Vere has been so regarded. From the reign of Henry VII., "azure, a harp or, strings argent," has been regarded as the Irish coat, and as such is inserted into the imperial shield. There is no authority of any standing for a coat of arms for the whole of the principality of Wales, but the coat usually attributed to it is "quarterly azure and gules, 4 lions passant gardant, counterchanged." The ancient princes of Wales would scarcely have adopted the lions of England. Moreover, this coat was never used by any leading chief in either middle or south Wales.

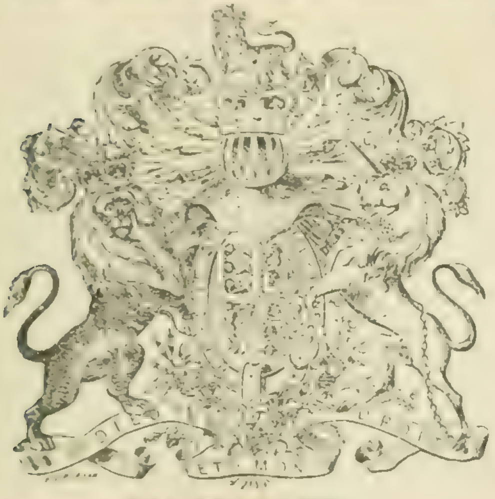


Fig. 1.—Arms of Great Britain.

In Scotland arms territorial are much recognized. The dukes of Athole quarter Man. The garbs are quartered by the Erskines for the earldom of Bute. When Archibald Douglas was created duke of Touraine, he placed the arms of that duchy, three fleurs-de-lys, on his first quarter, before those of Douglas, Annandale, and Galloway. The dukes of Richmond bear three buckles for the dukedom of Aubigny. "Paly of 6 argent and sable" are the reputed arms of the earldom of Athole, and "a saltire between 4 roses" those of that of Lennox.

To this head belong arms of pretension, where a sovereign claims *de jure* a possession which he no longer holds, and sometimes never held, *de facto*. Thus the kings of England from Edward III. to George III. bore the French lilies, and claimed to be kings of France, and the kings of Sardinia and Naples used the arms of Cyprus and Jerusalem. In fact, nearly all the older sovereigns of Europe used arms of this character. The armorial shield of the house of Austria at the dissolution of the empire affords a number of curious examples of arms of pretension. Besides Hungary, Bohemia, Dalmatia, and Slavonia, it contained Aragon and Sicily, Brabant, Swabia, Antwerp, Flanders, Burgundy, Naples, Jerusalem, Lombardy, and Milan.

2. *Arms of Communities* are borne by corporations, religious houses, colleges, cities and boroughs, the cinque ports, guilds, and inns of court, some of which were allowed arms from an early period. These are very generally adopted in honour of some founder, great benefactor, or early and distinguished member of the body. Thus Birmingham bears the arms of the barons of that name, Manchester of the Byrons, Leicester of the Bellomonts, Cardiff of the De Clares. Of religious houses Atherstone bore the arms of Basset; Garendon of the earls of Leicester; Kirby-Bellers of Bellers. Of colleges, Balliol and All Souls at Oxford, and Pembroke and Clare at Cambridge, so commemorate Balliol, Chichele, Valence, and De Clare. The Cinque Ports all bear a part of the arms of England. The arms of the guilds and city companies usually contain some allusion to their trade; those of the grocers are 9 cloves; of the fishmongers, 3 dolphins; of the blacksmiths, 3 hammers. Of the inns of court, the Inner and Middle Temples bear badges of that order; Lincoln's Inn uses the purple lion of the De Lacys, earls of Lincoln; Furnival's Inn the bend and martlets of the Barons Furnival. A bishop, as a corporation sole, represents his see and bears its arms. These usually contain some ecclesiastical emblem, keys, crosses, mitres, martyrs' crowns, or the like. Hereford bears the arms of Cantilupe, possibly from its canonized bishop of that family. The arms of Lichfield and Coventry are founded upon those of Jerusalem; London, Winchester, and Bath and Wells assert their temporal power by bearing swords. The English sees were early provided with arms, but in Scotland they were of very late introduction. Bishops before the 17th century seem

to have used their personal arms. Thus Gawain Douglas, bishop of Dunkeld,

"Who gave rude Scotland Virgil's page,"

and Alexander Douglas, bishop of Moray in 1606, placed the Douglas arms upon their seals. Sometimes, however, this seems to have been combined with some ecclesiastical emblem, for the archbishops of St Andrews placed the cross of St Andrew on their seals, while below were their paternal arms, and the bishops of Glasgow so bore a figure of St Mungo.

3. *Arms of Office* are not uncommon. The electors and chief officers of the empire each bore some token of their office. The crossed swords so well known on Dresden china were borne by the electors of Saxony; the sceptre by those of Brandenburg; the crown of Charlemagne by the electors of Hanover as arch-treasurers. The ancestors of the dukes of Ormond were hereditary butlers of Ireland, and bore three covered cups. The kings-at-arms bear arms of office. Garter, the principal king, bears "argent, a cross gules, on a chief azure a crown or encircled with a garter of the order buckled and nowed between a lion of England and a lily of France," by no means such an example of heraldry as might be expected from the chief herald of England. The knights of St John of Jerusalem augmented their paternal arms with a chief gules, charged with a cross or. Several civic offices in France gave a right to bear arms. Ménage observed of a mayor of Angers who died upon his election, and was buried with his newly acquired arms—

"[illegible],
[illegible]"

4. *Arms of Concession* were granted by a sovereign or some feudal superior, sometimes in memory of some great deed, but more frequently to indicate the connexion between the lord and his follower, when they are called arms of patronage. Of the former character was the heart in the arms of Douglas, first used by William I., earl of Douglas, 1356, in memory of James Lord Douglas's mission with Robert Bruce's heart; and to this a crown was added in the time of William II., earl of Angus, in 1617. Also the families of De la Warr, Pelham, Vane, and Fane bear arms in allusion to the share of the ancestors of each in the capture of John of France at Poitiers. Sir James Audley, after Poitiers, not only divided the Black Prince's present between his four squires, but allowed them to bear portions of his coat armour, "gules, a fret or," in memory of which the family of Delves still bear "argent, a chevron gules, fretty or, between 3 delves sable" (fig. 82); and that of Dutton, "quarterly, argent and gules, on the 2d and 3d quarters a fret or." It was probably in memory of the same event that John Touchet, Lord Audley, granted to John and Thomas Mackworth, for services performed by their ancestors and themselves to his ancestors and himself, to bear "party dentelle de sable et d'hermine, un chevron de gules fretté d'or,"—arms still used by the Mackworths with a slight addition, and now blazoned "per pale indented sable and ermine, on a chevron gules 5 crosses patée or." Among many similar instances may be mentioned Tatton of Cheshire, who bears "quarterly argent and gules," evidently derived from Massy. Harvey of Ickworth bears "gules, on a bend argent 3 trefoils slipped vert," derived from [illegible], who bore "gules, a bend argent." [illegible] of [illegible], who held by the [illegible] a [illegible] bore "[illegible]" [illegible] with a [illegible] bend [illegible], derived from [illegible] "[illegible], 2 chevrons and a canton gules." Lowther and Musgrave derive their annulets from Vipont. Moton of Peckleton, [illegible], Ashby of [illegible], [illegible] bore "argent, a cinquefoil [illegible]," "or, a cinquefoil [illegible]," "azure, a cinquefoil ermine," and "[illegible], a cinquefoil [illegible] or," all derived from the bearings of the Bellomonts, "gules, a cinquefoil ermine." Hardress, who held under De Clare at Tonbridge, bore "gules, a lion rampant debruised by a chevron or;" and the lords of Avan, Welsh barons under De Clare, bore the three chevrons. Thus also Flamville and Wharton used the maunch of Hastings. "Ermine and checquy," from the Newburgh earls, were common in Warwickshire, and the "canton" in Westmoreland, derived from the Lancasters, barons of Kendal. In Douglasdale the "stars" of Douglas preponderate, and in Annandale the "saltire" of Johnstone.

Arms also passed from one friend to another by deed or will, even when there was no blood relationship. Henry de Lacy, the last earl of Lincoln, bequeathed to his friend and executor Sir H. Scrope a lion passant purpure, in augmentation of his coat, and Sir Henry wore it accordingly, though for life only. Maud Lucy, heiress of her brother Anthony Lord Lucy of Cockermouth, married Henry Percy, earl of Northumberland, 1414. She died childless, but bequeathed her lands to the Percys on condition they bore her arms, "gules 3 luces," quarterly with Percy, which they continued to do, and indeed, though without any right, often styled themselves Barons Lucy. To this class also belong arms of augmentation, sometimes called additions of honour. Thus Richard II. chose to impale with his own the imputed arms of the Confessor, "gules, a cross patonce between 5 martlets or," and he granted to Thomas Holland, duke of Surrey, to impale them within a border argent with his own arms. Thomas Mowbray, duke of Norfolk, was also allowed to impale the entire arms of the Confessor, a fatal gift, as it was one of the charges brought against his ambitious descendant Henry Howard. Richard also allowed De Vere, duke of Ireland, to bear for life "azure, 3 golden crowns within a bordure," which seems then to have been regarded as the arms of Ireland. They are found on tiles marshalled quarterly with De Vere. After the victory of Flodden, Henry VIII. granted to the earl of Surrey to augment his arms with a "demi-lion gules pierced through the mouth with an arrow, within a double tressure flowered of the same," to be placed on the Howard bend. Henry used both the pale and the flaunch in his augmentations to the families of his English wives. Seymour bore "quarterly, 1 and 4, or, on a pile gules between 6 fleurs-de-lys azure 3 lions of England; 2 and 3, Seymour." The augmentation to Catherine Howard includes 2 flaunches, that to Catherine Parr a pale. Manners of Belvoir bore "or, 2 bars azure, a chief quarterly azure and gules, in the 1st and 4th quarter 2 fleurs-de-lys, in the 2d and 3d a lion of England, or." The bars were no doubt taken from the Marchamps. The chief and its contents were an augmentation from Henry VIII.

In Scotland so early Lord Seton had a concession from Robert Bruce of a sword supporting a crown, and his descendant in 1601 received as an augmentation "azure, a blazing star of 8 points within a double tressure or."

Most of the earlier grants or concessions seem intended to commemorate some territorial or genealogical concession, those of later date some connexion with royalty, or some deed of arms in the field. Thus Sir Cloudesly Shovel received 2 fleurs-de-lys in chief and a crescent in base in memory of two victories over the French and one over the Turks, and Nelson and other naval commanders received what might rather to be described as sea pieces than as heraldic augmentations.

5. *Family and Paternal Arms* and arms of succession are such as descend by custom to the male heir. The descendants of females, heiresses, save by special licence, can only quarter their arms. This rule has indeed been much abused, and on every side are seen good maternal names and arms adopted to the exclusion of those less dis-

tinguished on the paternal side. Paternal arms are of very various dates and origin. There seem, however, always to have existed certain recognized rules which the earl marshal had power to enforce. One of the most important of these was that no two persons in the same kingdom should bear the same arms, a practice clearly subversive of the main use of such insignia. Many were the disputes and challenges that arose out of this regulation, of which two of the most remarkable have already been mentioned.

6. *Arms of Alliance or heirship* were used when those of a great heiress were allowed to supersede the paternal coat. Thus the heiress of Mandeville, earl of Essex, married Say, and their heiress, Beatrice de Say, married Geoffrey Fitz Piers. Geoffrey (died 14 John) became earl of Essex, and their descendants took the name and bore the arms of Mandeville exclusively. William II., earl Warren (died 1148), left a daughter and heiress Isabel, who married Hamelin, natural son of Geoffrey of Anjou and brother to Henry II. He became earl of Surrey, and bore the name and arms and continued the line of Warren. The De la Bere family, who claimed to descend from the male stock of the De Clares, bore the 3 chevrons differenced with a label of 3 points, though when, in the reign of Richard II., they intermarried with the Staffords, they laid this aside, and adopted "a chevron between three roses." When Gilbert Talbot (died 1274) married Gwendllian, or Gwendoline, the heiress of the Welsh prince Rhys ap Griffith, he laid aside his paternal coat, "bendy of 10 pieces, argent and gules," and adopted that of the lady, "gules, a lion rampant or, within a border engrailed of the field," as still used by the earls of Shrewsbury.

7. *Arms of Attribution* are altogether fictitious, and such as the heralds of the 15th and 16th centuries indulged in to an absurd extent, providing every hero of antiquity with a coat of arms. The same age that represented the Virgin Mary as versed in the canon law declared that Solomon, as the wisest of men, must have been a good herald, and described the armorial bearings of Achilles and Hector. Perhaps the most extravagant example of this fashion is contained in the work of Dame Juliana Berners, who says: "Of the offspring of the gentielman Japhet, comes Habreham, Moyses, Aron, and the profetys, and also the kyng of the right lyne of Mary, of whom the gentilman Jhesus was borne, very God and man; after his manhode King of the londe of Jude, and of Jues, gentilman by is modre Mary, prynce of coat armure;" and again, "The four doctors of holy chirch, Seynt Jeromy, Ambrose, Augustyn, and Gregori, war gentilmen of blode and of cotarmures." At an earlier period, in the reign of Richard II., it was believed that many of the bearings in use had been borne ever since the Conquest, as appears from the evidence in the Scrope and Grosvenor controversy. Almost all the older genealogists attribute coats of arms to ancestors long before they were in use. On the tomb of Queen Elizabeth are emblazoned the arms of William the Conqueror and Matilda of Flanders, and of Henry I. and Matilda of Scotland, all of course pure inventions. It is only of very late years, since a critical spirit has found its way even into heraldry, that these absurdities have been exposed.

8. *Canting Arms,* the "armes parlantes" of French heraldry, are common to all the preceding classes of arms, and most common in those of the earliest date. Such were the castle and lion for Castile and Leon, the fers de cheval of Ferrers, the lion (lowe) of Louvaine, the luces of Lucy, the sharp pointed row of fusils of Montacute, the corbeau or raven of Corbet, the herons of Heron, the falcon of Falconer, the greyhounds (levriers) of Mauleverer, the barnacles of Bernak, the castle of Chastil, the swine's head of Swinbourne, the penfeathers of Coupenne, the hirondelles of Arundel, the storm-finches of Tempest, the hammers of Hamerton, the tyrwhits of Tyrwhitt, the hanks of cotton Cotton, the fusils of Trefusis, the oxen of Oxenden, the fe de moline of Molyneux, the hazel leaves of Hazlerigge, the Danish axes of Hakluyt, the bozons or bird bolts of Boltesham and Bozon, the bend wavy of Wallop, or Well hope the whelk-shell of Shelley, and many more, mostly early coats, and borne by considerable persons and families. I fact the practice was introduced whenever the name ad mitted of it, and sometimes when the allusion is very far fetched indeed, as in the boar pig "verres," the crest of D Vere, and the cock for Law, alluding to his cry, cock a leary law! Canting arms were equally common in other countrie In Italy the Colonne, Frangipani, and Ursini families bor a column, a piece of broken bread, and a bear. They wer also common in France, Spain, and Germany.

TINCTURES.

Tinctures (in French, *émaux*) include metals, colours, and furs. The *Metals* are—

Or	Yellow	Topaz	Sol.
Argent	White	Pearl	Luna.

The *Colours*—

Azure	Blue, azur	Sapphire	Jupiter.
Gules	Red, gueules	Ruby	Mars.
Purpure	Purple, pourpre	Amethyst	Mercury.
Sable	Black, sable	Diamond	Saturn.
Vert	Green, sinople	Emerald	Venus.

The *Furs*—

Ermine, Vair, Ermines or Counter-ermine.
Erminois, Erminites, Pean, Vair-en-point, Counter-vair, Potent-counter-potent.

Gules is thought to come from the Persian *gul*, "a rose," but more probably from *gula*, "the throat." The othe terms are French. To the older colours have been adde "sanguine" and "tenné" or tawny, a compound of red an yellow. They are almost unknown in English heraldry and are symbolized, the one by sardonyx and dragon's tail and the other by jacinth and dragon's head. The blazonin by precious stones and planets, and even by the virtues was a foolish fancy of the heraldic writers of the 16th century, and applied to the arms of peers and princes. Gwillin condescends to use it.

A shield is rarely of one tincture only. In the roll o Caerlavrock, however, Sir Eurmenious de la Bretto

> "La baniere eut toute rougeate."

The original bearing of the Gournays of Norfolk seem to have been sable. De Barge of Lorraine bore "azure." The Captal de Buch, who figures in Froissart as a Guyenn knight, bore "or," and Boguet, a Norman knight, bor "argent."

The furs (fig. 2) are all supposed to be formed of th skins of small animals fastened together. Ermine and vai were long the only furs acknowledged, and even now the rest are not common. Ermine (*a*) represents the skin of the animal of that name, and is white powdered with black spots.

In vair (*b*) the skins in shape resemble small escutcheons, the wings representing the forelegs and the point the tail. The fur is that of a sort of squirrel, bluish-grey on the back and white on the belly, and thence called "varus." The skins are arrange alternately argent and azure; and if of other colours the must be specified. There are varieties of vairs, as vair-e

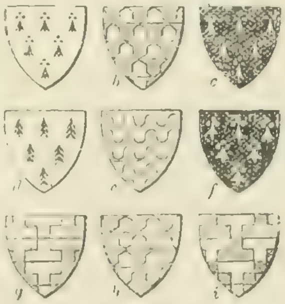


Fig. 2.—Furs.

point, where the point of one escutcheon is placed opposite to the base of that below; counter vair (*h*), where those of the same colour are placed base to base and point to point. At first the vair was drawn bell shaped (*i*).

In ermines (*c*) the field is sable and the spots white, in erminois (*d*) the field or and the spots sable; pean (*f*) is the reverse, having golden spots on a black field. Erminites resembles ermine, save that the two lateral hairs of each spot are red. This fur, however, is seldom if ever used in English heraldry. Guillim in blazoning a fur prefixed the word "purfled."

Potent (*k*) is a variety of vair, and often blazoned as "vair-potent." There is also a form of it called "potent-counter-potent" (*l*). Manchester, of the county of Stafford, bore "potent counter potent, argent and sable, a bend gules." The escutcheons or skins are T-shaped, and resemble a "potence," that is, a gallows or a crutch head.

Ermine and vair are used almost to the exclusion of all other furs. Even erminois is very rare.

The dukes of Brittany, earls of Richmond, bore "ermine" (this was the coat of John de Montfort, duke of Brittany, whose widow married Henry IV.); [illegible], "per pale argent and sable, a saltire engrailed [illegible] ermine;" [illegible], "vair, a [illegible] gules;" Gresley of Drakelow, "vair, ermine and gules;" Calvert, "paly of 6 ermine and pean, a bend engrailed counterchanged."

Of the colours, gules, azure, and sable are by far the most common in early bearings. They contrasted strongly with each other and with the metals. To preserve this contrast, arose the very early and general rule not to place metal upon metal, or colour upon colour. Scott takes the licence of a poet to break this rule in *Marmion*, whose falcon

"Soared sable in an azure field,"

and in *Ivanhoe*, where the black knight bears "a fetterlock and shackle bolt azure, on a field sable." He pleasantly defended himself by quoting the arms of the kingdom of Jerusalem, "argent, a cross potent between four crosslets, all or," which thus violates this fundamental canon. The French call such coats "armes à enquerre." There are a few other less illustrious but early instances.

[illegible], 1300, bore [illegible] on a field sable, five [illegible] 2, 2, 1.

[illegible], a [illegible] gules between three fleurs-de-lis [illegible].

Sir [illegible], *temp.* Edward II.: "d'azure, a six [illegible] [illegible]."

When an object is given of its natural colour it is blazoned as "proper." Thus in the insignia of the order of St George and St Michael we have "the archangel encountering Satan, all proper;" [illegible] the German family of Teufel displays a [illegible] proper. A very striking contrast of [illegible] "counterchanged," where a field is divided between two colours, and a charge placed over the dividing line is also divided between the same colours [illegible].

[illegible], per pale argent and gules, [illegible].

[illegible]

A very convenient practice of representing the tinctures by certain marks and lines arose in the 16th century and is attributed to Pietro [illegible], an Italian. It was devised to allow of the representation of armorial bearings in drawings or engravings where it was inconvenient to colour them. [illegible] the earliest known instance of the use of this method in England to be in [illegible] attached to the death warrant of Charles I. [illegible] Bysshe in Upton, 1654, gives a representation of these marks. Or (fig. 3) is represented by dots or points, silver is plain, azure is represented by horizontal lines, gules by vertical lines, those for purpure are drawn diagonally from sinister to dexter, and those for vert from dexter to sinister. For sable, the lines are vertical and horizontal; for sanguine, diagonal,

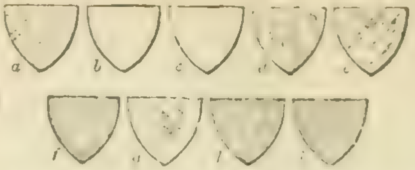


Fig. 3.—Representations of Tinctures. *a*, or; *b*, argent; *c*, azure; *d*, gules. *e*, sable; *f*, purpure; *g*, vert; *h*, sanguine; *i*, tenné.

or in saltire, from right to left and left to right, a compound of purpure and vert; and for tenné, diagonal from sinister to dexter, and horizontal, a compound of purpure and azure.

PARTS OF ARMS.

These are (1) the escutcheon; (2) the ordinaries; (3) partition lines; (4) charges.

The Escutcheon.

The *Escutcheon*, [illegible], or shield, called in blazon the field, upon which all lines are drawn and charges delineated, represents the shield borne in war upon which the arms of the knight were displayed. The figure of the shield varied in heraldry as in war. First came the long pointed, kite shaped shield or "pavesse," slightly convex, and used with chain armour. As late as the reign of Richard I. and John such may be seen on early effigies, commonly but by no means always without armorial bearings, which were not then generally in use (fig. 4). Varieties of this are the heart-shaped or pear shaped shields (fig. 5), and sometimes a shield representing a third part of a cylinder with square top and bottom much used in siege operations. Early in the 13th century was introduced the small heater shaped shield, also triangular, but narrow, short, and somewhat [illegible]. This was in use in the reign of Henry III., and in the Early English period of architecture (fig. 6). The three water bougets of Ros appear on a shield of similar form of the date of Edward I. in the Temple Church (fig. 7). As [illegible] of arms were then simple, this shield was large enough to contain them without crowding, and therefore with well [illegible]. When drawn or carved in architecture it is suspended by its "guige" or shield strap, either upright or by the upper sinister angle, whence it is said to be "couché." Fig. 8 is from the [illegible] seal of Thomas de Beauchamp, earl of Warwick, and shows the form of shield [illegible] part of the Edwardian period.

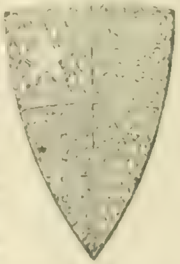


Fig. 4.

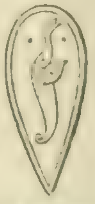


Fig. 5.—From the Bayeux Tapestry.

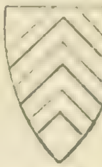


Fig. 6.

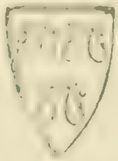


Fig. 7.

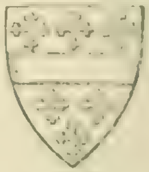


Fig. 8.

As [illegible] and fancy [illegible] came into fashion, the shield also altered its form and became four sided, and concave in the top and side edges, with a central point [illegible] was cut in the upper dexter corner to allow the lance to reach its rest, which projected from the breastplate, as in the shields upon the tower of the chapel of the Babingtons at Dethick, and on their toll house at Kingston (fig. 9). Such shields were called "chancrée," or "à bouche." They are frequently carved as an ornament in the Perpendicular style of architecture. As the shield ceased to be used in war, and was only known as a representation upon tombs or in pedigrees, it was altered to suit the fashionable practice of introducing large numbers of quartered coats, frequently twenty or thirty, and sometimes a hundred, as in an escutcheon of the earls of Huntingdon in Burnham church.

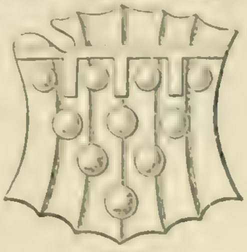


Fig. 9

In the construction of the shield, while actually used in war, great strength had to be combined with as much lightness as possible, and this was attained by the use of cuir-bouilli and plates of horn stretched upon a wooden frame. The cramps and cross pieces employed to stiffen the whole are sometimes seen upon early shields, and are supposed, with much reason, to have been painted or gilded as ornaments, and to have given rise to the bars or ordinaries which predominate in the first simple coats. Our acquaintance with the forms and fashions of the earlier shields is chiefly derived from their representations on tombs, but the actual shield of John of Gaunt was long preserved in old St Paul's, and that of the Black Prince still hangs above his tomb at Canterbury, as do those of his father and of Henry V. at Westminster. An unmarried woman did not place her arms upon an escutcheon, but, whether maiden or widow, upon a lozenge, an early practice in allusion probably to a fusil or distaff. When married she shared the shield of her husband.[1] The lozenge is an ancient usage, being found in the seals of English ladies of the middle of the 14th century, and in Scotland a century later. In modern heraldry the shields of knights of an order are usually oval or circular, called "cartouche" shields, and encircled with a ribbon bearing the motto of the order. When married the knight's arms are blazoned alone within the ribbon, and again represented with those of his wife in a second shield encircled with a plain ribbon, and placed on the sinister side of the other. The dexter side of the escutcheon is that on the proper right of the bearer and therefore on the left of the spectator.

To secure due precision in blazoning, nine points, indicated by as many names, are taken on the surface of the shield. These (represented by the letters in fig. 10) are—at the top in a horizontal line three, the middle, dexter, and sinister chief; at the base three, also horizontal, the middle, dexter, and sinister base; and in the central or vertical axis also three, of which the upper is the honour point, the lower the nombril point, and the middle the fess point—the central point of the shield. The last three are of course in a line with the chief and base middle points.

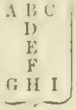


Fig. 10

Before passing to the ordinaries, it will be convenient here to mention a species of decoration applied to the shield, which, though not strictly heraldic, is often used in early heraldry and called "diaper." A shield "diapered," "bretessé," is covered with a ground pattern usually in squares or lozenges with a flower or scroll work in each compartment. The idea is said to be copied and named from the linen cloths of Ypres. An often quoted example of diaper, and a very good one, is the shield of Robert de Vere upon his tomb at Earls Colne (fig. 1). Also the shield of William de Valence upon his effigy in Westminster Abbey is a very fine example of diaper. There the ground is divided into small squares, and each contains a pattern. The row of shields in the tabernacle work of the old chapel of St Stephen's, Westminster, exhibits some fine specimens of diapered work in squares, lozenges, and circles. The shield of Earl Warren at Castle Acre Priory is a good example of diaper, as is the counterseal of Thomas le Despenser affixed to a Kentish charter in 1397 (fig. 11).

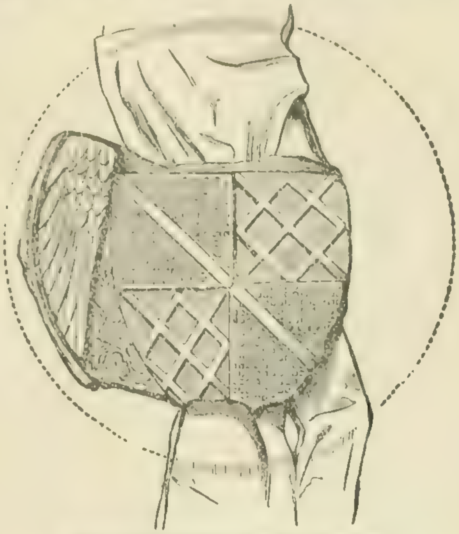


Fig. 11.—Counterseal of Thomas le Despense.

Ordinaries and Partition Lines

The *Ordinaries*, or, as they are called in most heraldic books, "the honourable ordinaries," have been supposed to represent the clamps or fastenings of the shield, converted into ornaments by painting or gilding. They may be regarded as nine in number—the chief, the pale, the fess, the chevron, the bend, the cross, the saltire, the pile, and the quarter. When charged they are drawn somewhat broader than when blank, and each has one or more diminutives. All were more or less in use in the earliest times of heraldry, and they were then drawn more boldly and narrower than is now the custom. When such of the ordinaries as admit of it are cut short so as not to reach to the margin of the field, they are said to be humettée or coupée.

Partition Lines, closely allied to the ordinaries named from them, are the lines by which shields may be divided, and which vary both in direction and pattern. It will be convenient to notice these before proceeding to a detailed account of the ordinaries, as the partition lines will be constantly referred to in the examples. When the field is divided in the direction of an ordinary it is said to be "party per" that ordinary, as party per fess or per bend. Party per chief is rare, party per pile or per quarter unknown; party per cross is called quarterly; party per cross and per saltire is gyronny. When the partition line is mentioned without qualification, it is a straight line, but it may be broken in a variety of ways, as indented, dancette, engrailed, invected, undy, nebuly, embattled, dove-tailed, and raguly. These partition lines in some cases, if not in all, have arisen from the outline of a charge or bearing. Thus Charnels of Snarestoun at first bore eleven lozenges conjoined in cross, which at a later date became a cross engrailed, and fusils in the same way became converted into dancette. In English heraldry the partition lines are per pale, per fess, per chevron, per bend dexter and sinister, quarterly, per saltire, and gyronny.

---

[1] When an [illegible] of a well-known patent [illegible] a short time returned to civil life, it was [illegible]:—

"So [illegible] shield
[illegible],
But when [illegible] of [illegible]
Return to [illegible] arms."

The annexed shield (fig. 12) represents these partition lines. It may be blazoned—quarterly of nine coats: 1. Butler: or, a chief indented azure; 2. Fleetwood: party per pale nebuly, azure and or, six martlets counterchanged; 3. Vavasour: or, a fess dancette sable; 4. ——— or, a chevron invected azure; 5. Boyle: party per bend embattled, argent and gules; 6. Trevor: party per bend sinister, ermine and ermines, a lion rampant or; 7. Lawrence: argent, a cross raguly gules; 8. Botetourt: or, a saltire engrailed sable; 9. ——— party per fess dovetailed, or and sable. A good example of a cross raguly, not an armorial bearing, is found upon a 14th century tomb in the church of [illegible]-yn-Gwynfa in Powysland.

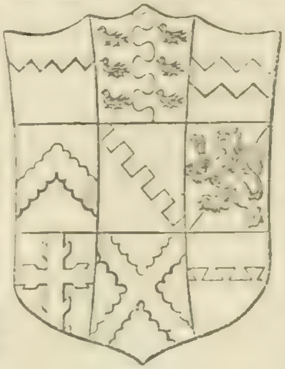


Fig. 12.

The French use parti and coupé for per pale and per fess; they do not part per chevron, but per bend and per bend sinister are tranché and taillé; quarterly is écartelé, and per saltire écartelé en sautoir; gyronny is gironné. Besides these the French have a number of other divisions, as "tiercé," when the shield is divided into three parts, as "tiercé en pal, tiercé en fasce, &c. Tiercé en pal is convenient when the coats of two wives are to be marshalled on the husband's shield.

Formerly such broken lines as were used were not mere margins, but affected the whole ordinary; a fess indented was a *zigzag* and called a daunce or dancette. This practice is still preserved with the line undy. A bend undy or wavy is not a mere bend with a wavy edge, but the whole bend is in waves, whereas a bend nebuly or raguly has merely a particular kind of edge.

Returning to the ordinaries, it may be remarked that very many both of these and of the subordinaries in heraldry are very frequent constituents in mouldings in the Norman style of architecture. The chevron and the billet are amongst the most common. The roundel forms the head moulding of a door at Peterborough, and is inserted in a moulding in the intersecting arches of St Augustin's, Canterbury. The fret, the billet, and the roundel or pellet are largely used in the oldest parts of Malmesbury, and on Lincoln tower is a good example of undy,—and this before the regular employment of heraldic bearings.

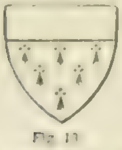


Fig. 13.

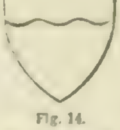


Fig. 14.

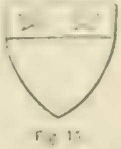


Fig. 15.

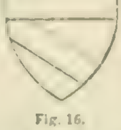


Fig. 16.

1. The *Chief*, chef, caput, is the upper part or head of the shield [illegible] Henry III. [illegible]

[illegible]

2. The *Pale*, pal, palus, is a vertical strip set upright in the middle line of the shield, and one-third of its breadth. One of its earliest examples, if indeed it be not a mere gilt ornament, is ascribed to Grantmesnil, baron of Hinkley, who is reported to have borne gules, a pale or; but the banner of the barons of Hinkley carried by Simon de Montfort was per pale indented, gules and or. The "sable pale of Mar" is the well-known bearing of Erskine, argent, a pale sable (fig. 17), but when it was introduced into Scotland is not clear. In the roll of Henry III. there is not one pale, but there are three examples of paly. Party per pale is also there found. In the roll of Edward II. there is also no pale, but paly or party per pale [illegible] times. The latter is called simply "party".—Plays, "party d'or et goules."

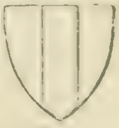


Fig. 17.

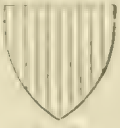


Fig. 18.

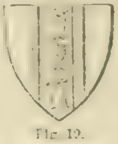


Fig. 19.

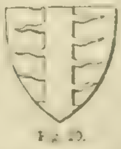


Fig. 20.

The diminutives of the pale are the pallet, one-fourth, and the endorse, [illegible] of the breadth of the pale, both unknown [illegible]. The pallet may be used singly, the endorse only in pairs, one on each side of the pale.

[illegible]

[illegible] earl of Pembroke: party per pale or and vert, a lion rampant [illegible].

[illegible] (fig. 19).

When the pale is repeated, it is blazoned as "paly," and the number of pieces specified.

[illegible]: paly of [illegible] argent and gules (fig. 18).

[illegible]

[illegible] three greyhounds' heads [illegible].

[illegible] sable.

[illegible]: azure, a pale raguly [illegible] (fig. 20).

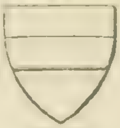


Fig. 21.

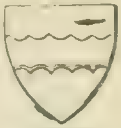


Fig. 22.

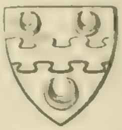


Fig. 23.

3. The *Fess*, fasce, fascia, is a strip placed horizontally across the middle of the shield. It occurs about twenty-five times in the roll of Henry III., and its diminutives about twenty-three times, or forty-eight times in all, against ninety in the roll of Edward II.

[illegible] a fess [illegible]

[illegible] George III. on the shield of Mecklenburg-Strelitz placed a [illegible] party per fess gules and or, for Stargard.

[illegible]

[illegible]: azure, a fess engrailed or (fig. 22). This is a way of describing what is better known as azure, five fusils conjoined in fess or.

The seal of Walter son of Alan steward of Scotland, 1190, gives a fess chequy, [illegible] of the Stewart coat.

[illegible] between three crescents ermine (fig. 23).

[illegible]

[illegible] between three [illegible] or.

[illegible] and argent.

[illegible]

[illegible] argent, three cinquefoils counterchanged.

[illegible] (fig. 24).

[illegible] of the fess [illegible] one-fifth of the field; [illegible] bar. [illegible] and these [illegible]. The bar is [illegible] coat [illegible]. The term fessy is not used.

[illegible]

4. [illegible] the

[illegible] the ten spots. [illegible] part of the [illegible] of the [illegible], [illegible] to have [illegible] a [illegible]. [illegible] it occurs six [illegible] of Henry III., [illegible] its diminutive, [illegible] times. [illegible] in the roll of Edward II. In [illegible] of [illegible], and the [illegible] breadth. The [illegible]. When the [illegible]. [illegible], to the [illegible] of the British army, but of late years has been [illegible].

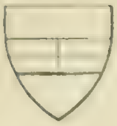


Fig. 24.

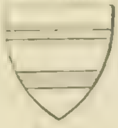


Fig. 25.

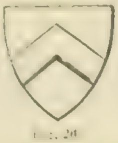


Fig. 26.

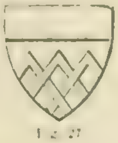


Fig. 27.

[illegible]
[illegible] escallop [illegible].
[illegible]
[illegible]
[illegible] Hugh [illegible] (the word is [illegible].)
[illegible]
[illegible]
[illegible]
[illegible] three [illegible] (fig. 31).
[illegible]

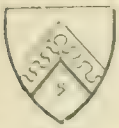
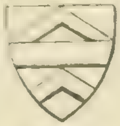


Fig. 28.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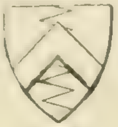


Fig. 30.

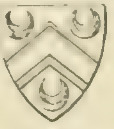


Fig. 31.

5. The *Bend*, bende, benda, is a strip extended upon the shield from dexter chief to sinister base, and in breadth one-fifth of the field. Its diminutives are the *bendlet*, the *baton*, but the bend, and the *cotise*, [illegible], borne in pairs, flanking the bend, and the [illegible] of the bend. The riband is used as a difference, and [illegible] couped or cut short, when it becomes a *baton*, and [illegible]. The baton often marks illegitimacy. The term baton, however, is also applied to the riband.

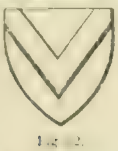


Fig. 32.

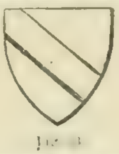


Fig. 33.

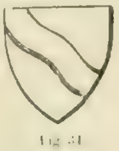


Fig. 34.

Scrope of Bolton: azure, a bend or; a very celebrated example of the bend (fig. 33).
Culpeper: argent, a bend engrailed gules.
[illegible]: argent, a bend wavy sable (fig. 34).
[illegible]: azure, a bend engrailed argent [illegible].
[illegible]: sable, a bend between two [illegible] (fig. [illegible]).
[illegible]: [illegible] argent and gules (see fig. 15).
[illegible]: argent, three [illegible] (fig. [illegible]).
[illegible]
[illegible] (fig. 37).
[illegible]: [illegible] a chief [illegible] over all a bend [illegible].
[illegible] (fig. 38).
Sir [illegible]: argent, on a bend [illegible] three eagles displayed [illegible].
Keck of [illegible]: sable, a bend ermine between two [illegible], flory counter-flory or.

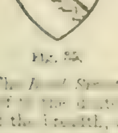


Fig. 35.

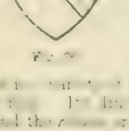


Fig. 36.

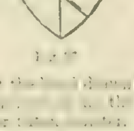


Fig. 37.

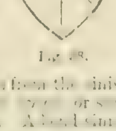


Fig. 38.

The *Bend Sinister* [illegible] from the sinister chief to the dexter base. [illegible] or scarp, half the breadth, and the [illegible]. A bend sinister is a rare bearing and, with its diminutives, is frequently used to express illegitimacy, especially the baton, though sometimes as a difference only.

[illegible] of Durham: party per bend sinister, or and azure, a [illegible].
[illegible]
[illegible]: azure, three fleurs-de-lys or, a baton argent (fig. 40).

6. The *Cross*, croix, crux, needs no description save that in heraldry it [illegible] the Greek cross or that of equal arms. The [illegible] of the shield. It is an early and very common bearing, [illegible] speedily became identified with the emblem of [illegible] popular throughout Christendom—

> "[illegible] semper [illegible]
> [illegible] [illegible]
> [illegible], et pellat omne malignum."

When plain it is blazoned only as "a cross." Thus the cross of St George is "argent, a cross gules," and the statutes of the Temple direct each knight to wear a red cross upon his "cotte d'armes," on breast and back. As a plain cross it occurs six times in the roll of Henry III., and in its varieties eleven times, and in the roll of Edward II. these numbers have risen from 17 to 102, when it was the most popular of the ordinaries.

De Burgh of Ireland: or, a cross gules (fig. 41).
[illegible] of Buckenfield: [illegible], a cross pointed wavy sable, voided.
Ufford: sable, a cross or, [illegible] (fig. 42).

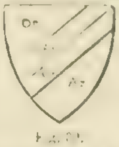


Fig. 39.

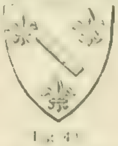


Fig. 40.

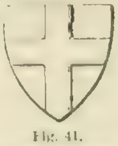


Fig. 41.

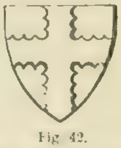


Fig. 42.

A seal of John de Ufford, probably about 1360, bears on a heater shield what would now be described as eight fusils conjoined in cross, and which is an early form of the Ufford coat. There is also a mullet in dexter canton, possibly to mark a younger branch.

[illegible]: argent, a cross wavy, voided, sable (fig. 43).
[illegible], bishop of Durham: argent, six willow wands interlaced in cross sable, [illegible] to his father, who was a basket maker (fig. 44).
Lowther (see fig. 12).

Party per cross or quarterly is an early and popular bearing.

Saye: quarterly, or and gules (fig. 45).
Lacy: quarterly, or and gules, a bend sable.
Fitz Warin: quarterly, per fess indented, argent and gules.
Atkyns of Saperton: argent, a cross sable, bordered with half fleurs-de-lys, between four mullets, sable.
Lamme of Kirkharle: quarterly, sable and argent, a cross counter-quartered of the field.

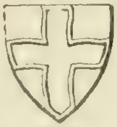


Fig. 43.

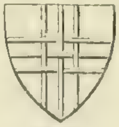


Fig. 44.

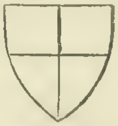


Fig. 45.

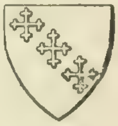


Fig. 46.

When the central square of the cross is removed, it is said to be quarter-pierced, a cross quarter-pierced.

The varieties of the cross are almost innumerable. Edmondson gives 107 of them, and there are many more. Of these it will be sufficient to notice those comparatively few that are older and in general use, as the cross botonny, the cross crosslet, the cross flory, moline, patée, patonce, potent, recercelée, and voided. None of these varieties extended to the margin of the field. When a plain cross does not so extend it is blazoned as couped or humetty.

The cross botonny, treflée, or modulata has each limb capped by a trefoil, or sort of button.

Northcote of Pynes: argent, three crosses botonny sable, palewise in bend (fig. 46).

The cross crosslet has its extremities crossed. It is usually borne as a charge in numbers, but not always.

Westerby: argent, a cross crosslet [illegible].
Beauchamp, earl of Warwick: [illegible] six cross crosslets or (fig. 8).

When the lower limb is [illegible] and pointed it is "fitchy."

[illegible]: argent, a cross [illegible] (fig. 47).

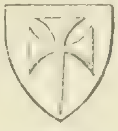


Fig. 47.

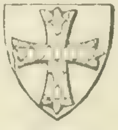


Fig. 48.

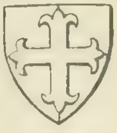


Fig. 49.

The cross patée was the emblem of the Knights of St John, and is [illegible] "[illegible] Maltese." The cross patonce has expanded ends like the cross patée, but each terminates in three points. Patée and patonce are not always distinguished. At

---

[1] [illegible] or [illegible]. When [illegible]. The [illegible] is a parapet or an embrasure, the [illegible]. When [illegible] a smaller merlon is placed on the first, the battlement is said to be stepped.

[illegible] Latimer is described as bearing a cross patée, whereas the original seal of the family has gules, a cross patonce or.

W[illegible] de F[illegible], [illegible]: gules, a cross p[illegible] (fig. 49).

The cross flory or fleuretée is capped in a similar way by fleurs-de-lys.

[illegible] of Lampleigh, argent, a cross flory sable (fig. 50).
L[illegible], a cross flory argent.

The cross moline is so called from the fer de moline, or millrind, the iron clamp of the upper millstone. When the millrind itself is borne it is pierced, but the cross moline is not necessarily so. Its extremities are split, curved outwards, and cut off square. It is an early bearing. When pierced, this must be specified.

Bec of Eresby, gules, a cross moline argent.
Molyneux of Sefton, azure, a cross moline, quarter pierced or (fig. [illegible]).

The cross potent, potence, or crutch or gibbet headed, has its extremities T-shaped.

An early example is seen in the arms of Jerusalem, argent, a cross potent between four crosslets or (fig. 51). Originally, however, the arms of the cross ended in knobs like the handles of a pilgrim's staff, then called "potents."

The cross patonce has both the ends split and curled outwards, but differs from the cross moline in having them pointed. The two bearings were frequently confounded, and while the [illegible] bore a cross moline, Bishop Antony Bec, his brother, is described as bearing a cross patonce.

The cross voided is the outline only, called by the French "une croix faux," the field is seen through it. The cross [illegible] is usually also voided.

The [illegible] of C[illegible] bore "une [illegible] faux [illegible] de gueles [illegible]" (fig. 52).
Hasting, temp. Edward III., azure, a cross [illegible] voided or.

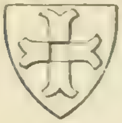


Fig. 50.

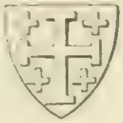


Fig. 51.

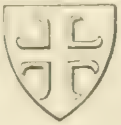


Fig. 52.

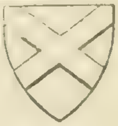


Fig. 53.

The cross formée is peculiar among these varieties, inasmuch as its extremities reach the edge of the field. In other respects it resembles the cross patée.

Lawley of Spoonhill, argent, a cross formée chequy, or and sable.

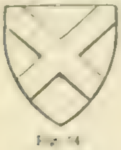
Among the other, later, and but little used varieties of the cross may be mentioned the avellane, ending in filbert husks; the cross anchored, of which the limbs terminate in anchors; the cross of the crucifixion or of Calvary, mounted on steps. A cross with a narrow border of another colour is "fimbriated"; a cross pointed is where the ends are so cut.

7. The saltire, saltier, or sautoir, is known as the cross of St Andrew, and is a common [illegible] in Scottish coats of arms. The origin is said to be a sort of stirrup or [illegible] loop suspended from the saddle, by the aid of which the knight leaped into his seat. Such a stirrup distinctly appears on the seal of Patrick, earl of March, on his [illegible], and on the seal of an early Despencer, and this is the only suggestion that accounts for the name. The saltire is in breadth one-third of the field.

The Scottish ensign is azure, a saltire argent; that of St Patrick, argent, a saltire gules. Neville bore

"A saltire [illegible] upon martial red,"

that is, gules, a saltire argent (fig. 54).
B[illegible] (fig. 55).
G[illegible] (fig. 56).
G[illegible].
B[illegible].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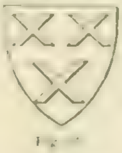
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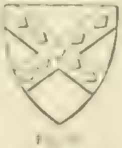
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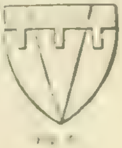


Fig. 57.

[illegible]

[illegible]

[illegible] the point [illegible]. It has been derived from the Roman *pilum*, a military weapon, and from the pile of the engineer. The origin is obscure, but it is a very early bearing. It has no diminutive.

Sir John Chandos, as Froissart often tells us, bore "d'argent, a ung pel de gueles, e un label d'azure" (fig. 57), and his ancestor Robert, *temp.* Henry III., bore or, on a pile gules three estoiles, between six of the same, counterchanged, an unusually complicated bearing for that age.

[illegible]: or, a pile engrailed sable.

Frequently more piles than one were used, generally three, when they are to be blazoned as meeting in base.

B[illegible], three piles [illegible] meeting in base (fig. 58).
K[illegible], three piles sable, one issuant from the chief between two from the base.

When the base of the pile is applied to any other part of the shield than the chief, it must be specified. The pile was used by Henry VIII. [illegible] for some of his grants of augmentation.

8. The quarter, or [illegible], occupies the dexter chief quarter of the shield. If placed in the sinister quarter, this must be specified. Its diminutive is the canton, of two-thirds its size. Both [illegible], but in the roll of Henry III. the quarter appears [illegible] in later rolls are [illegible] with the canton. [illegible] frequently [illegible]. When either occurs in conjunction with another [illegible] or ordinary, they are placed above it, and [illegible] the field. Both are used as [illegible] differences, as [illegible] the families of Zouche and Basset, and both are always borne with straight edges. A canton is also called a corner, and a cross between four crosses is said to be cantoned of them.

De C[illegible], or, a quarter gules (fig. 59).
S[illegible], a quarter ermine.
S[illegible].
Samuel Clark, [illegible], a fleur-de-lys [illegible], a canton ermine (fig. 60).

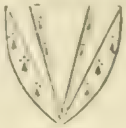


Fig. 58.

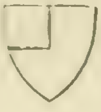


Fig. 59.

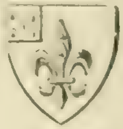


Fig. 60.

Subordinate Ordinaries.—These are the border, the inescutcheon, the orle, the tressure, the fret, the gyron, the flanche, the lozenge, the fusil, the mascle, the rustre, the roundel, guttes or drops, the billet, and chequy.

The *Border*, bordure, fimbria, or limbus, though a very old and independent bearing, was frequently used as a difference, and occasionally as a mark of illegitimacy. It is what its name expresses, and its breadth is one-fifth of the field. When used in an impaled coat the border is not continued round the inner side, in fact it is dimidiated. In old examples this was not always attended to. In a quartered coat the border is borne complete.

Sir [illegible], temp. Edward III.,

"[illegible]
[illegible]."

bore "[illegible]."
Ro[illegible], a border [illegible], or and sable (fig. 61).

Hamelin, illegitimate brother of Henry II., seems to have borne around his arms, on a border gules, eight leopards passant or. This was before [illegible]. The augmentation granted by Henry VIII. to [illegible], marquess of [illegible], was a border quarterly of England and France, the fleurs-de-lys and lions [illegible], or in orle (fig. 62).

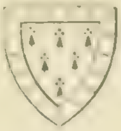


Fig. 61.

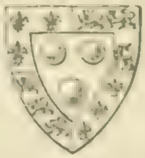


Fig. 62.

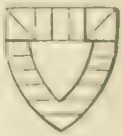


Fig. 63.

The *Inescutcheon*, or escutcheon, is a small shield borne within and upon the principal one. It occurs in the earliest rolls, and when voided becomes an orle.

[illegible]

The [illegible], voided, and is then [illegible] called by the French a faux escutcheon.

John de Baliol: "De goules ove ung faux escocheon d'argent," that is, gules, an orle argent (fig. 65).
W[illegible]: argent, [illegible] within an orle of martlets sable (fig. 66).

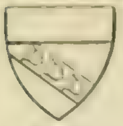


Fig. 64.

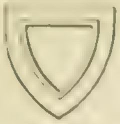
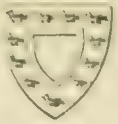


Fig. 65.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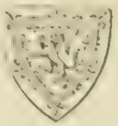


Fig. 67.

The Tressure is in fact a narrow orle, almost always borne double, and usually flowered. [illegible], but is set with fleurs-de-lis placed alternately, the upper and the lower half on each face of the tressure, when it is blazoned "flory counter-flory." Thus, in the Scottish royal arms, [illegible] the early alliance between that country and France. The bearing is, or, a lion rampant within a double tressure, flory counter-flory, gules (fig. 67). The tressure was a common grant of augmentation from the crown for services or in memory of an alliance. Scott of Thirlstane had it from James V., and bore or, a bend azure, charged with a mullet pierced, between two crescents of the first, the whole within a double tressure flory-counterflory of the second—

"The tressured fleur-de-luce he claims
To wreath his shield."

The Fret was originally borne fretty, representing a trellis. The single fret is very rare in ancient arms, but many of those families who at first bore fretty afterwards bore a fret. Fretty is usually composed of eight pieces.

Maltravers: sable, fretty or, which was later borne and continued as the fret or (fig. 68).

When nailed at the joints it is said to be clouée.

Trussel: gules, a trellis (fretty) clouée or.
Harrington: sable, a fret argent, commonly known as a Harrington knot (fig. 69).
Vernon of Sudbury: argent, a fret sable.

The Gyron, also an old bearing, is the lower half of a quarter divided diagonally. It is a Spanish ordinary, and said to come from "giron," a gusset. It is seldom borne singly, and usually is gyronny, when the shield is divided per pale, per fess, per bend dexter and per bend sinister into eight sections. If more, the number must be specified. In the earliest examples the divisions are twelve.

Bassingbourne: gyronny of twelve or and azure.
Campbell: gyronny of eight or and sable (fig. 70).

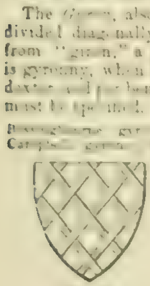


Fig. 68.

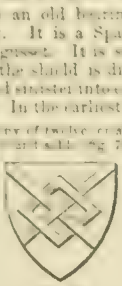


Fig. 69.

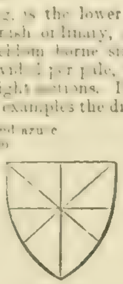


Fig. 70.

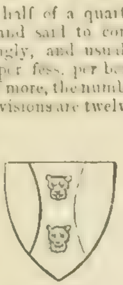


Fig. 71.

The Flasque, or flaunch, is the segment of a circle taken out of the two sides or flanks of the shield, the margin of which forms the chord. They are always used in pairs, one on each side. This bearing is not of great antiquity.

The Voider, the diminutive of the flasque, has a flatter curve. The voider in defensive armour was a gusset-piece either of plate or of mail, used to cover a void or unprotected space at the elbow or knee joints.

Frere: gules, two pards' faces between as many flasques or (fig. 71), alluded to in Whistlecraft by Mr Hookham Frere—

"Two leopards' faces were the arms he bore."

When the bearer was asked to give some verses descriptive of his arms to be placed at the head of a history of the family, his answer was—

"The flasques, on our field of gules,
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] having,
[illegible] matches,
[illegible]
[illegible] father's led;
[illegible]
[illegible]
[illegible]

The lozenge, the mascle, and the rustre are all derived from the fret or fretty, and do not appear originally to have been used singly.

The Lozenge is a square set up diagonally like the diamond in playing cards. It is seldom used alone, and when the shield is covered with it, it is called lozengy.

Fitzwilliam: lozengy, argent and gules (fig. 72).
De Burgh: gules, seven lozenges vair, conjoined 3,3,1.

The Mascle, or rather masculy, for originally it was so used, is said to represent a net.

Rokele of Suffolk: masculy, gules and ermine.
[illegible] of Stoke [illegible]: [illegible], argent and gules.
De Quincy, earl of Winchester: "[illegible] six mascles d'or, voydés du champ," and afterwards, gules, seven mascles or, conjoined 3,3,1 (fig. 74).

The Rustre is of late introduction, and is not a common bearing. It is a lozenge pierced in its centre by a round hole.

Custance: or, a rustre sable (fig. 73).

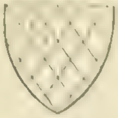


Fig. 72.

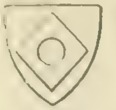


Fig. 73.

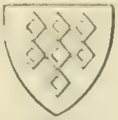


Fig. 74.

The Fusil is an elongated lozenge, from the French fuseau, a spindle, and is supposed to represent a distaff charged with yarn. A very early example of its use is

Montacute: "d'argent [illegible] fess engrelé de goules de trois pieces," which [illegible] "argent, three fusils conjoined in fess gules" (fig. 75).
William of Waynflete and W[illegible]: fusily, ermine and sable, a canton or (fig. 76).

It has been suggested that the Percys derived their fusils from their lordship of Spindleton.

Trefusis of Trefusis: argent, a chevron between three spindles sable.

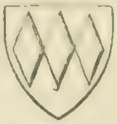


Fig. 75.

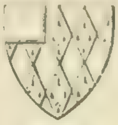


Fig. 76.

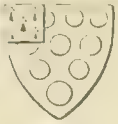


Fig. 77.

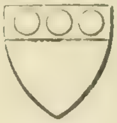


Fig. 78.

The Roundel, if of metal, is a simple disk; if of colour, it is convex, half a globe. It is seldom borne singly, and is named specially from its colour.

If Or, a Bezant.
,, Argent, a Plate.
,, Azure, a Hurt.
,, Gules, a Torteau.
,, Sable, a Pellet, Gunstone, or Ogress.

If Vert, a Pompey.
,, Tenny, an Orange.
,, Sanguine, a Guze.
,, Purpure, a Golpe.

The last four are almost unknown in English heraldry. Akin to these is the fountain, a disk barred wavy, argent and azure, to represent water. Although bezants, plates, hurts, and torteaux are given in early rolls of arms, their names do not always carry their colours. They are blazoned as roundels d'or, pelottes d'argent, torteaux de goules. The torteau is sometimes called a séruse. The pellet often stands for the roundel, and the bezant is called a talent, from a coin of that name current with the bezant in the East.

Alan La Zouch: Gules, bezanty. This was afterwards reduced to ten bezants, 4,3,2,1, with a quarter and sometimes a canton of Brittany, that is, "ermine" (fig. 77).
Camoys: or, on a chief gules three plates (fig. 78).
Wellesley: gules, a cross argent between twenty plates, 5,5,5,5.
Baskerville of Old W[illegible]: argent, a chevron between three hurts (fig. 79).
Hurting: argent, ten hurts, 4,3,2,1.
Courtenay: or, three torteaux (fig. 62).
Babington: argent, ten torteaux, 4,3,2,1, a label azure (fig. 9).
[illegible]: sable, on a cross between twelve billets argent three golpes.
Greville: sable, on a cross engrailed or five pellets.
Bridgeman: argent, ten ogresses, on a chief a lion rampant of the second.
Stourton of Stourhead: sable, a bend or between three fountains (fig. 81).

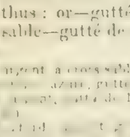


Fig. 79.

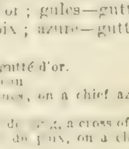


Fig. 80.

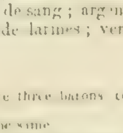


Fig. 81.

In early lists the annulet is blazoned as a false roundel; thus Vipont is said to bear gules, six false roundels or.

Gutté or drops are represented pear-shaped with a tail like a Rupert's drop, or the tears on funeral draperies. They are not found in the earliest coats. They, like roundels, are named from their colour, thus: or—gutté d'or; gules—gutté de sang; argent—gutté d'eau; sable—gutté de poix; azure—gutté de larmes; vert—gutté d'huile.

M[illegible]: argent, a cross sable, gutté d'or.
W[illegible]: azure, gutté d'eau.
K[illegible]: [illegible], gutté de larmes, on a chief azure three [illegible] coronets or (fig. 80).
[illegible]: [illegible] gutté de sang, a cross of the same.
Chichester city: [illegible], gutté de poix, on a chief indented gules a lion of England.
Marshal: argent, on a fess gules three drops ermine.

The B[illegible] or d[illegible] is a small parallelogram usually borne in numbers, [illegible] on one end.

Coudray: [illegible].
Delves: argent, a chevron gules, fretty or, between three delves sable (fig. 82).

Somewhat akin to these subordinaries is a division of the field [illegible] chequy, where the field is divided into small squares like a chess-board. Their number is not specified, but usually is made [illegible] squares in a line, and in depth according to the length of [illegible]. Hugh, earl of Vermandois, is said to have borne chequy, [illegible] and azure, and as his daughter married Warren, it is possible that the earls of Surrey thence derived their well-known coat

Warren.—Chequy, or and azure (fig. [illegible]).
T[illegible].—Chequy, [illegible] and gules, a [illegible].

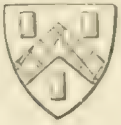


Fig. 82.

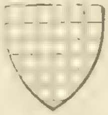


Fig. 83.

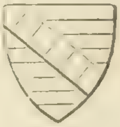


Fig. 84.

Chequy was not confined to the field, but was also applied to the charges upon it.

Stuart.—Or, a fess chequy, argent and azure.

Where there is but one row of squares, the bearing is called *gobony* or *compony*, if of two rows *counter-compony*.

[illegible], barry of six, argent and azure, a bend compony of the first and gules [illegible].
Fitzroy?—gules, a border quarterly, ermine and counter-compony or and azure.

Common Charges.

Next to the purely heraldic figures connected with the shield and their diminutives and subordinaries, come those imported into heraldry as charges from all quarters, including an immense variety of objects, natural and artificial, beasts, birds, fishes, reptiles and insects, flowers, and the fruits of the field, chimerical, astronomical and celestial figures, men and their parts, arms and armour, implements of war and the chase, ships, articles of dress, and a miscellaneous budget far too heavy to enumerate.

The rules for the placing of these charges are simple. If single, they stand in the centre of the shield; if two, in pale, or one over the other; if three, 2 and 1; if the number is larger the order must be specified (see fig. 85). The French carry the unexpressed understanding much further. With them, four pieces are placed 2 and 2; five pieces, in saltire; six are 3,2,1; seven are 3,3,1; eight are in orle; and nine are 3,3,3.

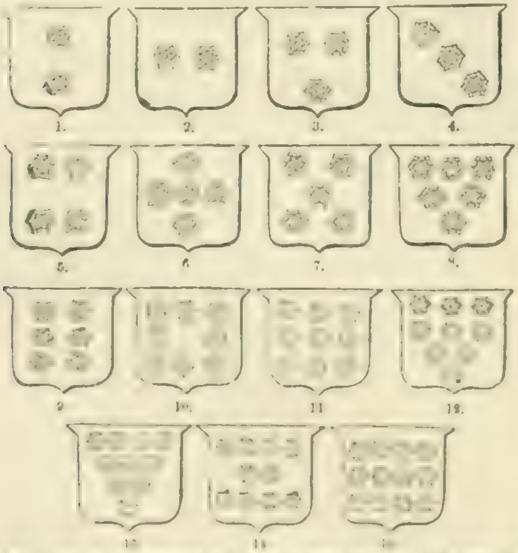


Fig. 85.—[illegible]

Animals.

[illegible]

looking towards the dexter side; when to the sinister, the word "counter" is prefixed, "a lion counter-passant." Animals back to back are "addorsed"; face to face, "confronted"; facing the spectator, "guardant," or "affronté"; looking back, "regardant"; when rising out of the edge of an ordinary, "issuant"; when out of the middle of it, "naissant." When the claws, horns, tongues, hoofs, or mane are shown of a special colour, the animal is "armed," "attired," "langued," or "[illegible]," "unguled," or "crined." Sometimes he is crowned [illegible], sometimes "collared," "gorged" or "accollée." When a [illegible] "[illegible]."

When of its natural colour an animal is "proper," but it may be of any metal, colour, or fur, and divided by any partition lines. When a head or member is torn off it is "erased"; when cut off "couped." When men are clothed, they are "habited"; when naked, they are "salvage."

QUADRUPEDS.—Of these the *Lion* is by far the most important, nor is he peculiarly confined to England. He appears not only in the British arms, but in those of Spain, Holland, Denmark, Bohemia, and Saxony, [illegible] of Edward II.'s [illegible], 125 [illegible]. The favourite attitude is rampant, but he may be passant, salient, statant, sejant, couchant, or dormant. [illegible] writers, but [illegible] other than rampant or passant. Sometimes he is borne [illegible], especially as a crest. His paws or jambs are also borne, and his tail [illegible] or two tails [illegible]. The [illegible] "[illegible]," that is, his head and paws and the end of his tail are cut off. When [illegible] "[illegible]." [illegible] sometimes [illegible], and there are [illegible], though not many. When [illegible], they become [illegible] of lions' [illegible].

[illegible] 1127 Henry I. [illegible] the lion [illegible] the [illegible] of the [illegible]. A [illegible] of Mons, [illegible] the [illegible] in the forest of [illegible] or Lyon in Normandy; his wife Adeliza was a daughter of Godfrey, duke of Louvain or [illegible], a [illegible] which [illegible] gave rise to the lion [illegible].

W[illegible], Henry's grandson, sealed with a lion. [illegible], who married a granddaughter of Henry, [illegible] earl of [illegible], who [illegible]. W[illegible], who married Henry's [illegible]. At this [illegible] period when armorial [illegible] established institution, and when [illegible] open to assume a bearing [illegible], it seems probable that to Henry I. we [illegible] English heraldry. [illegible] the [illegible], and [illegible] for the general adoption of the [illegible] of arms. In heraldry a "lion passant guardant or" is always blazoned as "a lion of England."

The [illegible] of the lion of England with the leopard has been the [illegible] controversy, and when Napoleon [illegible] of driving the leopards into the sea he [illegible] the word in disparagement [illegible]. The early heralds, who [illegible], seemed to have [illegible] the lion with the leopard, [illegible] of the [illegible]. [illegible] a lion [illegible] attitude, [illegible] leopard, but never drawn spotted like a [illegible] leopard. As [illegible] into use, [illegible] to the leopard [illegible], though as late as the reign of Edward III. and [illegible] II. [illegible] leopard, and Henry V. [illegible] leopard [illegible]. [illegible] the [illegible] of Arundel, [illegible] Mowbray [illegible] when

[illegible]
W[illegible]
Th[illegible]

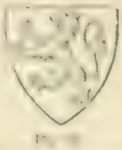


Fig. 86.

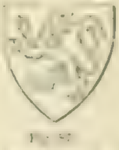


Fig. 87.

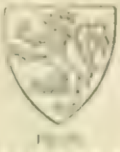


Fig. 88.

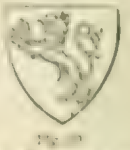


Fig. 89.

[illegible]

Me[illegible] of Castell y Merach: argent, a lion rampant [illegible] sable (fig. [illegible]).
[illegible]: gules, a lion rampant [illegible].
[illegible] (fig. [illegible]).
[illegible] to which [illegible] —

"[illegible]
[illegible]."

Sir [illegible] de F[illegible] (fig. [illegible]).
[illegible] by a bendlet [illegible].

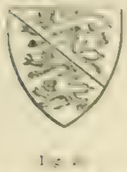


Fig. [illegible]

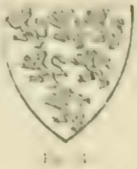


Fig. [illegible]

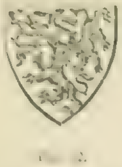


Fig. 92.

The lion [illegible] that of Percy and Talbot.
[illegible]: gules, a [illegible] crosslets, argent, [illegible].
[illegible].
[illegible].
[illegible] parts of the [illegible], armed and langued [illegible].
A [illegible] a fess, in base a [illegible].
[illegible] (fig. [illegible]).
[illegible] passant [illegible].
[illegible] or (fig. [illegible]).
[illegible].
[illegible].

Fig. [illegible]

Fig. [illegible]

Fig. [illegible]

Fig. [illegible]

The *Leopard*, that is, the [illegible] spotted animal, is seen now and then in coats of arms, but is of much later introduction than the lion, [illegible]. Thus Sir [illegible] as bearing "gules, two leopards passant de[illegible]; these most certainly were lions. A coat of [illegible], a leopard rampant argent, in that case [illegible]. He is [illegible] pard.
Ca[illegible], three pards' heads [illegible] fleurs-de-lys or (fig. 98).
[illegible] pards [illegible].
H[illegible] under [illegible]: sable, three pards' heads jessant [illegible].

The heraldic *Tiger* is neither a common nor an early bearing. To the [illegible] of the wolf he adds the tail of a lion, and he is studded with tufts of hair.

The supporters of Hastings, earls of Huntingdon, are two man-tigers affrontés.
Lone of [illegible]: a tiger passant or.
Hur[illegible] of Wingerworth: azure, a fess between three heraldic tigers' heads erased or.

The *Wolf*, when salient, is said to be "ravissant."
Lovett of Astwell: gules, three wolves passant sable, in pale.

The wolf, the bear, the hart, and the hare were the four heraldic beasts of venery. Dame Juliana Berners says:—

"[illegible] beastes of venery [illegible] are:
The first of them is the hert, the second the hare,
The [illegible] of them, the wolf, and [illegible] one moo."

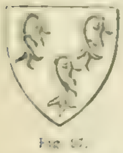


Fig. 97.

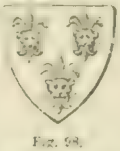


Fig. 98.

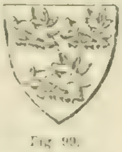


Fig. 99.

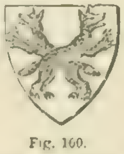


Fig. 100.

The *Bear* is the only beast besides the lion borne in the roll of Henry III., where [illegible] Swyneburne bears "de geules, a trois [illegible] (fig. 99), a bearing which, however, the [illegible] "per [illegible] gules and [illegible], two [illegible] derived from Umfraville. The [illegible]. The "glory of the [illegible] bear" is [illegible]." He is also [illegible].

[illegible] a bear sable.
[illegible] was the cognizance of Richard III., with a thorn bush—
"[illegible]
[illegible]
Walk [illegible] the thorny shade."
It is the crest [illegible] of the clan Campbell.

The *Boar* is also a beast of heraldry.
Beresford: argent, a bear rampant sable, muzzled, collared, and chained or.
[illegible]: a bear passant sable.

The *Fox*.

Williams: argent, two foxes salient counter-salient in saltire, gules, the dexter surmounting the sinister (fig. [illegible]).

The *Cat-a-Mountain*, muston, or wild cat, was long preserved in Rockingham forest, the country of Catesby, the first of the well-known trio—

"The cat, the rat, and Lovel our dog."

Catesby, however, bore argent, two lions passant [illegible] sable, crowned or.
Keate: [illegible], three [illegible] cats passant in pale sable.

The [illegible] was the emblem of Burgundy and the arms of an im[illegible] cat [illegible] to have been granted by Childebert to a knight who [illegible] Gundebert of Burgundy.

In the following dialogue from [illegible] *[illegible] of Gentrie* the reader will [illegible] in Quentin Durward.

"[illegible], begin and tell your sovereign [illegible]."

"[illegible] a [illegible] passant gardant [illegible] (fig. 101).

"[illegible] by my vaye, [illegible] such trading things. Why, this is [illegible] full of wild her dayn that we giffe she [illegible] to kepe it."

The *Dog*.—The [illegible] talbot supports the shield of the earls of Shrewsbury. "The talbot ever true and faithful to the crown." In the [illegible] of Sir [illegible] at [illegible], 14[illegible]2, the knight [illegible] whose collar is marked "Jakke."

[illegible]: sable, [illegible] three talbots' heads erased or.
[illegible]: gules, three [illegible] or levriers courant in [illegible].

The [illegible] was in great request. Those of Henry VIII. [illegible] on their collars. Fienes, Lord Dacre, used it as a supporter.

The [illegible] and *Hart* [illegible] old, though not of the earliest bearings. The stag appears in the roll of Edward II. When in motion he is trippant; when lying down he is lodged. His antlers are his "attires;" a pair of [illegible] attached to a fragment of the skull bone forms "a massacre." The head is usually borne full-faced, when it is said to be [illegible] or [illegible].

Green of Gre[illegible]: [illegible], three bucks trippant or.
[illegible]: [illegible] a stag's head caboshed argent, attired or, and between the attires a cross pattée fitchy of the third, transfixed through the nostrils by an arrow [illegible], barbed and feathered of the second. This is called a stag of St Hubert (fig. 102).
The kingdom of [illegible]: or, three attires of a stag barwise in pale sable.
Cocks: sable, a chevron between three massacres argent.
Roper: per fess, [illegible] a pale and three [illegible] bucks' heads counterchanged.
John Tire who, *temp.* Edward II., was son and heir of Alicia de Hertley, bore "a hart's head cabossed."

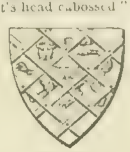


Fig. 101.

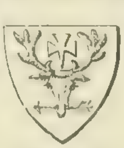


Fig. 102.

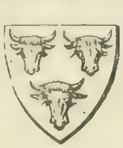


Fig. 103.

The stag's head was the emblem and armorial bearing of the M'Kenzies, whose chief, the lord of Kintail, was called by the Highlanders "Caberfaigh"—

"Proud chief of Kintail,
Let the stag in thy standard bound wild in the gale."

The heraldic *Antelope*, or agacella, somewhat resembles a tiger, but has horns and hoofs. Brooke, Lord Cobham, had for a dexter supporter an agacella, horned, tusked, and armed or.

The *Elephant*.

Elphinstone: gules, an elephant passant argent, tusked or.
Saunders of Woolford: per chevron, sable and argent, three elephants' heads erased counterchanged.

The *Bull*, or buffler, in his wild state was a formidable animal, and is used heraldically, though more frequently as a crest, supporter, or cognizance, than in arms.

"Mightiest of all the beasts of chase
That roamed in woody Caledon."

Front de Bœuf, a real Norman name, probably bore no arms, though Scott appropriately gives him the bull's head. The head [illegible] was a Welsh bearing; and when the horns and hoofs are noticed, he is said to be armed or corned and unguled. The bull's head is the crest of Hastings and Nevill, and the pied bull a well-known cognizance.
Sh[illegible]: argent, three bulls' heads [illegible] sable, armed or (fig. 103).

The *Calf*.

Le Veal of [illegible] St Fagans in Glamorganshire: argent, on a bend sable three calves or.
Calverley: [illegible] a fess gules three calves [illegible].

The *Horse*, the support of the equestrian order, does not appear in early coats of arms, although the winged horse was a cognizance of the order of the Temple. A grey horse is a liard, a bay a bayard. When in the field he is free, when in harness barded and caparisoned.

Trevelyan of Nettlecombe, whose ancestor is supposed, in Cornwall, to have come out of the sea at the Land's End [illegible], incongruously enough, upon a land horse, bears gules, a demi land horse issuant from the water, all proper.

Horsey of Melcombe-Horsey: azure, three horses' heads couped, bitted, and reined or.

The *Ass*, probably the wild ass endued with sublimity in the book of Job, found a place on the shield of the old Cheshire family of Hockenhull, argent, an ass's head erased sable.

The *Ram*.—Recently a valuable silver dish was fished up from Whittlesea Mere, having rams' heads at each end, evidently once the property of the Abbey.

Ramsey Abbey, "Ramsey the rich," bore or, on a bend azure three rams' heads couped argent, armed of the field.

The *Sheep* is occasionally seen, but the *Lamb* from its religious association was in general use. The Paschal Lamb was one of the cognizances of the Templars, and is adopted with equal propriety by the gentlemen of the long robe. As the "Lamb and Flag" it is known extensively in South Wales. Price of Park and other descendants of Jestyn ap Gwrgant bore it as a crest.

Lambton of Lambton: sable, a fess between three lambs trippant argent.

The fleece of the sheep gave name to the great Burgundian order, and the toison d'or was its jewel. It probably refers to the pastoral wealth of Burgundy, but is said to have been founded by Philip the Good, in allusion, not to the bad faith of Jason, but to the prowess of Gideon.

The *Goat*.—William de Capraville bore a goat "exsiliens."

Thorwold of Marston: sable, three goats saliant argent.

The *Coney*.

Coningsby of Hampton Court: gules, three coneys argent.

The *Otter*.—L'outre was used as a supporter by Luttrel of Dunster.

The *Squirrel*.

Nutshaw: argent, a squirrel sejant nibbling a nut, all proper, from a hatchment in [illegible] Church.

The *Hedgehog*, herison, erizius.—In the church of Gamelston, Notts, is a fine effigy in chain mail of the end of the 13th century, of one of the family of Heriz, and on the shield are three hedgehogs. They bore azure, three hedgehogs or. The hedgehog is also borne by the Maxwells for the lordship of Herries.

The *Mole*.

Mitford of Mitford: argent, a fess sable between three moles proper.

The *Ermine*, the fur of which is borne widely, is scarcely known in heraldry as an animal. The reader will, however, remember the three [illegible] in the windows of Waverley House.

Birds.—The bird of heraldry before all others is the *Eagle*, the symbol of the fourth evangelist. Its earliest and chief popularity was in Germany, where it was adopted by the empire and by many of the principal sovereign princes.

It appears but twice in the roll of Henry III., but after his brother Richard, earl of Cornwall, became king of the Romans, he adopted the eagle, which on that account was to be seen in all the armorial glass of the midland churches, and was widely copied in private coats of arms. His son Edmund, while bearing "Cornwall" for his arms, suspended his shield from the beak, and placed it on the breast of an eagle in reference to his father's rank. In the roll of Edward II. there are forty three examples of eagles.

The nobles of the old Holy Roman empire place their shields upon [illegible] eagle, [illegible] in England in the insignia of the duke of Marlborough as a prince, and of the earl of Denbigh and Lord Arundell of Wardour as counts, of that empire.

The Imperial eagle is always represented with two heads, the origin of which is obscure. The emperor Frederick II. on his contemporary shield in Westminster Abbey has a single-headed eagle. The second head is supposed to have been produced by the dimidiation of two [illegible], but [illegible] probable. The [illegible]. Some of the North Wales gentry, [illegible] Wynn, [illegible] eagle, [illegible] headed, [illegible] Scotland. [illegible] of Edward II. [illegible] husband's arms [illegible].

[illegible] Austria, [illegible] Russia, imperial [illegible] Moravia, [illegible] Ireland, and France, [illegible] Gray, Weston [illegible], in Scotland. The [illegible].

The [illegible], with the [illegible] expanded, — what [illegible].

[illegible] In the roll of Henry III. [illegible]

Dru de Barenton bore sable, three eagles or, and his descendents in the reign of Edward II. had increased the number to six and gave them argent. Piers Gaveston bore six eagles upon his shield and horse furniture.

Peter, earl of Richmond and Savoy, who built the Savoy Palace in 1250, and was uncle of Eleanor, queen of Henry III., on the shield of his monumental effigy at Aqua Bella bears an eagle for Savoy. The cross, the later arms of that house, appears on the pommel of his sword. Long before this, about 1142, when Mathieu de Montmorenci married Adela of Savoy, he added four alerions or eaglets to his arms, probably in compliment to his wife, who bore an eagle displayed; and certainly in 1266 the acknowledged arms of the house of Savoy were an eagle.

Parts of birds, especially of eagles, are borne, as the head, wings, legs, and feathers. When feathers are used, and the quill is of a special colour, they are said to be quilled. When a bird is leaving the ground it is "rising," when on the wing it is "au vol," when the wings are down it is "closed," when open "disclosed."

Bedingfeld of Oxburgh: ermine, an eagle displayed barry argent and gules (fig. 104).

Glynne of Hawarden: argent, a two-headed eagle sable (fig. 105).

Culcheth of Culcheth: argent, an eagle [illegible] proper on a child in a mantle gules, swaddled or. This is the crest of Stanley, well known in Lancashire as the bird and bantling.

Aubrey of [illegible]: azure, a chevron between three eagles' heads erased or.

Seymour: gules, two eagles' wings conjoined in lure or (fig. 106).

Bray of Shere: argent, a chevron between three eagles' legs erased à la quise ("cuisse," that is, removed at the thigh) sable, armed gules (fig. 107).

Fig. 104.

Fig. 105.

Fig. 106.

Fig. 107.

The *Falcon*, as an accessory to field sports, was much esteemed and is often borne in heraldry. It is also called a gerfalcon, peregrine falcon, and tiercelet. The falcon is usually borne with the jesses or leather thongs about its legs, sometimes with a hood and bells. It is then jessed, hooded, and belled. When feeding it is "at prey." The lure was a bunch of feathers towards which the bird was taught to return. On the seal of Alice, countess of Eu (1234-42), she bears on her hand a falcon with its jesses pendant. It was the custom to slip over the claws of the young birds a silver ring, which could not afterwards be removed. Two such rings were found at Castle Hedingham, the seat of the De Veres, engraved "Ox-en-forde." One of gold found at Biggleswade bore "Sum regis Angliæ," and within the ring "et comitis Hertfordiæ." However well trained, these birds were always liable to prove riflers, that is, not to return to the lure—

"For though thou night and day take of him hede,
And strew his cage faire and soft as silk,
And give him sugre, hony, bred and milke,
Yet [illegible] up,
He with his feet will spurn adoun his cup,
And to the wood he will, and wormes," &c.

Falconer of Halkerton bore originally gules, three hawks' lures or. After a marriage with Douglas they bore or, a falcon's head proper, issuant out of a man's heart gules, between three stars azure. The English Falconers bore argent, three falcons gules, jessed, belled, and hooded or (fig 108)

Fig. 108.

Fig. 109.

Fig. 110.

Degge: or, on a bend azure, three falcons [illegible] argent [illegible] and belled of the field.

[illegible] argent, on a fess [illegible]

[illegible]

[illegible]

The [illegible] of the [illegible]. [illegible], earl of Hereford, [illegible] IV. [illegible]

---

[1] [illegible]

[illegible] could lawfully keep a "game" of swans. The keeper who looked after them was the "gamester."

[illegible] of Dorset, [illegible] between two [illegible].
[illegible]: azure, a chevron between [illegible] proper.

The *Peacock*, pawn, is more frequently used as a crest than in the shield. He is usually represented with his tail spread, and is then blazoned as a "peacock in his pride," as seen in the crest of Manners.

[illegible] peacocks in their pride proper.

Yeo of Devon bore argent, a chevron sable between three Turkey-cocks, tails expanded, proper.

The *Pelican* is also more frequent as a crest than in arms. When in profile she is usually wounding her breast, and when full-faced on her nest feeding her young she is "a pelican in her piety."

Carne of Wales: [illegible] a pelican in her piety or (fig. 109).
Pelham: azure, three pelicans vulning themselves proper.

The *Ostrich* is also better known as a crest as borne by Digby, or as a supporter by the earls of Buchan. The plume of ostrich feathers, the well-known cognizance of the Black Prince, gave rise to the arms of his natural son, Sir Roger Clarendon, who bore or, on a bend sable three ostriches' feathers argent, passing through as many scrolls of the field.

Jervis of Devon: argent, six ostriches' feathers, 3,2,1, sable.

The *Stork*.

Starkie of Huntroyde: argent, a bend between six storks sable.

The *Heron* is one of the few birds found in early coats of arms.

Heron of Chipchase and Ford occurs in the roll of Henry III. One of the family was the husband of her of whom

"Fame
Whispered light tales" . . .

at the court of James IV. They bore gules, three herons argent.

The *Cormorant*, or liver, appears with a double pun in the arms of Liverpool: argent, a liver sable, billed and legged gules, holding in his bill a branch of laver vert.

The *Sheldrake*, also a water-fowl, was introduced into heraldry to suit Sheldon, mayor of London in 1676, who bore sable, a fess between three sheldrakes argent.

The *Raven*, corbeau, has been the bearing of Corbet from the beginning of armorial bearings.

Corbet of Moreton Corbet: or, a raven sable—

"A raven sat on Corbet's armed crest."

Ravenhill: argent, three mounts vert, on each a raven sable.

The *Rook* is occasionally borne, and sometimes conjointly with the piece known as the rook in chess.

Rooke of Kent: argent, on a chevron engrailed between three rooks sable, as many chess rooks of the first.

The *Owl*, the bird of Minerva, but seldom condescends to figure in a coat of arms. The learned Sir Henry Savile however bore—

argent, on a bend sable three owls of the field.
Sir Francis Theobald of Barking, Castell's "harum linguarum callentissimus," bore sable, a fess embattled between three owls argent.

The *Cock*, more usual as a crest, is sometimes borne in arms. When his beak, comb, wattles or gills, and spurs are given, he is beaked, crested, wattled or jewlapped, and armed.

Cockaigne: azure, three cocks argent, armed, crested, and jewlapped proper.

The *Popinjay*, papagay, or pye, is one of the earliest heraldic birds.

Curzon: argent, on a bend sable three popinjays or, collared gules.
[illegible] Marmaduke: argent, a fess gules between three popinjays vert, beaked, legged, and collared of the second.

The *Chough* is in repute in Cornish heraldry; he is black, with red legs and beak.

[illegible]: argent, three Cornish choughs sable, beaked and legged gules.
[illegible]: argent, a fess between six Cornish choughs proper.

The *Shoveller*, said to be a Cornish bird, is borne by the family of Herle, who came to Cornwall from West Herle in Northumberland, and probably therefore assumed their arms, argent, a fess gules between three shovellers proper, after their migration. The heiress married Hastings.

Tyrwhitt: gules, three tyrwhitts or.

The *Swallow*, or hirondelle, forms the very early coat of the Arundels, of whom William le Brito (1170) says—

"Hirundele velocior alite, quæ dat
Hoc agnomen ei
"More swift than the bird whence Arundel
[illegible] shield of arms is blazoned well.
He [illegible] with his spear in rest
(The shaft was strong, the point right sharp) runs full upon the breast
Of Sir Guillaume."

Sir Thomas Arundell was by Rudolph II. (1595) created a count of the empire for military service against the Turks. The Arundells of Wardour bore sable, six swallows argent, 3,2,1.

FISHES.—The inhabitants of the water do not play a very important part in heraldry, and are scarcely known among the more ancient coats, although a special and interesting volume has been written by Mr Moule on the heraldry of fishes. When borne horizontally they are "naiant," when vertically, "hauriant" though this is not always expressed; when bent they are "embowed" as the dolphin in the crest of Courtenay.

The *Pike*, or luce, is the oldest example of a fish in heraldry.

Lucy of Charlecote, Shakspeare's "Justice Shallow": gules, semée of cros crosslets, three luces hauriant argent (fig. 110).

The *Dolphin*, whatever his zoological position may be, is heraldically a fish, as is also the *Whale*. As the emblem of Dauphin the dolphin was adopted with the name by the heirs apparent the old French monarchy, who quartered with the fleur-de-ly azure a dolphin hauriant or.

Fishacre of Fishacre: gules, a dolphin naiant argent.
Kendall of Pelyn: argent, a chevron between three dolphins naiant embowe sable.

Dean Swift says that his cousin Thomas Swift gave for his d vice a swift or dolphin twisted about an anchor with the mott "Festina lente." This, however, was the device of the print Aldus.

Whalley of Whalley: argent, three whales' heads erased naiant sable.

The *Barbel* was also an early bearing, used by the counts of Bar who bore azure, crusily fitchy, two barbels erect embowed o within a border engrailed gules,—a bearing found in the quartering of many German princes.

The *Herring* occurs in the roll of Edward II.

Heringaud: gules, three herrings hauriant argent.

The manor of Earlton, Norfolk, was held by the service of presenting annually at the exchequer certain herring pies.

Roach.—Peter de Rupibus or Des Roches, bishop of Winchester bore three roaches.

Conger.—Chief-Justice Gascoyne bore argent, on a pale sable conger's head erased or.

Trout.

Troutbeck: azure, three trouts fretted in triangle argent.

The *Chabot*, a sort of gurnet, was used as a badge by the famil of Rohan-Chabot.

The *Scallop*, or escallop shell, is an old and popular charg especially in Spain, as the emblem of St James of Compostella, whic led to its being the sign of a pilgrim. The seal of the fraternit of St James at Wisby (about 1200) represents St James as a pilgri with a scallop upon his scrip. Sir Walter Raleigh says—

"Give me my scallop shell of quiet,
My staff of faith to walk upon."

Scales: gules, six escallops argent, 3,2,1 (fig. 111).
Shelley: sable, a fess engrailed between three whelks or.

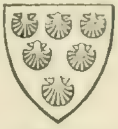


Fig. 111.

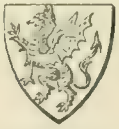


Fig. 112.

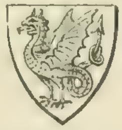


Fig. 113.

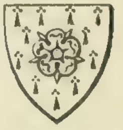


Fig. 114.

REPTILES, INSECTS, AND MONSTERS.—Reptiles and Insects ar charges rarely seen in early coats.

The *Serpent* is the bearing of the Visconti, dukes of Milan: argent, a serpent gliding in pale azure, crowned or, vorant an infan issuant gules.

The *Snake* or bisse, anguis.

Sir Wm. de Malbisse: three testes de bysses.
The usual bearing of the name of Vaughan in S. Wales is azure, three boy heads couped at the bust argent, wreathed about the neck with a snake prope
Bottreaux: argent, three toads (botraces) erect sable.

The *Fly*, musca.—Muschamp of Wooler bore argent, a chevro vert between three flies. This bearing is seen on a boss of th cloister at Canterbury, but the muscæ are represented as butterflies which loses sight of the allusion.

The *Bee*.—Both Sir Robert Peel and Sir Richard Arkwrigh appropriately placed a bee in their arms.

Chimæras.—A chimæra is a modification of some existing animal though often much more than "parce detorta" from its type. them the most celebrated is the winged lion of St Mark, the prou emblem of ancient Venice. Technically the bearing is "azure, winged lion sejant gardant, with a glory, or; in his fore paws a open book, thereon 'Pax tibi, Marce, Evangelista meus,' over th dexter page a sword erect,—all proper."

The *Dragon*, though not very much used in heraldry, is a chimær of ancient date and much employed in early romance. He is thu described—

"There was a dragon great and grymme,
Full of fire and also of venym;
And as a lion then was his fete,
His tayle was long and full unmete;
Between his head and his tayle
Was twenty two foote withouten fail:
His body was like a wine ton,
He shone full bright against the sun;
His eyes were bright as any glass,
His scales were hard as any brass."

The dragon was a favourite standard with the Welsh princes, and used also by the Anglo-Norman sovereigns. He is drawn with four legs and wings, a long barbed tail usually knotted, and a body protected by scales. In English heraldry he is used chiefly as a crest. In Wales, Rhys Ap Tudor Mawr is said to have borne "argent, a dragon segreant sable."

The *Gryphon* is popular both in romance and heraldry. He is an emblem of vigilance, and inhabited a mountain in Bactria and guarded much gold there. It was in defence of this that he

> "Through the wilderness
> Pursued the Arimaspian."

He is drawn with the body and tail of a lion, the head of a cock, a pair of wings, and very long sharp claws. When on his hind legs he is segreant.

Morgan of Tredegar: or, a gryphon segreant sable (fig. 112).
Evelyn of Wotton: azure, a gryphon passant and a chief or.
Cotton of Landwade: sable, a chevron between three gryphons' heads erased argent.

The gryphon was an early cognizance of Redvers, earl of Devon, and was used statant by some branches of the Montacutes in the time of Henry III.

The *Wyvern* is a two-legged dragon with the body passing off into a long tail barbed at the end and usually borne nowed or knotted.

Drake: argent, a wyvern statant, tail displayed and nowed gules (fig. 113).

Cockatrice.

Langley: argent, a cockatrice sable, combed gules.

The *Unicorn* or licorne abounds in Scottish heraldry, and was made the sinister supporter of the arms of Great Britain by James I.

> "Cest [illegible] beste,
> Qui [illegible] teste
> S[illegible]
> [illegible] seigneur.
> C[illegible]
> Qu[illegible] vierge [illegible] estel."

Harting: argent, a unicorn sejant sable, armed and unguled or.

The *Mermaid.*

Ellis: argent, a mermaid gules, crined or, in her right hand a comb, in her left a mirror, argent.

The *Martlet*, or merlotte, a small bird without legs, and always represented close. It is one of the oldest and commonest of charges, but seldom if ever borne singly (see Fleetwood, fig. 1[illegible]).

F[illegible]: argent, a bend between [illegible] gules.
Roger de M[illegible], temp. Henry III.: barry [illegible], on a border [illegible].

FLOWERS AND FRUITS OF THE EARTH.—Of these the palm was an emblem of victory; the laurel, of triumph; the oak, of strength; the olive, of peace; the cypress, of woe; the vine, of fecundity and joy; the lily, of purity; the daisy, of humility; while the holy

> "Trefoil [illegible]
> Hinder [illegible] of their wa[illegible]."

Fleur-de-lys.—At the head of heraldic flowers, if flower indeed it be, is the *fleur-de-lys* (fig. 6[illegible]), the *flos gladioli* of Upton, said to have been brought down by an angel for the arms of France, and which was certainly used by Louis VII. and borne singly and in numbers by Philip Augustus. It may be allied to the lily—

> "The [illegible] lady of the flowery field,
> Or fleur-de-luce, her lovely paramour;"

or its original designation may have been "Fleur de Louis." It was not at first popular either in Normandy or in England, occurring [illegible] in the roll of Henry III., and only [illegible] times in that of Edward II., [illegible] the assumption by Edward III. that it [illegible] in England. The Cantelupes bore three fleurs-de-lys [illegible] the pards' heads (fig. 9[illegible]).

Digby of [illegible]: azure, a fleur-de-lys argent.
[illegible]
[illegible] of France, bears [illegible]
[illegible]
[illegible]

The [illegible] is a more popular charge in English heraldry, [illegible] Henry III. [illegible] Edward II. [illegible]. Usually the flower is [illegible]. It [illegible], it is usually "slipped," that is, cut off [illegible].

[illegible]: a rose gules, barbed and seeded proper [illegible].
[illegible]

The rose [illegible] of which a good [illegible] Henry [illegible]. After the [illegible] and the [illegible] for the love of me."

[illegible]

The *Trefoil*, *Quatrefoil*, *Cinquefoil*, and *Sexfoil* are all common charges, usually but not always borne, like the rose, without a stalk.

Harvey of I[illegible]: gules, on a bend argent three trefoils [illegible].
Vincent of Stoke d'Abernon: azure, three quatrefoils argent (fig. 115).
Robert de Beaumont, earl of Leicester [illegible] cinquefoil [illegible], bearing on each foil [illegible] one of [illegible]."
Umfraville of [illegible]

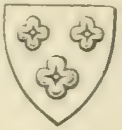


Fig. 115.

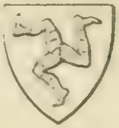


Fig. 116.

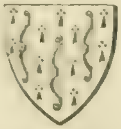


Fig. 117.

The *Thistle*, which gives name to the Scottish order, is also an heraldic bearing in that country.

Leaves, [illegible], are borne by Leveson and Foulis; hazel leaves by Hazlerigg of Noseley; strawberry leaves, or fraises, by Fraser of Lovat; walnut leaves by Waller; oak leaves by Oakes; by Elmes of Lilford, elm leaves; rye and barley or orge by Rye and Grandorge. Ingleby bears three ears of [illegible].

W[illegible]
B[illegible] indented and [illegible]

When Queen Elizabeth visited Worcester the citizens transplanted a pear tree laden with fruit into the market place, for which attention she added pears to the city arms. Warden Abbey, Beds, was famous for a pear that bore its name and [illegible] its arms—azure, three Warden pears or. The kingdom of Granada bore argent, a pomegranate slipped proper. S[illegible]eaux bore argent, a saltire [illegible] between twelve cherries slipped gules.

The *Garb*, gerbe, or wheatsheaf, was a common bearing, especially in Cheshire. Sometimes the garb is banded of a different colour [illegible].

[illegible]: azure, a garb or.
V[illegible] three garbs or (fig. 9[illegible]).

CELESTIAL FIGURES.—The *Sun* was the cognizance of Louis XIV., with the overbearing motto, "Nec pluribus impar." In heraldry this was blazoned as "the sun in his splendour."

Jean de la Haye bore argent, the sun in his splendour gules.
Ralph de la Haye, temp. Henry III., differenced this coat by bearing only a ray of the sun [illegible].
Sir John A[illegible], temp. Edward II.: azure, a ray of the sun or. In both examples the ray issues from the dexter chief, and is borne bendwise. It resembles a pile wavy.
John de Fountains, bishop of Ely, 1220-25, bore the sun, moon, and seven stars 2 1 2 1 2 1.

The *Moon* is always borne as a crescent, and usually with the concavity upwards. If this be to the dexter it is increscent, if to the sinister, decrescent. It is an early and general charge, though seldom borne singly.

Chapman: per chevron argent and gules, a crescent counterchanged.
Wells: azure, a fess [illegible] between three crescents ermine.
Baron of [illegible]: azure, in chief two crescents increscent and decrescent argent, in base an estoile or.
The seal of Sir Lawrence de Berkerolles, 1392, gives a chevron between three crescents (fig. 118).

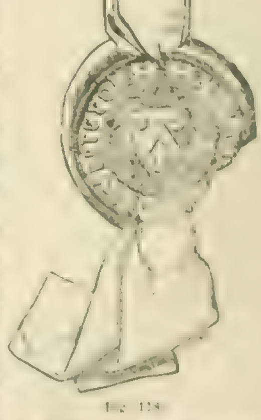


Fig. 118.

The *Star*, or estoile, is usually drawn with six rays, wavy, and is thus, and by not being pierced, distinguished from the mullet. If there be more rays the number must be given.

Ingleby of Ripley: sable, an estoile argent.
One of the branches of De la Haye bore ar[illegible]
Sir [illegible] a fess [illegible] stars [illegible]

MAN AND HIS PARTS.—The full human figure [illegible]. It is said that the [illegible] bore [illegible], a naked man with arms extended, proper; formerly he was [illegible] from a [illegible].

[illegible] hands [illegible]

Mr Wyon [illegible] a MS. [illegible], in which two knights are represented [illegible] a French [illegible], one of whom bears for [illegible] in a [illegible].

C[illegible]: argent, three blackamoors' heads couped sable, capped or [illegible].

[illegible] three dexter arms conjoined at the shoulder, [illegible]

[illegible]

[illegible]

[illegible] and spurred [illegible] in use [illegible]

A [illegible] bearing is that granted to [illegible] for services in [illegible]

[illegible] two [illegible], the sinister surmounted by the dexter [illegible]

[illegible] crowned by a royal crown proper, on a chief [illegible]

The "[illegible]" or five wounds of the crucifixion are a common [illegible] bearing on [illegible] shields, and several bishoprics bear figures of saints on their shields, but these are scarcely within the [illegible] of proper heraldry. Thus the arms of the see of [illegible]

Azure, [illegible] seated on a tombstone, in his sinister hand a [illegible] extended [illegible] In his mouth a sword fesswise argent, [illegible] to the sinister.

MISCELLANEOUS OBJECTS.—*Helmet.*—The helmet completed the knight's equipment. He wore "[illegible] au cou, son heaulme sur la tête, et son [illegible]," or,

> "His helm of latoun bright,
> His sword was [illegible],
> His [illegible] as the sun shone,
> His spere was of fine cypress."

Halliday of Hungerford: sable, three helmets argent, garnished or, with a border [illegible] referring to the omitted fourth helmet [illegible] "Quarta saluti."

Morion, or steel cap.

Brudenell of Deene: argent, a chevron between three morions sable.

Gauntlet.

Gentey of [illegible]: sable, three dexter gauntlets or.

The *Sword* is much used in heraldry; it was the oldest weapon [illegible]. The soldier in all time was the man of the sword. Damascus, Cologne, Bilboa were in turn famous for the manufacture, as was among smiths Andrea di Ferrara. The swords of great soldiers have been celebrated: Blowance as the sword of [illegible], Excalibur of Arthur, Taillefer of Cœur de Lion—

> "[illegible]
> Was by [illegible] made."

There was also the weapon by which Roland, with "huge two-handed sway," cleft the pass of Roncesvalles,

> "And to the enormous labour left his name."

The sword of Talbot bore "Sum Talboti pro vincere inimicos meos."—"Bad Latin," says Fuller, "on it, but good steel in it." King John gave his own sword to the town of Lynn Regis with the inscription, "Ensis hic donum fuit regis Joannis, a suo ipsius latere datum." The sword of heraldry is two-handed.

Kilpec of Kilpec: argent, a sword bendwise sable.

The *Axe* was reckoned a manly weapon—

> "King Richard, as I understand,
> Yet he went out of Englonde,
> Let make an axe for the nones,
> Therwith to crush the Saracens bones.
> . . . . .
> Thereon were twenty pound of steele."

The Danish battle-axe was famous. Walter de Plumpton held Plumpton by the tenure of a Danish axe that hung up in his hall there.

[illegible]clayt: gules, three Danish axes or.

Lance.—The arms granted to Shakespeare's father were, or, on a bend sable a lance of the field.

Spear Head.—This is a common bearing among the Welsh of Glamorgan and Brecknock, and used by Jones of Fonmon: sable, a chevron between three spear heads argent, points embrued gules. It is quartered by Lewis of Greenmeadow, a cadet of Van, and by others.

The *Arbalest*, or cross-bow, was a most unpopular weapon, as requiring no strength or manliness for its use. Richard I. is generally said to have met his death from a cross-bow; but the earls of Aberdeen, who claimed to represent Bertrand de Gourdon, bear as their crest two arms drawing a long bow. The cross-bow was forbidden by Innocent II. and the emperor Conrad at a council in 1139. Guillaume de Dôle, who wrote before 1200, says of this weapon—

> "[illegible] lance et d'escu,
> [illegible],
> [illegible],
> [illegible]."

Nevertheless as early as 1270 the master of the cross-bows was a great officer of the French crown.

Arblaster: ermine, a cross-bow in pale gules.

The *Bow*, though formed of Spanish yew, was essentially an English weapon. It occurs in heraldry, though scarcely so frequently as might have been expected, and chiefly in allusion to a name. The belt or baldrick, sheaf of arrows, buckler, and sword completed the equipment of an archer—

> "Their baldrics set with studs athwart their shoulders cast,
> To which under their arms their sheafs were buckled fast;
> A short sword at their belt, a buckler scarce a span,
> Who struck below the knee, not counted then a man.
> All made of Spanish yew, their bows were wondrous strong;
> They not an arrow drew but was a clothyard long.
> Of archery they had the very perfect craft."

The bow was used by the English in the attack on the isle of Rhé in 1627.

Bowes of Streatlam: ermine, three bows palewise strung gules (fig. 117).

The *Arrow.*—Drayton describes

> "Their arrows finely paired for timber and for feather,
> With birch and brazil pierced, to fly in any weather;
> And shot they with the round, the square, or forked pile,
> The loose gave such a twang as might be heard a mile."

The burgesses of Sheffield seal with a sheaf of arrows.

***Birdbolt*, or bozon.**

William de Gresley held a manor "per unum arcum . . . et unam bozonem."

Bozon of Barrowby: argent, three birdbolts gules, feathered or.

The *Pheon*, or broad arrow.

Sydney of Penshurst: or, a pheon azure (fig. 119).

Floyer of Floyer's Hayes: sable, a chevron between three broad arrows argent.

In heraldry arrows are usually drawn as clothyard shafts. The pheon is always drawn with the head only.

Besides these, and also more or less connected with war and the chase, are the buckle, barnacle, calthrop, castle, fireball, hammer, horse-shoe, hunting horn, maul, pick, spur, stirrup, and some hundreds of miscellaneous objects, travelling so far out of the legitimate charges of heraldry as to include apples and acorns, beehives, and a turnstyle. A very few of the most ancient have been selected.

Walter Agard held Tutbury under Henry III. by a white hunter's horn, and bore for arms, argent, three hunters' horns sable.

The *Chain* borne by the kings of Navarre, the puzzle and delight of French heralds, "gules, a trellis of chains or, in cross and saltire," also blazoned "gules, a carbuncle closed and pomelled or," or by the Spanish heralds—"cadenas d'oro atronesados en campo de sangre."

The *Annulet*, said to be a link of mail.

Musgrave of Edenhall, derived from Vipont: azure, six annulets or, 3,2,1.

Lowther also derived his arms, or, six annulets sable, 3,2,1, from the same source.

Calthrop—a four-spiked implement, so arranged that when thrown on the ground one spike always stood upright. Calthrops were used to keep off cavalry. Bruce used them at Bannockburn, and among the stores at Dover castle, 16 Edward III., was a barrel containing 2900 calketrappes. Froissart says the English on one occasion supplied their place by sticking their spurs into the ground.

Horseman: or, three calthrops gules (fig. 120).

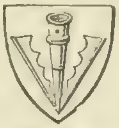


Fig. 119.

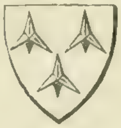


Fig. 120.

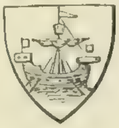


Fig. 121.

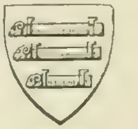


Fig. 122.

Castle.

Hill: ermine, on a fess sable a castle triple towered argent.

Comb—a singular bearing of high antiquity borne by Ponsonby of Ponsonby and Tunstall of Thirland.

Cups.

Argentine: argent, three cups gules.

Cushions, oreilliers.

Earls of Moray: argent, three pillows gules.

Maheu de Redman, in the roll of Henry III.: de goules, a trois horeillers d'or. Possibly these are birds.

Tiara.—The Dukes d'Urbino bear a papal tiara.

Crowns (mural, naval, and others) and *mitres* are not uncommon in arms. The Berkeley crest is a mitre. The *crancelin* or crown of rue was used in 1150 by Saxony. Bernhard of Anhalt bore barry of eight or and sable, a crancelin vert.

Mullet.—This is usually called a spur rowel, but it was in use long before the rowelled spur. Besides being employed as a difference, it is a constituent of numberless coats of arms.

Assheton of Downham: argent, a mullet pierced sable.

But it is generally borne in numbers (see fig. 15).

The *Lymphad* or galley. The bearing of the Lords of the Isles, quartered by the dukes of Argyll for Lorne, is argent, a lymphad, sails furled and oars in action, all sable, flags flying gules (fig. 121)

The *Maunch*, or lady's sleeve—

> "A lady's sleeve high-spirited Hastings bore."

The earls of Pembroke bore or, a maunch gules; those of Huntingdon bear argent, a maunch sable. It was borne also by Flamville, Wharton, Maunsel, Conyers, and many others. Bayard took a lady's sleeve and proclaimed it, with a valuable ruby, as a prize to be contended for. Bayard himself won it, and the lady wore it for his sake. Fig. 123 is from the seal of John de Hastings, 1291.

The *Battering-ram* is borne by the Berties, earls of Lindsey, sometime dukes of Ancaster, with the allusive motto, "Virtus ariete fortior" (fig. 122).

The *Escarbuncle* was a very early bearing of the Mandevilles. It is a wheel of eight rays, set with knobs and the ends ending in fleurs-de-lys. In another form the ends are connected by cross-bars. The escarbuncle of the reign of Henry III resembles the iron work on doors of that period.

Blount of Exton: argent, two bars azure, over all an escarbuncle of eight rays gules, fleurettée and pomettée or.

Among musical instruments the *Clarion* is borne by Granville, and is seen on tiles at Neath abbey. It resembles a pan-pipe. The *Trumpet* is seen on the fine Trumpington brass near Cambridge.

Williams of Thame: azure, two organ pipes saltierwise, the dexter over the sinister, between four saltires argent.

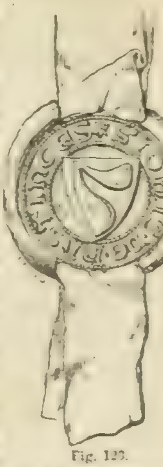


Fig. 123.

The *Water Budget* or bucket is an early charge identified with the names of Ros and Rose. Ros, however, got it from the Trusbuts of Belvoir, who possibly bore it as lords of Watre in Holderness. Mr Planché has discovered a drawing of a pair of water budgets in actual use. They were of leather, and carried in pairs on a stick over the shoulder.

DEBASED HERALDRY.

Of debased heraldry there is no lack of examples, and a few are ancient. Thomas de Insula, bishop of Ely (1345–61), bore gules, three bezants, on each a crowned king, robed sable, doubled ermine, sustaining a covered cup in his right hand and a sword in his left, both or. No doubt, like the arms of the sees of Chichester and Salisbury, this extraordinary coat was meant to be painted on a banner. Camden granted a great number of coats, mostly of a complex character, and since his time heraldic taste has not improved. Tetlow (granted 1760) bore "on a book erect gules, clasped and leaved or, a silver penny argent, thereon written the Lord's Prayer; at the top of the book a dove proper, in his beak a crowquill pen sable." Other grants show negroes working in a plantation, Chinese porters carrying cinnamon, &c. The grants to Lord Nelson and his gallant captains, and to the elder Herschel, are utterly unheraldic. It can scarcely be wondered at that Lord Chesterfield, correcting the Garter of his day, remarked, "You foolish man, you don't understand your own foolish business."

DIFFERENCES AND MARKS OF CADENCY.

The object of an armorial bearing having been to distinguish one iron-sheathed warrior from another, it was necessary to provide bearings for the members of a family, all entitled to take the paternal coat. This was managed by the introduction of a difference (French, *brisure*), usually some slight but well marked alteration, sometimes by reverting the tinctures, sometimes by changing an ordinary or a smaller charge, as a bend for a fess, or a crescent for a martlet. Where an heiress had been married a part of her coat was often introduced. The object was with a sufficient difference to show the connexion with the head of the house. The following examples are from the families of Hastings and Zouch. Females, who wore no armour, did not need distinguishing marks, and bore the coat unbroken.

Sir John Hastings bore (see fig. 123) or, a maunch gules, called "le [illegible] armes."
Sir William Hastings bore the same, with a label of Pembroke.
Sir John Hastings bore the same, with a border of Valence.
Sir Edmund Hastings bore the same, with a label vert.
Sir Nicholas Hastings bore the same, with a label azure.
Sir Miles Hastings bore or, a fess and a chief, three mullets gules.
Sir Philip Hastings bore the same, with a label azure.
Sir Robert Hastings bore ermine, on a chief azure, three mullets or.

The label of Pembroke and border of Valence show the match with the heiress of Valence, earl of Pembroke. Sir Miles formed a distinct branch, that of Daylesford, probably before armorial bearings were fixed; his descendants, however, returned to the maunch.

Sir Alan la Zouch bore gules, bezanty.
Sir William la Zouch bore the same, with a quarter ermine.
Sir William la Zouch bore the same, with a label azure.
Sir Oliver la Zouch bore the same, with a chevron ermine.
Sir Amory la Zouch bore the same, with a bend argent.
Sir Thomas la Zouch bore the same, on a quarter argent a mullet sable.

The quarter ermine is to show the descent from the dukes of Brittany.

These and many others of an early date are suitable for their purpose; but, as armorial bearings became less actually useful, alterations of a different character crept in. The label, however, retained its place. It closely resembles the strap with pendants which from the saddle crossed the horse's chest. The earliest example of its use is said to be by Geoffrey, son of Henry II., in 1153, but a more certain case is the seal of Saher de Quincy, though whether there borne as a charge or as a difference is uncertain. At Caerlavrock Maurice de Berkeley bore a blue label "parceque ces pere vivoit." In Scotland William Fraser, in 1295, uses a label of three points and on each three roses or mullets, probably meant for "fraises" or strawberry leaves. The mullet, crescent, and fleur-de-lys are used as differences about the same time. The label, even then, was most frequently used by the eldest son, but occasionally he used the crescent, and the label was taken by the second son. The royal house generally used the label, but occasionally the border. Edward I., as prince, bore a label of five points azure; Edmund Crouchback his brother, who married a French princess charged the label with fleurs-de-lys. His second son, Henry, bore England with a bendlet ermine. Thomas and Edward, second and third sons of Edward I., used labels. Edward IV., as prince, bore on his great seal a label of three, and on his counterseal one of five points. John of Eltham, his brother, bore England with a border of France. The Black Prince, who bore France and England quarterly, added a label argent, and Richard, during his father's life, placed a cross of St George on the middle point. Lionel, third son of Edward III, having married the heiress of De Clare and De Burgh, used a label and on each point a canton gules, said to be the original arms of De Clare, and on his seal as earl of Ulster each point bore a cross for De Burgh. The number of points was matter of indifference, though usually confined to three. The label itself was, on the whole, and has continued to be, a mark for all the princes of the royal house.

Setting aside the royal family, a new system of differences came into use, and is touched upon by Upton early in the 15th century, though then but imperfect. He gives the crescent to the eldest son, and to the others the label with three or more points in succession. Dame Berners, in 1486, besides employing the billet, crosslet, and other marks, describes a method of differencing by "gerratting," that is, powdering the field with billets or other charges, but the good lady's coats are often mere fancies. The first regular appearance of the modern system is on the effigies of seven Beauchamp cadets in St Mary's windows at Warwick. There the label, annulet, crescent, martlet, fleur-de-lys, and [illegible] indicate the several cadets. The label is placed in chief, the rest on the fess point of each surcoat.

The modern marks now regularly admitted are—(1) the label of three points; (2) the crescent; (3) the mullet; (4) the martlet; (5) the annulet; (6) the fleur-de-lys; (7) the rose, (8) the cross moline, (9) the octofoil (fig 121). The elder son of the elder son places a label upon a label, the second a crescent, and so on, so that the ninth son of a ninth son would bear an octofoil upon an octofoil, pointing out the relationship of each member to the parent stock. Practically, however, marks of cadency are but seldom used. The earls of Huntington indeed, descending from the second son of a second son, place a crescent upon a crescent. Lords Abergavenny and Braybrooke difference their Neville saltire with a rose, as springing from the seventh son of Ralph, earl of Westmoreland. On the other hand Lord Derby, though a cadet, bears his arms unbroken.

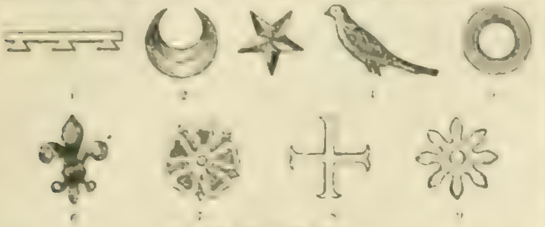


Fig. 121.—Marks of Cadency.

Marks of Illegitimacy are very various, and on the earlier coats not to be distinguished from differences. Probably the earliest English example is afforded by Wm. Longespee, natural son of Henry II., who bore six lioncels, no doubt derived from his father, though usually attributed to his wife Ela, heiress of the earldom of Salisbury. His counterseal bears the long sword whence he derived his name. The sons of Richard, brother of Henry III., bore their father's lion of Poitou, inverting the colours, until Sir Geoffrey Cornwall took prisoner the duke of Britanny, when he changed his field to ermine. In the roll of Edward II., Sir John Lovel le Bastard bore Lovel, usually or and gules, with "un label d'azur." Sir Roger Clarendon, son of the Black Prince, has already been mentioned (page 701). John Beaufort, son of John of Gaunt, bore per pale argent, and azure on a bend gules three lions of England, with his father's label. After his semi legitimization he bore England with a border gobonny argent and azure, the Lancaster colours. Arthur, Viscount Lisle, son of Edward IV., placed a bâton over his father's arms. Sometimes the father's coat was altered. Sir John Stanley bore a coat compounded of Stanley and Lathom. Sometimes a bâton sinister was added, sometimes a border. Strictly a natural son does not adopt his father's quarterings, unless such as are habitually borne conjoined, as the royal arms. The descendants of Charles II. bear the whole arms with a bâton sinister or border; those of William IV. the bâton. With the house of Bourbon the bâton marked the cadets, the bâton sinister the bastards. Sir Gilbert Talbot (1563), son of a bastard son of Sir Gilbert Talbot, was allowed Talbot and the usual five quarterings of the family, with a bendlet sinister over the whole, but this is unusual.

RULES OF BLAZON

To blazon a coat of arms is to describe it in the technical language of heraldry, and, although the works of the fathers of heraldic lore contain much irrelevant matter, and some confusion of arrangement, the rules of blazon, by whomsoever devised or perfected, are remarkable for their precision, brevity, and completeness. Great and successful care has been taken to produce clear and simple order, to avoid repetition, and to preserve a certain uniformity of arrangement through much complexity of detail. The peculiarities arise in great measure from the use of terms once well known, and the language, as was to be expected, shows traces of the French and Franco-Norman channels through which the "gentle art" reached England.

First comes the description of the field, its colour, or the arrangement of the colours (if more than one), and the character of the partition lines when parted. Thus the "parma inglorius alba" would be blazoned "he beareth argent." The coat of Waldgrave is per pale argent and gules; that of D'Ebroiers, earl of Gloucester, was "per pale dancette argent and gules."

Next follow the charges, and first those of most importance and nearest the field, their name, number, and position (if an animal, its attitude), and finally the colour. The principal charge is that which occupies the principal position. Thus Backhouse of Kellet bore party per saltire, azure and or, a saltire ermine; Bigland of Bigland, azure, two ears of bigg or. Where the principal charge is an ordinary placed between smaller charges, it follows the field: Foliot,—or, a fess between two chevrons gules. The same rule holds where the ordinary is charged, as in Braithwaite of High Wray,—gules, on a chevron argent three cross crosslets fitchy sable; or when the two are combined, as Kerr of Cessford,—vert, upon a chevron between three unicorns' heads erased argent, horned and crined or, as many mullets sable. Where the ordinary may be charged, but does not admit of being placed between charges, it is blazoned thus: Russell,—argent, a lion rampant gules, on a chief sable three escallops of the field. If the field be semée of figures (*i.e.*, besprinkled with them in regular order) they follow it: Pierrepoint,—argent, semée of cinquefoils gules, a lion rampant sable. Had the cinquefoils been on the lion instead of on the field the blazon would have run, argent a lion rampant sable, semée of cinquefoils gules.

The arrangement of common charges has already been explained (page 698, fig. 85):—if one, central; if two, per pale; if three, 2 and 1; if more, as must be specified, as in Babington (fig. 9). Such diminutives as are borne in pairs follow their ordinary: Cludde,—argent, a bend between four cotises sable. To avoid repetition, if a tincture occurs twice reference is made to the first: Scott of Abbotsford,—or, two mullets in chief and a crescent in fess, azure, within an orle of the last; and so if the same number of charges occurs twice, the words "as many" are used: Maling of Scarborough,—ermine, on a chevron vert between three hawks' jesses as many roses argent. Upton, who wrote in Latin, is put to strange shifts to express his meaning. He thus blazons the arms of Mortimer (fig. 63):—

> "Portavit arma barrata, et caput scuti palatum est et angulatum de azorio et auro, cum quodam scuto simplici de argento." In heraldic French this is, "Il portoit barrée et ung chef palée cunetée d'asur et d'or, et ung escu simple d'argent."

The following, from Menestrier, is the full blazon of the arms of the old kings of France:—

> D'asur a trois fleurs-de-lys d'or 2 and 1. Escu timbré d'un casque ouvert d'or placé de front, assorty de ses lambrequins d'or et d'asur, couronné de la couronne imperiale Françoise, entouré des colliers des ordres du St Esprit et St Michel, soutenu par deux anges vetus en Levites, la dalmatique des emaux de l'escu tenant chacun un banière de France; le tout placé sous un grand pavillon d'asur fleur-de-lisé d'or doublé d'ermines; le comble rayonné d'or et couronné de la couronne imperiale Françoise.
>
> Le dit pavillon attaché a la banière ou oriflamme du Royeaume. Cri du guerre, "Montjoye St Denis." Devise, "Lilia non laborant neque nent," alluding to the operation of the Salic law

MARSHALLING ARMS.

Marshalling is the disposing or arranging of such coats of arms as have to be included in one shield. Blazoning deals with the particulars of each coat, marshalling with its position as regards other coats. Arms may be arranged per pale or impaled, or the shield may be divided into as many squares as may be required, when it is said to be quartered. The first coat, that of the bearer, may or may not be repeated in the last quarter as may be required to make up an even number of squares, which, though not necessary, is desirable.

For a time armorial bearings were purely personal, and intended to supply a want only felt by the wearer of armour. Hence, at first, females do not seem to have used them, and when a place was found for them on armorial seals, the coat was regarded as that of their father, and therefore not differenced. For a time they seem to have had a separate shield. On one of the seals of Margaret of France, queen of Edward I., his three lions are displayed upon the point of her tunic, and on her right hand is a shield of France, on her left, one with a lion rampant. On the reverse is a shield of England, and around it, outside, a border of France. Margaret Bruce of Skelton married Robert de Ros. Her seal (1280) bears her effigy, somewhat defaced, so that nothing can be distinguished on her dress, but on her right is a shield of Ros, on her left one of Bruce.

A well-known seal, date about 1347, is that of Joan, daughter of Henry count of Bar, by Eleanor daughter of Edward I. by Eleanor of Castile. Joan was widow of Warren, earl of Surrey. Her seal is circular, with nine compartments. In the centre is Warren for her husband; above and below, England for her grandsire; right and left are two barbels for her father. These four are on lozenges. In the four corner compartments are—(1) and (4) a lion for Leon, and (2) and (3) a castle for Castile, for her grandmother. This is a sort of nebulous quartering.

To this succeeded the allotment to the wife of the sinister half of the husband's shield, displayed as though two shields had been divided vertically and united, omitting therefore the adjacent half of each coat. This is called dimidiation, and the shields so joined constitute an impalement. Another seal of Margaret of France illustrates this practice. In it half of England impales half of France. There is a good example of dimidiation in the tomb of William de Valence at Westminster, where Valence impales Claremont Nesle, both dimidiated. An early German seal combines half an eagle with half a lion in this way. The arms of the Cinque Ports are remarkable examples of dimidiation. In each, the lions of England are dimidiated with the arms of the special Port. That of Hastings (fig. 125) is party per pale dimidiated, Dexter, gules, three lions passant gardant or; Sinister, azure, three demi hulks of ships argent. Sometimes one of the coats only was dimidiated. Eleanor Montendre was widow of Guy Ferre. Her seal (1348) has a shield of Ferre, a cross moline and over it a baton, dimidiated, impaling Montendre, a lion within an orle of trefoils. The lion is whole. The seal of Elizabeth, wife of Sir Lawrence Berkerolle (fig. 126),—azure, a chevron or, between three crescents argent, impaling a lion rampant,—is a good example of an impalement without dimidiation (date 1392).

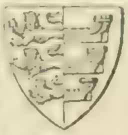
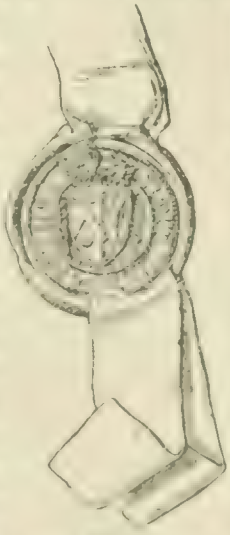


Fig. 125.



Usually the lady has the sinister side, but in the seal of Marion, wife of Sir William Dalzell (1390) this is reversed, as it is in the impaled shield of John of Gaunt, where his wife, a daughter of Peter of Castile and Leon, has the dexter side. Dimidiation is not applicable to all coats. A canton on the sinister side would be lost, and a chevron be converted into a bend. The border, orle, and tressure were usually, not always, dimidiated, and although this form of impalement has fallen into disuse, these charges are still borne dimidiated, as may be seen with the border and tressure on the tomb of Mary, queen of Scots.

When the lady was the last of her race, various modes were devised for the conservation of her name and arms. Thus on the death (1193) of Robert de Lacy, last of the line of Pontefract, John, constable of Chester, half-brother to Robert by his mother, took the name and arms of Lacy, and was ancestor of the earls of Lincoln of that name. In the same century Isabel, heiress of Earl Warren, married Hamelin Plantagenet, who took the name, and their children bore the arms of Warren; and so with the Mandevilles, earls of Essex.

Sometimes a coat was compounded of the two families. Thus Mr Planché is of opinion that the bend was added to the paternal coat of Bohun, on the marriage with the heiress of Milo, earl of Hereford. Scottish seals show many examples of such composition. Eustacea Colvile, widow of Reginald le Chein, in 1316, bore a cross moline, square pierced, for Colvile, between four cross crosslets fitchy for Chein. About the middle of the 14th century began the practice of placing the arms of females upon a lozenge. As early as 1347 Elizabeth D'Arcy so bears her arms, as in 1356 does Maud Fitz Payne. The seal of Joan Beaufort, widow of James I., affords the earliest Scottish example.

The first step towards a regular method of preserving heraldically the memory of a family extinct in the male line seems to have been taken in Spain by a process now known as quartering. Eleanor of Castile, queen of Edward I., has upon her tomb a shield divided into four quarters, in the first and fourth of which is Castile, and the second and third Leon. The practice, though not finally regulated, was approved, for on the seal of the "She wolf of France," queen of Edward II., the shield is quartered (1) England, (2) France, (3) Navarre, (4) Champagne, mixing up confusedly the arms of husband and wife, as they also are upon the shield of Philippa of Hainault, queen of Edward III., who bore quarterly, (1) and (4) England, (2) and (3) Hainault and Holland. A very early instance of regular quartering occurs in the will of Humphrey Bohun, earl of Hereford, dated 11th August 1319, by which he bequeaths a courte point quartered with the arms of England and Bohun. This is five years before the accession of Edward III., and makes it probable that the quartered coat of William de Foix at Winchester is original.

Under Edward III. quartering came into general use. The king led the way by quartering France and England, and the earl of Pembroke followed, quartering Hastings and Valence. John Hastings, his son, commemorated on his shield his father's match with Ann daughter of Margaret, duchess of Norfolk, a co-heir of Thomas of Brotherton, and this affords an early instance of the precedence often given in quartering to the royal arms. John Hastings bore quarterly of four—(1) and (4) Brotherton (Plantagenet), (2) Hastings, (3) Valence; and, on another example, (1) and (4) Brotherton, (3) and (3) Hastings quartering Valence. This latter arrangement of sub-quartering shows a considerable advance in the system. Henry IV. combined quartering with dimidiation in a shield long preserved in the window of Christ Church, Newgate, which bore France and England quarterly, impaling France with a bend gobony, and Navarre quarterly, dimidiated, for Joan of Navarre. In this case the 1st and 3d quarters were removed, and the sinister bearings thus reduced to what may be better blazoned as party per fess, (1) Navarre, (2) France. The French sometimes quartered diagonally, called "Ecartelé en sautoir." The old kings of Sicily thus divided their shield, party per saltire, (1) and (4) Aragon, (2) and (3) Swabia. This plan never found favour in England, where a regular system of quartering sprang up, and has continued in use. A quartered shield, though of no special family, is shown by fig. 126.

At first the arms of an heiress were impaled by her husband, but latterly they were placed on a central inescutcheon designated an escutcheon of pretence. The children divided the shield into four quarters, and placed the paternal coat 1 and 4, the maternal 2 and 3. If a second heiress came in, she was placed in No. 3; if a third, in No. 4; if more, the shield was divided as required. The following pedigree will explain the system. In it all the descents that did not bring in an heiress are omitted

4. Waleran de Newburgh

1. Ralph de Monthermer. 5. Wm. Mauduit = 4. Alice

2. John de Montacute = 1. Margaret. 6. Wm. Beauchamp = 5. Isabel. 7. Hugh le Despenser = 8. Alianor de Clare.

3. Richard Neville = 2. Alicia 6. Richard Beauchamp = 7. Isabel.

8. Richard Neville = 6. Anne.

9. Geo. D. of Clarence = 3. Isabel. 10. Richard D. of Gloucester (Richard III.) = 3. Anne.

1. Monthermer: or, an eagle displayed vert.
2. Montacute: argent, three fusils conjoined in fess gules.
3. Neville: gules, a saltire argent.
4. Newburgh: chequy or and azure, a chevron ermine.
5. Mauduit: argent, two bars gules.
6. Beauchamp: gules, a fess between six cross crosslets or.
7. Le Despenser: quarterly, 1 and 4 argent, 2 and 3 gules a fret or, over all a ribbon sable.
8. De Clare: or, three chevrons gules.
9. Clarence: quarterly France and England, a label of three points argent, each charged with a canton gules.
10. Gloucester: quarterly France and England, a label of three points ermine, on each point a canton argent.

The armorial bearings of each generation will be as follows:—

1. Monthermer alone. 2. Montacute impaling Monthermer. 3. Neville impaling quarterly, 1 and 4 Montacute, 2 and 3 Monthermer. 4. Newburgh alone. 5. Mauduit impaling Newburgh. 6. Beauchamp impaling quarterly, 1 and 4 Mauduit, 2 and 3 Newburgh. 7. Le Despenser impaling De Clare.
6. R. Beauchamp: quarterly of four—1 and 4 Beauchamp, 2 Mauduit, 3 Newburgh; impaling quarterly of four—1 and 4 Le Despenser, 2 and 3 De Clare.
8. R. Neville: quarterly of four—1 and 4 Neville, 2 Montacute, 3 Monthermer; impaling quarterly of six—1 and 6 Beauchamp, 2 Mauduit, 3 Newburgh, 4 Le Despenser, 5 De Clare.
9. George, duke of Clarence: France and England quarterly, impaling Isabel Neville quarterly of nine—1 and 9 Neville, 2 Montacute, 3 Monthermer, 4 Beauchamp, 5 Mauduit, 6 Newburgh, 7 Le Despenser, 8 De Clare.

The above, being a well-known and very noble pedigree, has been selected to illustrate the system of quartering, which is explained by the shield (fig. 127), thus emblazoned:—

1, George, duke of Clarence; 2, Neville, who brings in 3, Montacute; 4, Monthermer; 5, Beauchamp, who brings in 6, Mauduit; 7, Newburgh; 8, Le Despenser; 9, De Clare.

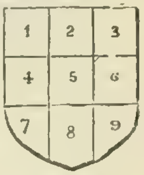


Fig. 127.

Unfortunately the several bearers of these arms were fanciful, and sometimes gave precedence to one and sometimes to another coat, and indeed never used the whole, which would have crowded their shields and caparisons. The four woodcuts, figs. 128-31, will illustrate this

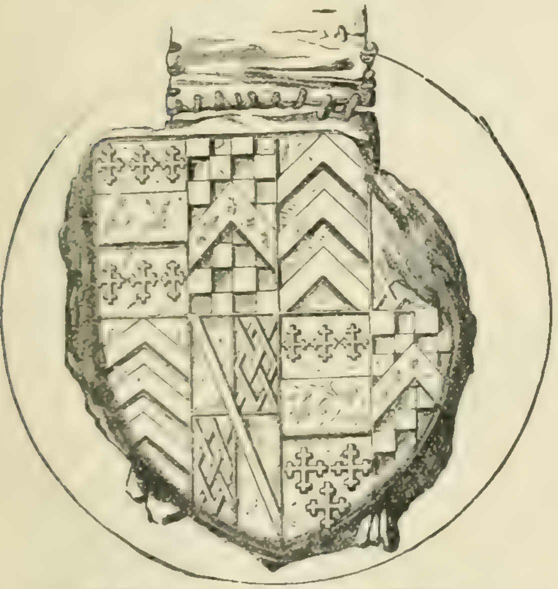


Fig. 128.—Seal of Richard Beauchamp earl of Warwick.

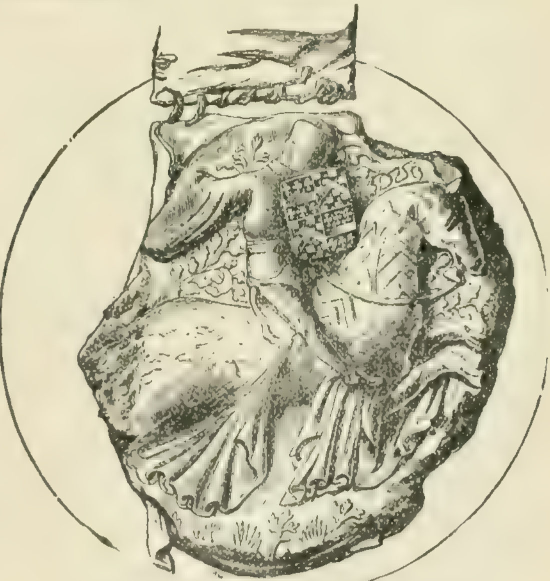


Fig. 129.—Counterseal of Richard Beauchamp earl of Warwick.

They represent the great seals of Richard Beauchamp, earl of Warwick, who married Isabel le Despenser, and Richard Neville, earl of Warwick, who married Anne Beauchamp.

Beauchamp quarters the arms of his wife, but makes De Clare impale Le Despenser, while he himself impales Newburgh. The blazon would thus be quarterly of four grand quarters—I. and IV., Beauchamp impaling Newburgh, II. and III., De Clare impaling Le Despenser (fig. 128). On the counterseal (fig. 129) the earl bears on his shield Beauchamp and Newburgh quarterly, and on his caparisons Beauchamp, Newburgh, De Clare, and Le Despenser also quarterly.

The other is the seal of the king-maker. As lord of Glamorgan he gives precedence to De Clare and Le Despenser, and bears quarterly of four grand quarters—I. and IV. quarterly, De Clare and Le Despenser; II. and III., Montacute and Monthermer; Neville not appearing at all. The crests are those of Beauchamp and Montacute. The remaining supporter is the Neville bull, unmuzzled, and below are ragged staves for Beauchamp (fig. 130).

The counterseal gives on the shield Neville above with a label, and the swan crest on the helmet. The caparisons are quarterly of four grand quarters: I. quarterly—1, effaced; 2 and 3, Newburgh charged with five pards' heads, jessant fleurs-de-lys for Cantelupe; 4, Beauchamp; II. and III.—1 and 4, De Clare; 2 and 3, Le Despenser; IV.—1 and 4, Beauchamp; 2 and 3, Newburgh (fig. 131).

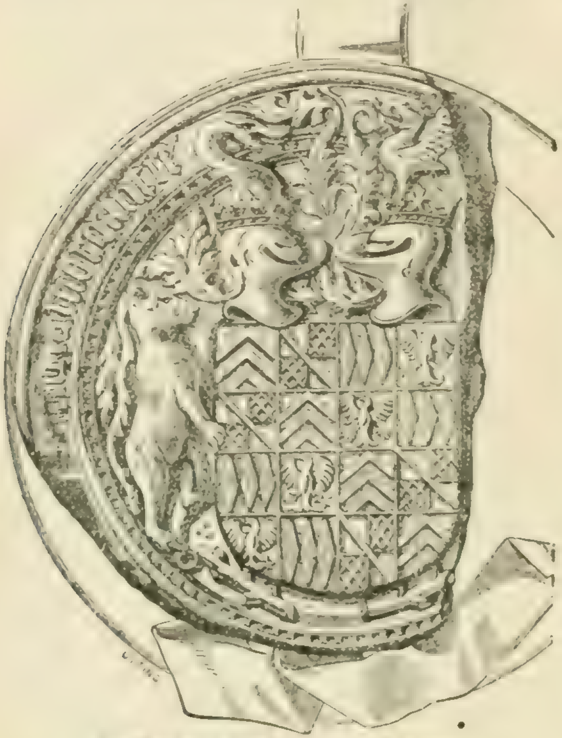


Fig. 130.—Seal of Richard Neville, earl of Warwick.

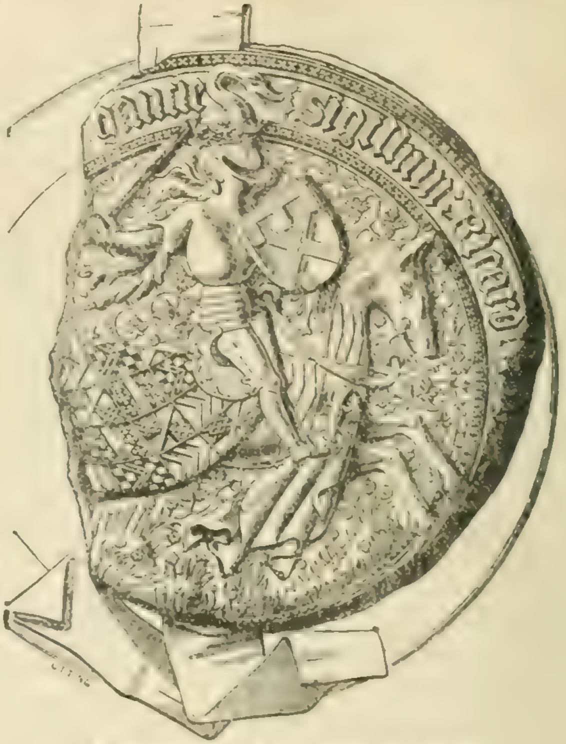


Fig. 131.—Counterseal of Richard Neville, earl of Warwick.

The rules were also departed from where the royal arms were quartered, as by Devereux, Hastings, and Stafford, when it was usual to place them in the first or second quarter out of their genealogical order. Also in certain cases the quarterings of an heiress are not broken up, but borne combined as a sub-quarter, sometimes called a grand quarter. Thus the royal arms always form a special quarter, and probably the arms of Howard, quartering, as they always do, Brotherton, Mowbray, and Warren, would be so treated.

The English mode of quartering is defective, inasmuch as it affords no proof of purity of descent on both sides. A new man whose father married a Talbot or Clinton heiress would combine their ancient quarterings with his new coat, and few would be the wiser. On the Continent and in Scotland the system is far more perfect, and the quarterings include all ancestors and ancestresses of every kind. There a man who can prove the arms of his father and mother has two quarters, of his grandfather and grandmother, four; and so on. The following scheme, supplied from the family records of Mr C. J. Middleton, registrar of the prerogative court, the representative in the male line of a Scottish family, the Middletons of Fettercairn, two of whom were earls of Middleton, will explain this. It gives, or nearly gives, the well-known "sixteen quarters," without which, in former days, scarcely any important office was ever to be obtained:—

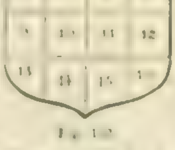
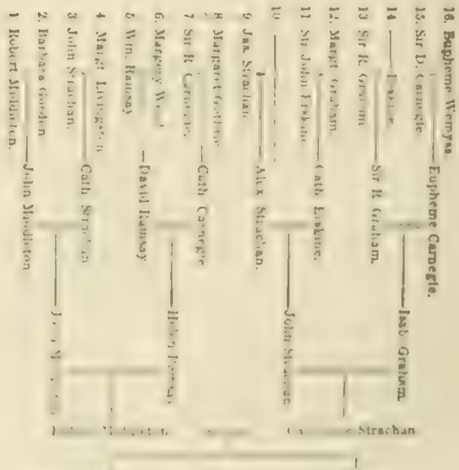


Fig. 132.



The arms are thus marshalled (fig. 132):—

Quarterly of 16—1, Middleton; 2, Gordon; 3, Strachan; 4, Livingstone; 5, Ramsay; 6, Wood; 7, Carnegie; 8, Guthrie; 9, Strachan; 10, ——; 11, Erskine; 12, Graham; 13, Graham; 14, Erskine; 15, Carnegie; 16, Wemyss.

When John de Foix, count of Candale, was about to marry Joan, daughter of William de la Pole, duke of Suffolk, by Alice Chaucer, the "probatio nobilitatis" was sought for, though with little success, in England:—

"1. Petitur informatio lineæ De la Pole, et primo quænam fuerit mater G^{li} de la Pole; 2do Quænam fuerunt ejusdem pater et mater; 3^{tio} Quænam fuerit uxor Thomæ Chaucer seu mater Aliciæ, &c. . . . Fiant-but arma gentilitia prædictarum Pole, Chaucer, et aliarum, quæ apponuntur in superioribus locis monumenti, in lapide, aut picturis cum debitis coloribus, aut sculptura, per armorum figuras et colores.'

This sort of escutcheon at once placed before the eye the heraldic history of the family for four generations.

Bishops, deans, kings-at-arms, and the heads of certain corporations wear their paternal arms impaled by those of their office. No provision is made for the wife.

Single women or widows bear their arms upon a lozenge. Widows and peeresses use their husband's supporters. Peeresses in their own right use their own. But no lady uses crest or motto.

A commoner who marries a peeress in her own right uses two shields. On the dexter are his own arms with those of his wife on a scutcheon of pretence ensigned with her coronet; on the sinister the lady's arms alone on a lozenge with supporters and coronet. If the lady be only a dowager peeress, and not an heiress, there are also two shields. On one the husband impales her arms in the ordinary way; on the other are the lady's arms, &c., as a widow, impaled by those of her first husband, with his supporters and coronet, but no crest, and the arms in a lozenge.

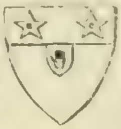


Fig. 133.

A baronet of England or Ireland bears a sinister hand couped gules on an inescutcheon or a canton. It is blazoned "argent, a sinister hand, couped at the wrist and appaumée, gules." Those of Nova Scotia bear argent on a shield of pretence, Scotland ensigned with a crown.

Bacon of Redgrave, the premier baronet, bears gules, on a chief argent two mullets pierced sable (fig. 133).

A knight of an order surrounds his shield, usually a cartouche, with the ribbon and motto of the order. If married he takes a second and sinister shield, and thereon impales his wife's arms, the whole within a plain ribbon.

A widower marrying a second wife divides his shield tierce per pale, and places his own arms in the centre, his first wife's on the dexter, his second's on the sinister side. For a greater number there is no strict rule. A certain Sir Gervase Clifton who survived seven wives, placed himself in the centre of the shield, and his wives around him. The widow of two husbands may divide her lozenge tierce per pale, and place her first husband on the dexter side, her second in the centre, and herself in the sinister place; or she may divide the dexter half on her lozenge per fess, and place the arms of the first husband above, and those of the second below.

APPENDAGES.

These include whatever is borne outside the shield, as the crest, badge, motto, supporters, helmet, coronet, and some other additions. Strictly speaking, armorial bearings are confined to the contents of the shield; and heralds have never regarded the appendages as of the same importance.

The *Crest* was the ornament of the headpiece, and afforded protection against a blow. In early rolls of arms it is not noticed. In early seals when it appears it is rarely heraldic. Richard I. wears a sort of fan-shaped ornament, but has a lion passant gardant on the front of his helmet. Edmund Crouchback in 1296 uses distinctly a crest. Of fourteen seals of horsemen in complete armour appended to the barons' letter to the pope in 1301, three only have regular crests, although many have plumes. The three are—Thomas earl of Lancaster and Ralph earl of Gloucester, men of high rank, and Sir John St John, a great military commander. In the 14th century they became general. In 1355 the count of Hainault presented to Edward III. "unam galeam pretiosam cum apparatu quam idem comes solebat in capite suo gestare." This was the crest of the eagle seen on the count's seal, and which the king regranted at the fords of Annan to Montagu, earl of Salisbury. Edward himself used the lion, which has continued to be the crest of the English sovereigns. Adam de Blencowe (1356-7) had a grant of arms and crest of the Greystoke bearings from William, lord of Greystoke.

Richard Beauchamp, earl of Warwick (died 1439), rests his feet upon the crests of the bear and griffin for Warwick and Montagu. His paternal crest, the swan's head out of a ducal coronet, is placed upon his helmet, beneath his head. The dragon and wyvern were common crests, and the plume of feathers is still used by Scrope and Courtenay. Ralph, Lord Neville of Raby, used the bull's head in 1353; Hastings, a bull's head in 1347. Crests were, like arms, allusive. Grey of Wilton used a "gray" or badger; Lord Welles, a bucket and chain; Botreaux, a buttress. The crest was sometimes placed on a ducal coronet, sometimes rises out of a wreath or torse of the colours of the arms. The coronet below the crest is not a mark of rank. In Carlisle cathedral is the crest of Davidson, a bird rising out of an earl's coronet. This, however, is rare; the coronet so used is generally ducal. Crests were granted and bequeathed. In Germany it is usual to bear the crests of the "seize quartiers" or some of them. This of course is inconsistent with the actual use of the crest in war. At first crests were confined to persons of rank, but they have long been included in every grant of arms. In England two or more can only legitimately be borne when the bearer has from the crown a grant of name and arms in addition to his own, as Chetwynd-Talbot, Fitz-Alan-Howard.

With the crest is usually combined some flowing drapery known as the "panache," "mantling," or *lambrequin*. This seems to have served to protect the helmet from heat and dust, and was also ornamental. It is represented in great perfection on tombs of the 15th and 16th centuries, commonly of some brilliant colour with a lining and tassels. The tilting helmet which supports the head of the effigy of Humphrey de Bohun (died 1267), at Gloucester, is accompanied by a grand early specimen of the lambrequin.

The *Badge* or *Cognizance* was not worn on the helmet, but displayed upon the persons of the retainers of great barons, and sometimes used to ornament the shield or seal. At the celebrated judicial combat at Coventry before Richard II. in 1398, Henry of Lancaster appeared with his housings of blue and green embroidered with swans and antelopes, his badges; and Mowbray had housings of crimson velvet, embroidered with silver lions and mulberry trees, his badges. The bear was the Beauchamp badge, derived possibly from Urso D'Abitot. They also used the ragged staff and the combination of the two.

The seal of Richard III., 1484, as lord of Glamorgan, exhibits the boar as a supporter, and the counterseal repeats it as a badge (figs. 134, 135). This seal well illustrates various heraldic points. Its blazon is per pale, baron and femme; baron, France modern and England quarterly, over all a lábel of three points; femme, per fess, Beauchamp, and checquy, on a chevron five pards' heads jessant fleurs-de-lys, for Newburgh combined with Cantelupe. The same arms are repeated on the shields and caparisons of the counterseal. Richard married Anne Neville, but the Neville saltire does not appear, only the arms of Beauchamp and Newburgh, both of whom were earls of Warwick.

"The rampant bear chained to the ragged staff" was inherited by the Nevilles and Dudleys, and granted about 1560 to the Grevilles as the owners of Warwick castle. Pelham used a buckle, Percy a crescent, Bourchier, Bowen, Dacre, Heneage, Hungerford, Lacy, Stafford, Wake, and

Harrington used the knots that bear their names. Gower designates the great nobles of his day by their badges, as is done in the following satirical lines written about 1449:—

> The rote[1] is ded, the swan[2] is goon,
> The firy cresset[3] hath lost his lyght,
> Therfore Inglond may mak gret mone,
> Were not the helpe of God Almyght.
> The castelle[4] is wonne, where care begoun
> The portecolys[5] is leyd adoun;
> Y-closid we have oure Welvette hatte[6],
> That keverid us from mony stormys brown.
> The white lioun[7] is leyd to slepe,
> Thorowe the envy of the ape clogge[8],

and so on, through interminable further instances.

The Scottish clans wore native plants for their badges: Chisholm, the alder; Menzies, the ash; M'Intosh, the box, &c.

The Motto.—In times when each chief tenant under the crown brought his own tenants into the field and led them, distinct war-cries were common. The royal cry was "St George for England." The French cried, "Montjoye St Denis;" the *cri de guerre* of Bauffremont was their name; that of Barr, "Au feu"; Seyton, "St Bennet and Set on." The common Highland cry or slogan was "Claymore"; that of the Medici, "Palle, palle," alluding to their arms. The motto succeeded to this (1291); Bruce of Annandale used "Esto fortis in bello"; Courtenay, "Passez bien devant"; Hastings, "Honorantes me honorabo;" Kirkpatrick used the crest of the bloody dirk with the motto "I mak sicker." The Warren motto, alluding to the earls' resistance to the "quo warranto," was "tenebo;" Vernon, "God save the Vernon," ill exchanged for "Vernon semper viret." The Scottish borderers, who lived by harrying their neighbours by moonlight, used stars and crescents for their arms, and such mottos as "Reparabit cornua Phœbe" for Scott of Harden, or "Watch weel" of Halyburton. In modern times Sir Dudley Ryder died while his patent of peerage was under seal. It was given to his son, who adopted as a motto "Fides servata cineri."

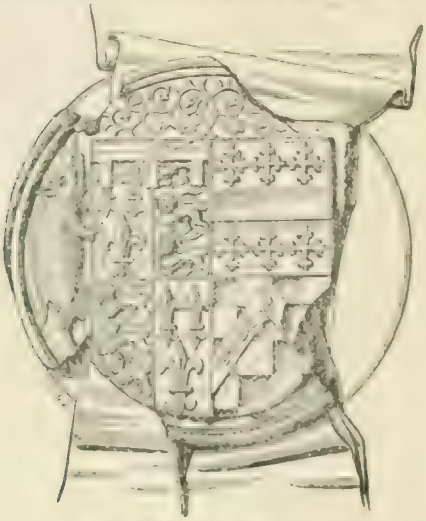


Fig. 134.—Seal of Richard III.

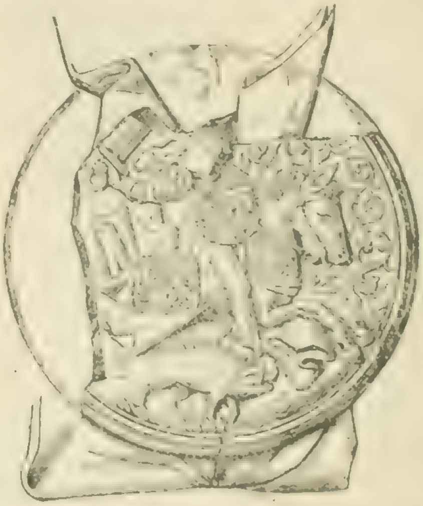


Fig. 135.—Counterseal of Richard III.

Supporters are now placed on either side of the shield, and are usually animals or human figures. They seem to have arisen from the ornaments introduced by the seal engraver, and became heraldic with the practice of quartering. The seal of Edmund Crouchback bears a shield flanked by two wyverns, probably ornaments. That seal (1296) and the seal of Henry of Lancaster in 1300 contain both crest and helm, lambrequin and supporters. The seal of Catherine, queen of Henry IV., has two antelopes, and her husband as prince used two swans. At Naworth the family supporters, of gigantic size, support the principals of the roof of the hall. Under the house of Tudor many families of knightly rank, as Edgcumbe, Stanhope, and Luttrel, used supporters, but at this time supporters are only granted to peers, knights of the garter, grand crosses of the bath, Nova Scotia baronets, and a few private persons who hold them by prescription. In Scotland they are used by heads of clans, and by a few lowland families. Fletcher of [illegible] [illegible].

[illegible] is the *Eagle*, upon which some North Wales families place their shields, and the double-headed variety as used by nobles of the Holy Roman empire.

The *Livery* has long lost its early signification, and is used only for the dress of the retainers in their lord's colour. At Richard III.'s coronation 8000 badges of the white boar were wrought upon liveries of fustian. A statute of Henry IV. forbade the use of liveries under heavy penalties, but they reappeared in the Wars of the Roses. Richard III. used "collars of livery," but these were for persons of rank. One remains upon a Neville effigy at Brancepeth.

Crowns, Coronets, and Symbols of Rank.—The crown is the head attire of a sovereign prince. It is usually closed at the top by four arched bars called diadems, and surmounted by a globe and cross. Edward IV. is said to have first closed the English crown. That now in use is a circle of gold, jewelled, edged above with crosses patée and fleurs-de-lys alternate, and closed above with four bars and the cross and globe called in Germany the Reichsapfel (fig. 136). Since the Restoration the crown of the Prince of Wales has been surmounted by two bars, also with the Reichsapfel (fig. 137). They also use the plume of three ostrich feathers, with the words "Ich dien," adopted by the Black Prince (fig. 138). Figs. 139 and 140 give representations of the imperial crown of Austria and the crown of the old kings of France. The [illegible] crown [illegible] (fig. 141), [illegible] 1[illegible], 1[illegible], and 1411. The [illegible] may be seen [illegible] the elector's badge of arch treasurer. The doges of Venice and Genoa bore a peculiar cap or toque, seen in Greek statuary, and upon the figures on the arch of Constantine.

---

[1] Duke of Bedford.
[2] [illegible]
[3] [illegible]
[4] [illegible]
[5] [illegible]
[6] [illegible]
[7] [illegible]
[8] [illegible]

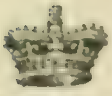


Fig. 136.—Crown of England.

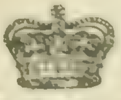


Fig. 137.—Coronet of the Prince of Wales.

Fig. 138.

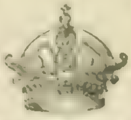


Fig. 139.—Crown of Austria.

The coronet is the head attire of a noble. In England those of princes of the blood are bordered with crosses patée and fleurs-de-lys under a regulation of 13 Charles II. (fig. 143). The princesses alternate the same ornaments with strawberry leaves (fig. 144).

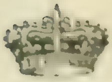


Fig. 140.—Crown of [illegible]

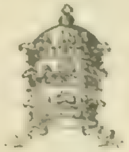


Fig. 141.—The Pope's Crown.

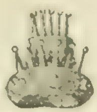


Fig. 142.—The Sultan's Tiara.

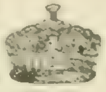


Fig. 143.

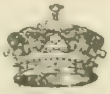


Fig. 144.

The coronet of a duke is bordered with eight strawberry leaves (fig. 145); that of a marquis with four alternating with four pearls placed on low points (fig. 146). An earl's coronet has eight strawberry leaves alternating with eight pearls upon tall points (fig. 147). The viscount borders his coronet with an indefinite number of pearls, set close upon the rim (fig. 148). The baron's coronet, granted to the order by Charles II., carries six pearls placed on the rim at equal intervals,—four being seen at once (fig. 149). These coronets are all lined with ermine, and enriched with jewels. On occasions of state, when not worn by the peer, they are carried before him on a cushion. The eldest sons of peers above the rank of viscount wear the coronet due to their father's second title. The crowns of the kings at-arms are of gold, bordered with and encircled by the motto "Miserere mei, Domine." The ducal, as an ancient form of coronet, is often used without reference to rank, as the base for a crest. It was so used by Sir Simon de Felbrigge in 1442.

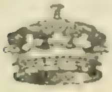


Fig. 145.

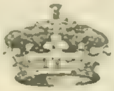


Fig. 146.

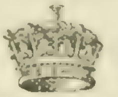


Fig. 147.

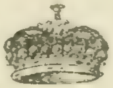


Fig. 148.

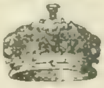


Fig. 149.

A bishop has neither crest nor coronet, but ensigns his arms with a mitre. The bishops of Durham, while palatines, placed their mitre in a ducal coronet, as—though without authority—do the archbishops (fig. 150). The Berkeley crest is a mitre. The ancient mitre was low, and of linen stiffened with vellum. The central band and the margin, embroidered with fleurs-de-lys or other patterns, were called the orphreys. The pendent side ribbons were the "infulæ." Prelates of the church of Rome ensign their shields with a hat, the tassels of which indicate their rank. A cardinal has four rows of red tassels, arranged 1, 2, 4, 8, or 15 on each side; an archbishop the same, but green. A bishop has three rows, an abbot two; the abbot's hat is black. Prelates and legates place a patriarchal cross in pale behind their shield.

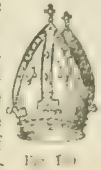


Fig. 150.

The *Helmet* also indicates the rank of the wearer. It is placed above the shield, and beneath the crest. The sovereign and the royal family bear the helmet full-faced or affrontee with six bars, all of gold (fig. 151). Those of dukes and marquises are of gold with five steel bars (fig. 152). The [illegible] have silver helmets borne in profile with gold ornaments and four silver bars. Those of baronets and knights are of steel, full-faced and open (fig. 153). An esquire's helmet is of steel, represented in profile, with the vizor closed (fig. 154). These distinctions were probably introduced after the Restoration.

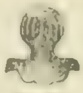


Fig. 151.

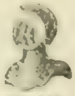


Fig. 152.

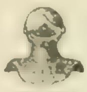


Fig. 153.

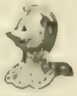


Fig. 154.

The *Mantling* is a sort of cloak or mantle of fur extended behind the shield, and sufficiently ample to include the whole achievement. Those of sovereigns are of gold doubled with ermine, and are called "pavilions." Peers' mantlings are of crimson velvet, doubled with white fur and barred with ermine spots; a duke has four bars, a marquis three and a half, an earl three, a viscount two and a half, and a baron two. Commoners use red mantlings lined with white fur. The prior of St John, whose place was on the right of the temporal barons, used a sable mantling doubled with murrey. The pavilion of France was of blue velvet, powdered with gold fleurs-de-lys, and lined with ermine. Such a mantling may be seen behind the arms of Beaumont in Rothley Temple chapel, in right of their descent from the blood-royal of France.

Certain officers of state accompanied their armorial shields with exterior marks of their rank. The Earl Marshal placed two truncheons saltirewise behind his shield, tipped above with the arms of England, and below with his own arms. His deputy places one truncheon in bend dexter.

In Scotland the Lord High Constable, the earl of Errol, places on either side of his shield an arm issuant from a cloud, and grasping a sword. Under the old monarchy the French colonels commandant placed the standards of their regiments saltirewise behind their shields.

The Lords High Admiral have been variously distinguished. Thomas de Berkeley bears on his brass a collar of tritons. Thomas, duke of Exeter, sealed with a ship and his arms on the mainsail. The anchor in some form or other was a common emblem.

Merchants' marks are scarcely heraldic, though they took the place of arms with the trading classes. They were usually monograms of the name or initials. They were protected by law as marks on goods, and are seen on merchants' tombs and sometimes in architecture.

FUNERAL ESCUTCHEONS.

Some of the most valuable records in the College of Arms are the certificates of funerals conducted under their superintendence and authority. These gorgeous and expensive ceremonials have happily fallen into disuse, save on very rare occasions, and for royal persons or eminent public characters. The last private funeral conducted with anything like the ancient ceremonial was that of Charles, earl of Shrewsbury, in 1828. All that is now usual is the suspension of a shield of arms in a large black lozenge-shaped frame called a hatchment or achievement against the wall of the house of the deceased. It is usually placed over the entrance at the level of the second floor, and remains for from six to twelve months, when it is removed to the parish church. Even this custom, scarcely consistent with living in hired houses and burying in cemeteries, is falling into disuse, though still not uncommon.

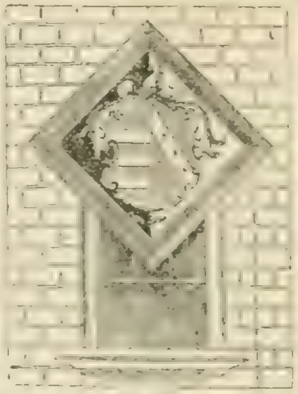


Fig. 155.

If for a bachelor, the hatchment bears upon a shield his arms, crest, and other appendages, the whole on a black ground. If for a single woman her arms are represented upon a lozenge, bordered with knotted ribbons, also on a black ground. If the hatchment be for a married man (as in fig. 155), his arms upon a shield impale those of his wife; or if she be an heiress they are placed upon a scutcheon of pretence, and crest and other appendages are added. The dexter half of the ground is black, the sinister white. For a wife whose husband is alive the same arrangement is used, but the sinister ground only is black. For a widower the same is used as for a married man, but the whole ground is black; for a widow the husband's arms are given with her own, but upon a lozenge, with ribbons, without crest or appendages, and the whole ground is black. When there have been two wives or two husbands the ground is divided into three parts per pale, and the division behind the arms of the survivor is white. Colours and military or naval emblems are sometimes placed behind the arms of military or naval officers. It is thus easy to discern from the hatchment the sex, condition, and quality, and possibly the name of the deceased.

In Scottish hatchments it is not unusual to place the arms of the father and mother of the deceased in the two lateral angles of the lozenge, and sometimes the 4, 8, or 16 genealogical escutcheons are ranged along the margin.

Undertakers are fond of substituting "In cœlo quies" or some such commonplace for the family motto. This is irregular.

The literature of heraldry commences with the treatises of Sassoferrato about 1358, De Fosse in the reign of Richard II., and Upton about 1441, all written in Latin and printed by Sir E. Bysshe in 1654. They are followed by the *Boke of St Albans*, written by Dame Juliana Berners, prioress of Sopwell, and printed in 1486. These, especially those of Upton and Dame Juliana, are valuable. The lady writes in a mixture of early English and Latin, but her descriptions are intelligible and copious. These writers were followed by a crowd of others, of whom the chief were Gerard Leigh, Ferne, and Morgan, who wrote in the latter half of the 16th century. Their great aim was to elevate their subject by tracing back the use of armories to the patriarchs and heroes of Jewish and pagan antiquity, whom they invested with coats of arms on the type of those used by Norman barons. There are traces of this folly in Dame Juliana, but it reached its height in the writings of her successors, and was not quite extinguished when Guillim wrote his *Display of Heraldrie* in 1610. Guillim, whose work is still a standard, wrote in English, but as late as 1654 and 1688 Spelman, in his *Aspilogia*, and John Gibbon strove hard to restore the use of a dead language upon a subject to which it was eminently unsuitable. In 1722 and 1780 were published the excellent volumes of Nisbet, chiefly relating to Scotland, and of Edmondson, whose list or ordinary of bearings was long very useful to those who seek to identify the name to which a coat belongs, until superseded by the very laborious and far more complete work of Papworth.

Recently the same critical spirit that has pervaded the works of our historians has been applied with equal diligence to the whole subject of heraldry; a number of authors, led by Planché, Boutell, Seton, Nichols, and Lower, have set aside all the fabulous pretensions and baseless assertions of the earlier writers, have sifted the old evidence and added much that is new. The whole subject of heraldic and quasi-heraldic seals has been brought under notice by the publication of Laing's fine plates of Scottish seals; and it may truly be said that the real origin and growth of the use of armorial bearings is placed before the reader in the books of these writers in a truthful and most attractive form. (G. T. C.)

[illegible]

[illegible]

HERAT is a city of great interest both historically and geographically, and is of even greater interest politically, its importance at the present day being indicated by its popular designation of the "key of India." Its origin is lost in antiquity. The name first appears in the list of primitive Zoroastrian settlements contained in the *Vendidad Sadé*, where, however, like most of the names in the same list,—such as *Sughdha* (Soghd), *Mouru* (Merv or Margus), *Haraqaiti* (Arachotus or Arghand-ab), *Haetumant* (Etymander or Helmend), and *Ragha* (or Argha-stán),—it seems to apply to the river or river basin, which was the special centre of population. This name of *Haroyu*, as it is written in the *Vendidad*, or *Haraiva*, as it appears in the inscriptions of Darius, is a cognate form with the Sanskrit *Sarayu*, which signifies "a river," and its resemblance to the ethnic title of Aryan (Sans. *Arya*) is purely fortuitous: though from the circumstance of the city being named "Aria Metropolis" by the Greeks, and being also recognized as the capital of Ariana, "the country of the Arians," the two forms have been frequently confounded. Of the foundation of Herat (or Heri, as it is still often called) nothing is known. We can only infer from the colossal character of the earth-works which surround the modern town, that, like the similar remains at Bost on the Helmand and at Ulan Robat of Arachosiá, they belong to that period of Central-Asian history which preceded the rise of Achæmenian power, and which in Grecian romance is illustrated by the names of Bacchus, of Hercules, and of Semiramis.

The natural advantages of Herat are mainly due to its river, which, rising in the high uplands 350 miles to the eastward, where the Koh-i-Babá, the prolongation of the Hindu-kush, bifurcates into the two parallel ranges of the Sufid-koh or "white mountains" to the north and the Siyah-koh or "black mountains" to the south, passes in the upper part of its course through a succession of rolling downs of the finest pasture-land, and lower down traverses a more contracted valley, enlivened, however, throughout with smiling villages and orchards, till it reaches the eastern limit of the alluvial plain of Herat. Here at the present day nine large canals (in former times there were twenty) carry off the waters of the Heri-rúd for the irrigation of the circumjacent plain, which on a rough calculation may be said to contain nearly 400 square miles of land available for cultivation. M. Khanikoff, who visited Herat in 1858, observes that nowhere in the East,—not even at Samarcand or Bokhara or Ispahán, where the art of canalization is supposed to be carried to perfection,—had he seen water-courses constructed with so much skill, or maintained with so much care, as in the valley of the Heri-rúd; and he adds that, although at the period of his visit nine-tenths of the villages of the plain, which in ordinary times amount to nearly 500, were partially in ruins and the adjoining fields laid waste, the cereal produce of the remaining lands was still far in excess of the wants of the settled inhabitants. The Heri-rúd, passing between 3 and 4 miles to the south of Herat, where it is spanned by a magnificent bridge of twenty-three arches, called the *Púl-i-Málán*, continues its course westward to the extremity of this rich and fertile plain; it then turns north through an arid country for some 200 miles to Sarakhs, receiving two small streams from the west, the Áb-i-Jám and Áb-i-Meshed, and forming the territorial boundary between Persia and Afghanistan. As the Heri-rud is formed of the converging drainage of the Sufid-koh and Siyáh-koh ranges, and its volume thus depends on the extent of snow that falls in the mountains, it is impossible to define with any exactitude the limit of its northern course; but in ordinary seasons water is rarely found in the river bed beyond Sarakhs, and never does the stream penetrate to the northward of a line uniting Abiverd and Merv; and it is of the more importance to note this geographical feature, as in many of our modern maps the line of the Heri-rud, or Tejend, as it is called in its lower course, is prolonged through the desert 200 miles to the north-westward of Sarakhs.

The city of Herat is in 34° 22′ N. lat. and 62° 9′ E. long. It is very centrically situated, great lines of communication radiating from it in all directions—southward to Seistan (200 miles), south-eastward to Kandahar (370 miles), eastward to Cabul (550 miles), northward by Mymeneh to Bokhara (600 miles) and by Merv to Khiva (700 miles), while to the westward four routes lead into Persia by Turbat to Meshed (215 miles), and by Birjend to Kermán (400 miles), to Yezd (500 miles), or to Ispahán (600 miles). The city forms a quadrangle of nearly a mile square (more accurately about 1600 yards by 1500 yards); on the western, southern, and eastern faces the line of defence is almost straight, the only projecting points being the gateways, but on the northern face the contour is broken by a double outwork, consisting of the *Ark* or citadel, which is built of sun-dried brick on a high artificial mound within the enceinte, and a lower work at its foot, called the *Ark-i-now*, or "new citadel," which extends 100 yards beyond the line of the city wall. That which distinguishes Herat from all other Oriental cities, and at the same time constitutes its main defence, is the stupendous character of the earthwork upon which the city wall is built. This earthwork averages 250 feet in width at the base and about 50 feet in height, and as it is crowned by a wall 25 feet high and 14 feet thick at the base, supported by about 150 semi-circular towers, and is further protected by a ditch 45 feet in width and 16 in depth, it presents an appearance of imposing strength. Whether the place is really as strong as it looks has been differently estimated. General Ferrier, who resided for some time in Herat in 1846, states that the city is nothing more than an immense redoubt, and gives it as his opinion that as the line of wall is entirely without flanking defences, the place could not hold out for twenty days against a European army; and M. Khanikoff, who, though not a professional soldier, was a very acute observer, further remarks that the whole interior of the city is dominated from the rising ground at the north-east angle, while the water supply both for the ditch and the city would be at the mercy of an enemy holding the outside country, the wells and reservoirs inside the wall, which would then be alone available, being quite inadequate to the wants of the inhabitants; but on the other hand all experience testifies to the defensibility of the position. Not to speak of the sieges which Herat sustained at the hands of Jenghiz Khan, of Timur, and of Ahmed Shah, we have only to remember that in 1837 the Afghans of Herat beat off the continuous attack for nearly ten months of a Persian army of 35,000 regular troops, supported by 50 pieces of artillery, and in many cases directed and even commanded by Russian officers. The truth seems to be that Herat, though in its present state quite unfit to resist a European army, possesses great capabilities of defence, and might by a skilful adaptation of the resources of modern science be made almost impregnable. A British engineer officer, Major Sanders, calculated in 1840 that at an outlay of sixty or seventy thousand pounds, which would include the expense of deepening the ditch, clearing the glacis and esplanade, providing flanking defences and repairing the walls, &c., throughout, Herat might be rendered secure against any possible renewal of the attack by Persia; but of course if an attack by a well-appointed European army were anticipated, more extensive preparations for defence would be required, including probably the erection of two independent forts on the high ground at Mosallá and Thaleh-bengi.

The city possesses five gates, two on the northern face, the Kutab-chak near the north-east angle of the wall, and the Malik at the re-entering angle of the Ark-i-now; and three others in the centres of the remaining faces, the Irák gate on the west, the Kandahar gate on the south, and the Khushk gate on the east face. Four streets called the *Chahar-súk*, and running from the centre of each face, meet in the centre of the town in a small domed quadrangle. The principal street runs from the south or Kandahar gate to the market in front of the citadel, and is covered in with a vaulted roof through its entire length, the shops and buildings of this bazaar being much superior to those of the other streets, and the merchants' caravanserais, several of which are spacious and well built, all opening out on this great thoroughfare. Near the central quadrangle of the city is a vast reservoir of water, the dome of which is of bold and excellent proportions. It is stated by General Ferrier to have been constructed by command of Shah Abbas, and to be a *chef d'œuvre* of its kind. It is supposed to contain above a twelve months' supply of water for the entire city, but, as M. Khanikoff observes, it is within easy mortar range of the high ground at the north-east angle of the city, and might thus be destroyed by a few well-directed shells, in which case the ruins of the dome would fill up the basin and the water supply would be lost. The only other public building of any consequence in Herat is the great mosque or *Musjid-i-Juma*, which comprises an area of 800 yards square, and must have been a most magnificent structure. It was erected towards the close of the 15th century, during the reign of Shah Sultan Hussein of the family of Timur, and is said when perfect to have been 465 feet long by 275 feet wide, to have had 408 cupolas, 130 windows, 444 pillars, and 6 entrances, and to have been adorned in the most magnificent manner with gilding, carving, precious mosaics, and other elaborate and costly embellishments. Now, however, it is falling rapidly into ruin, the ever-changing provincial governors who administer Herat having neither the means nor the inclination to undertake the necessary repairs. Neither the palace of the Charbagh within the city wall, which was the residence of the British mission in 1840-41, nor the royal quarters in the citadel deserve any special notice. At the present day, with the exception of the *Chahar-súk*, where there is always a certain amount of traffic, and where the great diversity of race and costume imparts much liveliness to the scene, Herat presents a very melancholy and desolate appearance. The mud houses in rear of the bazaars are for the most part uninhabited and in ruins, and even the burnt brick buildings are becoming everywhere dilapidated. The city is besides one of the filthiest in the East, as there are no means of drainage or sewerage, and garbage of every description lies in heaps in the open streets.

With regard to the population, it fluctuates so rapidly, according to the circumstances of the period, that it is impossible to give any estimate of its normal strength. When Christie visited the city in 1809 it was in a very prosperous condition, having been undisturbed for fifty years, and was supposed to contain 100,000 inhabitants. A. Conolly in 1829 reduced the numbers to 45,000. Before the Persian siege in 1837 the population was estimated at 70,000, but at the close of the war not over 7000 were all that remained. In 1845, at the time of General Ferrier's visit, the numbers had increased again to 22,000, and continued to increase to the time of the capture of the city by Dost Mahomed Khan in 1863, when there are said to have been [illegible] inhabitants within the walls. Since that time Herat has been a mere provincial city governed from Cabul, and its average population has ranged between 20,000 and 30,000, within which limits must be confined its present estimate.

The maximum population of which the enceinte would seem to be capable may be put at Christie's estimate of 100,000, and it is manifest therefore that when Herat contained a population of a million and a half, as is testified by so many contemporary authorities, the present city could have been only the citadel of this vast metropolis, the great mass of buildings lying along the slopes of the northern hills, where for a space of some 4 miles in length by 3 miles in breadth the surface of the plain, strewed over its whole extent with pieces of pottery and crumbling bricks, is also broken here and there by earthen mounds and ruined walls, the debris of palatial structures which at one time were the glory and wonder of the East. Of these structures indeed some have survived to the present day in a sufficiently perfect state to bear witness to the grandeur and beauty of the old architecture of Herat. The mosque of the Mosalla, for instance, originally built in the 12th century, but restored or rather rebuilt at the end of the 15th century, and intended for the reception of the body of the Imam Reza which Shah Sultan Hussein wished to remove from Meshed to Herat, is, even in its present state of ruin and decay, one of the most imposing and elegant structures to be seen in Asia. "The mosque," says General Ferrier, "is completely covered with a mosaic of glazed bricks in varied and beautiful patterns, and the cupola is of amazing dimensions. Several arcades supported by pillars in brick upon the proportions of the arch of Ctesiphon, and the seven magnificent minarets that surround it may be said to be intact, for the upper part of them only is slightly injured." Scarcely inferior in beauty of design and execution, though of more moderate dimensions, is the tomb of the saint Abdullah Ansari, in the same neighbourhood. The building, which was erected by Shah Rokh Mirza, the grandson of Timur, nearly 500 years ago, contains some exquisite specimens of sculpture in the best style of Oriental art. Adjoining the tomb also are numerous marble mausoleums, the sepulchres of princes of the house of Timur; and especially deserving of notice is a royal building tastefully decorated by an Italian artist named Cerdo, who was in the service of Shah Abbas the Great. The locality, which is further enhanced by gardens and running streams, is named *Gazergah*, and is a favourite resort of the Heratees. It is held indeed in high veneration by all classes, and to this day Dost Mahomed Khan lies himself buried at the foot of the tomb of the saint. Two other royal palaces named respectively *Takht-i-Shah* and *Takht-i-Safar*, are situated on the same rising ground somewhat further to the west. The buildings are now in ruins, but the view from the pavilions, shaded by splendid pine trees in the terraced gardens formed on the slope of the mountain, is said to be very beautiful.

The population of Herat and the neighbourhood is of a very mixed character. The original inhabitants of Ariana were no doubt of the Aryan family, and intimately cognate with the Persian race, but they were probably intermixed at a very early period with the [illegible], who seem to have held the mountains from Cabul to Herat from the first dawn of history, and to whom must be ascribed—rather than to an infusion of Turco-Tartaric blood introduced by the armies of Jenghiz and Timur—the peculiar broad features and flat countenance which distinguish the inhabitants of Herat, Seistan, and the eastern provinces of Persia from their countrymen farther to the west. Under the government of Herat, however, there are a very large number of tribes, ruled over by separate and semi-independent chiefs, and belonging probably to different nationalities. The principal group of tribes is called the *Chahar-Aimak*, or "four races," the constituent parts of which, however, are variously stated by different authorities both as to strength and nomenclature. Mountstuart Elphinstone, by far the best general authority on Afghan questions, gives the original four tribes as the Taimunis, the Hazarehs, the Taimuris, and Zuris; Khanikoff, on the other hand, whose forte was ethnography, and who made his inquiries on the spot, describes the *Chahar-Aimak* as [illegible] the Jamshidis (12,000), the [illegible], and the [illegible] 12,000, while [illegible] the Sunni [illegible] now for the [illegible], and [illegible]. Aimaks [illegible]. These tribes [illegible] to the north-east [illegible] and the south-east of Herat [illegible] in the aggregate perhaps [illegible] found that the [illegible]

The trade of Herat [illegible] supplies for 15,000 men [illegible] the fixed inhabitants, as well as to the mineral wealth of the adjoining mountains, and the industrial activity of the city population, especially in regard to silk and woollen manufactures (the carpets of Herat being famous throughout the East), the country rapidly recovers from the effects of war, and its normal condition may be said to be that of prosperity and abundance.

In actual territory Herat extends east and west from near the sources of the Heri-rud about [illegible] miles to the Persian frontier beyond Ghorian, and north and south from the Merv boundary, in [illegible] lat., 200 miles to the northern frontier of Seistan. The inhabitants of the city of Herat are for the most part Sunnis, and in regard to language and habits, as well as in origin, are Persians rather than Afghans. There are, however, both in the town and in the neighbouring villages a certain number of Afghan colonists, who have been [illegible] partly by [illegible] Shah during the last 100 years as well as Hazaras, Jamshidis, and Taimunis, with a few [illegible] Hindus and some [illegible] families of Jews. The net revenue of the valley and its immediate dependencies in ordinary times is under £100,000 per annum, but the vizier Yar Mahomed Khan is supposed in the plenitude of his power, and when he had for a time brought a great part of Seistan under his sway, to have realized double that amount from the entire province.

To trace in any detail the fortunes of Herat would be to write the modern history of the East, for there has hardly been a dynastic revolution, or a foreign invasion, or a great civil war in Central Asia since the time of the Prophet, in which Herat has not played a conspicuous part and suffered accordingly. Under the Taherides of Khorassan, the Soffarians of Seistan, and the Samanides of Bokhara, it flourished for some centuries in peace and progressive prosperity; but during the succeeding rule of the Ghaznevide kings its metropolitan character was for a time obscured by the ascendency of the neighbouring capital of Ghazni, until finally in the reign of Sultan Sanjar of Merv about 1157 the city was entirely destroyed by an irruption of the Ghuz, the predecessors, in race as well as in habitat, of the modern Turcomans. Herat gradually recovered under the enlightened Ghorian kings, who were owned masters of the province, though they preferred to hold their court amid their ancestral fortresses in the mountains of Ghor, so that at the time of Jenghiz Khan's invasion it equalled or even exceeded in populousness and wealth its sister capitals of Balkh, Merv, and Nishapoor, the united strength of the four cities being estimated at [illegible] millions of inhabitants. But this Moghul visitation was most calamitous; forty persons, indeed, are stated to have alone survived the general massacre of 1[illegible]2, and as a similar catastrophe overtook the city at the hands of Timur in [illegible], when the local dynasty of Kurt which had succeeded the Ghorides in eastern Khorassan was put an end to, it is astonishing to find that early in the 15th century Herat was again flourishing and populous, and the favoured seat of the art and literature of the East. It was indeed under the princes of the house of Timur that most of the noble buildings were erected, of which the remains still excite our admiration at Herat, while all the great historical works relative to Asia such as the *Rozet-es-Sefa*, the *Habib-es-seir*, *Hafiz Abru's Tarikh*, the *Matla-es-Sa'dein*, &c., date from the same place and the same age. Four times was Herat sacked by Turcomans and Uzbegs during the centuries which intervened between the Timuride princes and the rise of the Afghan power, and it has never in modern times attained to anything like its old importance. Afghan tribes, who had originally dwelt far to the east, were first settled at Herat by Nadir Shah, and from that time they have monopolized the government and formed the dominant element in the population. It will be needless to trace the revolutions and counter-revolutions which have followed each other in quick succession at Herat since Ahmed Shah Durani founded the Afghan monarchy about the middle of the last century. Let it suffice to say that Herat has been throughout the seat of an Afghan government, sometimes in subordination to Cabul and sometimes independent. Persia indeed for many years showed a strong disposition to reassert the supremacy over Herat which was exercised by the Suffavean kings, but Great Britain, disapproving of the advance of Persia towards the Indian frontier, steadily resisted the encroachment; and, indeed, after helping the Heratis to beat off the attack of the Persian army in 18[illegible], the British at length compelled the shah in 1857 at the close of his war [illegible] treaty recognizing the future independence of the place, and precluding Persia against any further interference with the Afghans. In 18[illegible] Herat, which for fifty years previously had been independent of Cabul, was incorporated by Dost Mahomed Khan in the Afghan monarchy, and such is the present condition of the province, the actual governor Ayub Khan being the younger brother and deputy of Yakub Khan, who recently signed with the Government of India the famous treaty of Gandamak. (H. C. R.)

HÉRAULT, a department in the south of France, formed from part of the old province of Languedoc, is bounded on the N.E. by Gard, N.W. by Aveyron and Tarn, and S. by Aude and the Gulf of Lyons. It has an area of 2441 square miles, and is situated between 43° 10′ and 44° N. lat., 2° 30′ and 4° 10′ E. long. Its greatest length is 84 miles, and its greatest breadth 50. About a third of the department consists of moorland, heath, and common, a fourth of arable land, a sixth of vineyards, and an eighth of wood. The southern prolongation of the Cevennes mountains forms the north boundary of the department. The highest point is about 4250 feet above the sea level. The ridge forms the watershed between the waters of the Atlantic and the Mediterranean, and from it there flow the Vidourle, Mosson, Hérault, Livron, and Orb. Of these the Hérault, 80 miles long, is the chief, and gives name to the department. The Vidourle forms the boundary between the department and that of Gard. The high mountains of the north are partly barren, partly wooded. In the extensive plains of the centre the vine and olive flourish, and figs, mulberries, and other fruit-trees are to be met with nearly in all parts. Grain is chiefly produced in the south. The soil of the north is chalky clay, of the centre light gravel, and of the south a strong rich loam. The "garrigues" are considerable portions of waste land, covered with heath and shrubs. St Loup, [illegible], and St Thibéry, the first of which is 750 feet high, are extinct volcanic cones. The greater part of the south coast consists of a series of salt marshes, separated from the sea by a narrow strip of land. The marsh of Thau, the largest, stretches from the mouth of the Hérault and communicates, through the marsh of Frontignan, with that of Maguelone on the eastern frontier of the department. The Canal du Midi, after stretching about 30 miles into the department, terminates at Agde. From Cette the navigation is kept up through the marshes by the canals of Agde and Radelle to Aigues Mortes. The coast line of the department is 66 miles long. In the valleys and at the foot of the mountains the climate is delightfully mild. Fish abound in the salt marshes. The vegetable productions comprise aromatic and dye-stuff plants; the ilex oak prevails in the forests. The mineral wealth of the department is considerable. Mines of lignite, coal, iron, copper, and lead are wrought. It produces magnificent blocks of marble, also alabaster, gypsum, granite, sandstone, potters' clay, alum; and the marshes supply France with salt. At Gabian there is a petroleum well. Wine and oil constitute the chief agricultural wealth of the department. The red wines of St Georges, St Drézéry, St Christol, and the white wines of Frontignan and Lunel, are held in high estimation. Considerable quantities of wheat, oats, and potatoes are grown. There is a large amount of excellent pasturage, and horses and sheep are extensively reared. Mulberries, pomegranates, figs, raisins and other dried fruits, and olives are prepared for exportation. The chief manufactures are woollen and cotton cloth, silk, perfumery, soap, and chemical substances. The department has Montpellier for its capital, and is divided into the arrondissements of Montpellier, Béziers, Lodève, and St Pons, with 36 cantons and 331 communes. The population was 429,878 in 1872, and 445,053 in 1876.

HERBARIUM, or Hortus Siccus, a collection of plants so dried and preserved as fully to illustrate their several specific characters. Since the same plant, owing to peculiarities of climate, soil, and situation, degree of exposure to light, and other influences, may vary greatly according to the locality in which it occurs, it is only by gathering together for comparison and study a large series of examples of each species illustrative of the flora of different regions that the laws of vegetable morphology, and many more points of scientific interest, can be satisfactorily determined. Thus, from the herbarium may be acquired a knowledge of those details concerning the minuter structure of individual plants which are of necessity omitted in works of systematic botany, as also of the relative taxonomic importance of the characters to be met with in large groups of forms.

Commencing with British herbaria, the collection of the Royal Herbarium at Kew, generally acknowledged to be at once the most extensive and the best preserved and most orderly in the world, comprises some 100,000 species, many of them represented by numerous specimens. It is arranged, for easy reference, in cases situate between the windows of the building containing it, the atmosphere of which is kept dry by means of hot-water pipes. In the intervening spaces are tables for the purpose of study, which is further facilitated by the presence in the same building of a large and valuable botanical library. Next in importance is the herbarium of the British Museum, which comprises assemblages of specimens gathered by numerous eminent botanists. The collection of Dillenius is deposited at Oxford, and that of the late Professor Harvey at Trinity College, Dublin. The original herbarium of Linnæus is in the possession of the Linnean Society of London. With the more important British herbaria are to be ranked also those of Cambridge and Edinburgh. The collections of Jussieu and St Hilaire are included in the large herbarium of the Jardin des Plantes at Paris, and in the same city is the extensive private collection of Dr Cosson. At Geneva are three large collections,—De Candolle's, containing the typical specimens of the *Prodromus*, Delessert's fine series, and Boissier's Mediterranean and Oriental plants. The university of Gottingen has had bequeathed to it the largest collection (exceeding 40,000 specimens) ever made by a single individual—that of the late Professor Grisebach. At the herbarium in Brussels are the specimens obtained by the traveller Martius, the majority of which formed the groundwork of his *Flora Brasiliensis*. Other national herbaria sufficiently extensive to subserve the requirements of the systematic botanist exist at Berlin, St Petersburg, Vienna, Leyden, Stockholm, Upsala, Copenhagen, and Florence. Of those in the United States of America, the chief, formed by Asa Gray, is the property of Harvard university; others are to be seen at Yale and Columbia colleges and at New York and Michigan universities. The herbarium at Melbourne, Australia, under Baron Müller, has attained large proportions; and that of the Botanical Garden of Calcutta is noteworthy as the repository of numerous specimens described by writers on Indian botany.

Specimens of flowering plants and vascular cryptogams are, at Kew, generally mounted on sheets of stout smooth paper, of uniform quality, and in most cases 17 inches long by 11 inches broad; the palms and their allies, however, and some ferns, require a size of 22 by 14 inches. The tough but flexible coarse grey paper (German, *Fliesspapier*), upon which on the Continent specimens are commonly fixed by gummed strips of the same, is less hygroscopic than ordinary cartridge paper, but has the disadvantage of affording harbourage in the inequalities of its surface to a minute insect (*Atropos pulsatoria*, L.), which commits great havoc in dried specimens, and which, even if noticed, cannot be dislodged without difficulty. The majority of plant specimens are most suitably fastened on paper by a mixture of equal parts of gum tragacanth and gum arabic made into a thick paste with water. Hard leathery leaves are attached by means of glue, or, if they present too smooth a surface, by stitching at their edges. Where, as in private herbaria, the specimens are not liable to be handled with great frequency, a stitch here and there round the stem, tied at the back of the sheet, or slips of paper passed over the stem through two slits in the sheet and fastened with gum at the back, or simply strips of gummed paper laid across the stem, may be resorted to. A new adhesive [illegible], a kind of [illegible], has lately come into use for the purpose, and is highly recommended. [illegible] the plants after [illegible] are brushed over with a liquid formed by the solution of ½ ℔ each of corrosive sublimate and carbolic acid in 1 gallon of methylated spirits. They are then laid out to dry on shelves made of a network of stout galvanized iron wire. After this are written, usually in the right-hand corner of the sheet, or on a label there affixed, the designation of each species, the date and place of gathering, and the name of the collector. Information as to economical or medicinal properties may either be added thereto, or mentioned on the back of the sheet. It is especially important to attach to the name of the plant the initials or abbreviated name of the author by whom it was first described; *e.g.*, the words *Ulva lactuca* alone, might signify either of two distinct plants, the one described by Linnæus, the other by Agardh. When the generic name has been altered, but the specific name has been retained, the name of the original describer of the plant is placed in brackets before the name of the later author. Thus the *Enteromorpha Grevillei* of Thuret, having been renamed, has become *Ulva Grevillei* (Thur.), Le Jolis. The value of specimens in private herbaria is greatly enhanced by briefly stating on the lower left-hand corner of the sheet the characters that distinguish it from the plants most nearly resembling it. Other particulars as to habit, local abundance, soil, and claim to be indigenous may be written on the back of the sheet, or on a slip of writing paper attached to its edge. It is convenient to place in a small envelope gummed to an upper corner of the sheet any flowers, seeds, or leaves needed for dissection or microscopical examination, especially where from the fixation of the specimen it is impossible to examine the leaves for oil-receptacles, and where seed is apt to escape from ripe capsules and be lost. The addition of a careful dissection of a flower greatly increases the value of the specimen. To ensure that all shall lie evenly in the herbarium the plants should be made to occupy as far as possible alternately the right and left sides of their respective sheets. The species of each genus are then arranged either systematically or alphabetically in separate covers of stout, usually light brown paper, or, if the genus be large, in several covers with the name of the genus clearly indicated in the lower left-hand corner of each, and opposite it the names or reference numbers of the species. Undetermined species are relegated to the end of the genus. Thus prepared, the specimens are placed on shelves or movable trays, at intervals of about 6 inches, in an air tight cupboard, on the inner side of the door of which, as a special protection against insects, is suspended a muslin bag containing a piece of camphor.

The systematic arrangement varies in different herbaria. The works usually followed are—for dicotyledons, De Candolle's *Prodromus*, and Endlicher's or Bentham and Hooker's *Genera Plantarum*; for monocotyledons, Kunth's *Enumeratio*; for ferns, Hooker and Baker's *Synopsis Filicum*; for mosses, Muller's *Synopsis Muscorum Frondosorum*; for algæ, Kützing's *Phycologia generalis*; for hepaticæ, Gottsche, Lindenberg, and Nees ab Esenbeck's *Synopsis Hepaticarum*; and for other groups of cryptogamic plants the treatises of various authors scattered through numerous scientific publications. In certain herbaria, as in those of Boissier and Delessert at Geneva, the authority of the *Prodromus* is accepted only in the absence of any more recent treatise, or of a complete monograph on a family. For the members of large genera, *e.g.*, *Piper* and *Ficus*, where the number of cosmopolitan or very widely distributed species is comparatively few, a geographical grouping is found specially convenient by those who are constantly receiving parcels of plants from known foreign localities. The ordinary systematic arrangement possesses the great advantage, in the case of large genera, of readily indicating the affinities of any particular specimen with the forms most nearly allied to it in type. In the United States the species in the genera, and the genera in the orders, are usually arranged alphabetically, and the orders serially; sometimes, however, the genera are placed alphabetically throughout without reference to the orders. The alphabetical arrangement, provided works on systematic botany are referred to for the identification of particular plants, possesses the advantage of permitting ready reference to any given species, and also of being independent of changes of classification; but in Europe it is rarely adopted, on account of the counterbalancing practical inconveniences it is considered to present. Instead of keeping a catalogue of the species contained in the herbarium, which, owing to the constant additions, would be almost impossible, such species are usually ticked off with a pencil in the systematic work which is followed in arranging them, so that by reference to this work it is possible to see at a glance whether the specimen sought is in the herbarium, and what species are still wanted. The custom commonly prevalent in Continental, especially German, herbaria of placing the dried specimens loosely between sheets of papers not always of uniform character is liable to lead to the admixture of nearly allied forms in intricate genera, such as *Rubus*, *Rosa*, *Hieracium*, *Salix*, &c., unless a label is attached to each specimen, a precaution not always adopted. In Germany Endlicher's system is much followed for flowering plants, with the exception of palms, for which Martius's arrangement is preferred. At Geneva De Candolle's original herbarium is arranged in exact accordance with his *Prodromus*. In the other large herbaria in that city, the mounting and arrangement of the specimens are conducted much as in England, with the exception that smaller-sized sheets of paper are used for cryptogams.

Specimens intended for the herbarium should be collected when possible in dry weather, care being taken to select plants or portions of plants in sufficient number and of a size adequate to illustrate all the characteristic features of the species. When the roots, leaves and fruits present any peculiarities, they should invariably be collected, but the roots should be dried separately in an oven at a moderate heat. Roots and fruits too bulky to be placed on the sheets of the herbarium may be conveniently arranged in glass-covered boxes contained in drawers. The best and most effective mode of drying specimens is learned only by experience, different species requiring special treatment according to their several peculiarities. The chief points to be attended to are to have a plentiful supply of botanical drying paper, so as to be able to use about six sheets for each specimen; to change the paper at intervals of six to twelve hours; to avoid contact of one leaf or flower with another; and to increase the pressure applied only in proportion to the dryness of the specimen. To preserve the colour of flowers pledgets of cotton wool, which prevent bruising, should be introduced between them, as also, if the stamens are thick and abundant, as in *Digitalis*, between these and the corolla. A flower dissected and gummed on the sheets will often retain the colour which it is impossible to preserve in a crowded inflorescence. Before placing in a screw-press, should that be used, a flat sheet of lead or some other suitable weight should be laid upon the top of the pile of specimens, so as to keep up a continuous pressure. Succulent specimens, as many of the *Orchideæ*, and sedums and various other Crassulaceous plants, require to be killed by immersion in boiling water before being placed in drying paper, or, instead of becoming dry, they will grow between the sheets. When, as with some plants like *Verbascum*, the thick hard stems are liable to cause the leaves to wrinkle in drying by removing the pressure from them, small pieces of bibulous paper or cotton wool may be placed round the leaves near their point of attachment to the stem. When a number of specimens have to be submitted to pressure, ventilation is secured by means of frames corresponding in size to the drying paper, and composed of strips of wood or wires laid across each other so as to form a kind of network. Another mode of drying is to keep the specimens in a box of dry sand in a warm place for ten or twelve hours, and then press them in drying paper. A third method consists in placing the specimen within bibulous paper, and enclosing the whole between two plates of coarsely perforated zinc supported in a wooden frame. The zinc plates are then drawn close together by means of straps, and suspended before a fire until the drying is effected. By the last two methods the colour of the flowers may be well preserved. When the leaves are finely divided, as in *Conium*, much trouble will be experienced in lifting a half-dried specimen from one paper to another, but the plant may be placed in a sheet of thin blotting paper, and the sheet containing the plant, instead of the plant itself, can then be moved. Thin straw-coloured paper, such as is used for biscuit boxes, may be conveniently employed by travellers unable to carry a quantity of bibulous paper. It offers the advantage of fitting closely to the [illegible] specimens, and of rapidly drying. A light but strong portfolio, to which pressure by means of straps can be applied, and a few quires of this paper, if the paper be changed night and morning, will be usually sufficient to dry all except very succulent plants. When a specimen is too large for one sheet, and it is necessary, in order to show its habit, &c., to dry the whole of it, it may be divided into two or three portions, and each placed on a separate sheet for drying. Specimens may be judged to be dry when they no longer cause a cold sensation when applied to the cheek, or assume a rigidity not evident in the earlier stages of preparation.

Each class of flowerless or cryptogamic plants requires special treatment for the herbarium.

Marine algæ are usually mounted on tough smooth white cartridge paper in the following manner. Growing specimens of good colour and in fruit are if possible selected, and cleansed as much as practicable from adhering foreign particles, either in the sea or a rocky pool. Some species rapidly change colour, and cause the decay of any others with which they come in contact. This is especially the case with the *Ectocarpi*, *Desmarestiæ*, and a few others, which should therefore be brought home in a separate vessel. In mounting, the specimen is floated out in a flat white dish containing sea-water, so that foreign matter may be detected, and a piece of paper of suitable size is placed under it, supported either by the fingers of the left hand or by a palette. It is then pruned, in order clearly to show the mode of branching, and is spread out as naturally as possible with the right hand. For this purpose a bone knitting-needle answers well for the coarse species, and a camel's-hair pencil for the more delicate ones. The paper with the specimen is then carefully removed from the water by sliding it over the edge of the dish so as to drain it as much as possible. If during this process part of the fronds run together, the beauty of the specimen may be restored by dipping the edge into water, so as to float out the part and allow it to subside naturally on the paper. The paper, with the specimen upwards, is then laid on bibulous paper for a few minutes to absorb as much as possible of the superfluous moisture. When freed from excess of water it is laid on a sheet of thick white blotting paper, and a piece of smooth washed calico is placed upon it (unwashed calico, on account of its "facing," adheres to the sea-weed). Another sheet of blotting-paper is then laid over it; and, a number of similar specimens being formed into a pile, the whole is submitted to pressure, the paper being changed every hour or two at first. The pressure is increased, and the papers are changed less frequently as the specimens become dry, which usually takes place in thirty-six hours. Some species, especially those of a thick or leathery texture, contract so much in drying that without strong pressure the edges of the paper become puckered. Other species of a gelatinous nature, like *Nemalion* and *Dudresnaia*, may be allowed to dry on the paper, and need not be submitted to pressure until they no longer present a gelatinous appearance. Large coarse algæ, such, for instance, as the *Fucaceæ* and *Laminariæ*, do not readily adhere to paper, and require soaking for some time in fresh water before being pressed. The less robust species, such as *Sphacelaria scoparia*, which do not adhere well to paper, may be made to do so by brushing them over either with milk carefully skimmed, or with a liquid formed by placing isinglass (¼ oz.) and water (1½ oz.) in a wide-mouthed bottle, and the bottle in a small glue-pot or saucepan containing cold water, heating until solution is effected, and then adding 1 oz. of rectified spirits of wine; the whole is next stirred together, and when cold is kept in a stoppered bottle. For use, the mixture is warmed to render it fluid, and applied by means of a camel's-hair brush to the under side of the specimen, which is then laid neatly on paper. For the more delicate species, such as the *Callithamnia* and *Ectocarpi*, it is an excellent plan to place a small fruiting fragment, carefully floated out in water, on a slip of mica of the size of an ordinary microscopical slide, and allow it to dry. The plant can then be at any time examined under the microscope without injuring the mounted specimen. Many of the fresh-water algæ which form a mere crust, such as *Palmella cruenta*, may be placed in a vessel of water, where after a time they float like a scum, the earthy matter settling down to the bottom, and may then be mounted by slipping a piece of mica under them and allowing it to dry. *Oscillatoriæ* may be mounted by laying a portion on a silver coin placed on a piece of paper in a plate, and pouring in water until the edge of the coin is just covered. The alga by its own peculiar movement will soon form a radiating circle, perfectly free from dirt, around the coin, which may then be removed.

There is considerable difficulty in removing mounted specimens of algæ from paper, and therefore a small portion preserved [illegible] should accompany each specimen, enclosed for safety in a small envelope fastened at one corner of the sheet of paper. Freshwater algæ may be mounted like ordinary seaweeds, and, as with [illegible] parasitic algæ, should whenever possible be allowed to remain attached to a portion of the algæ on which they grow, some species being almost always found parasitical on particular plants. [illegible] diatoms and desmids may be mounted on mica, as already described, by putting a portion in a vessel of water and exposing it to sunlight, when they rise to the surface, and may be thus removed comparatively free from dirt or impurity. Owing to their want of adhesiveness, they are, however, usually mounted on glass as microscopic slides, either in glycerin jelly, Canada balsam, or some other suitable medium.

Lichens are generally mounted on sheets of paper of the ordinary size, several specimens from different localities being laid upon one sheet, each specimen having been first placed on a small square of paper which is gummed on the sheet, and which has the locality, date, name of collector, &c., written upon it. This mode has some disadvantages attending it: such sheets are difficult to handle; the crustaceous species are liable to have their surfaces rubbed, the foliaceous species become so compressed as to lose their characteristic appearance; and the spaces between the sheets caused by the thickness of the specimen permit the entrance of dust. A plan which has been found to answer well is to arrange them in cardboard boxes, either with glass tops or in sliding covers, in drawers—the name being placed outside each box, and the specimens gummed into the boxes. Lichens for the herbarium should, whenever possible, be sought for on a slaty or laminated rock, so as to procure them on flat thin pieces of the same, suitable for mounting. Specimens on the bark of trees require pressure until the bark is dry, lest they become curled; and those growing on sand or friable soil, such as *[illegible]*, should be laid carefully on a layer of gum in the box in which they are intended to be kept. Many lichens, such as the *[illegible]* and *[illegible]*, are found in the best condition during the winter months. In mounting collemas it is advisable to let the specimen become dry and hard, and then to separate a portion from [illegible], earth, &c., and mount it separately so as to show the branching of the thallus. *[illegible]* should be represented by both fruiting and [illegible] specimens.

The larger species of fungi, such as the *Agaricini* and *Polypori*, &c., are prepared for the herbarium by cutting a slice out of the centre of the plant so as to show the outline of the pileus, the attachment of the gills, and the character of the [illegible] of the stem. The remaining two halves of the pileus are then lightly pressed, as well as the central slices, between bibulous paper until dry, and the whole is then "poisoned," and gummed on a sheet of paper in such a manner as to show the under surface of the one and the upper surface of the other half of the pileus on the same sheet. As it is impossible to preserve the natural colours of fungi, the specimens should, whenever possible, be accompanied by a coloured drawing of the plant. Microscopic fungi are usually preserved in envelopes, or simply attached to sheets of paper, or mounted as microscopic slides. Those fungi which are of a fleshy nature, like the *Myxomycetes*, may, like the lichens, be preserved in small boxes, and arranged in drawers. Fungi under any circumstances form the least satisfactory portion of an herbarium.

Mosses when growing in tufts should be gathered just before the capsules have become brown, divided into small flat portions, and pressed lightly in drying paper. During the process the capsules ripen, and are then obtained in a perfect state. They are then preserved in envelopes attached to a sheet of paper of the ordinary size, a single perfect specimen being [illegible], and spread out near the envelope so as to show the habit of the plant. For attaching it to the paper a strong solution of gum [illegible], containing an eighth of its weight of spirit of wine, answers best. If not preserved in an envelope the capsules [illegible] very apt to fall off and become lost. [illegible] are mounted in the same way, or may be floated out in water [illegible] paper [illegible] are best mounted in [illegible] the [illegible] [illegible]

[illegible]

See Bentham, *Proc. Linn. Soc. Lond.*, 1869-70, p. xlvi.; Johann Nave, *Handybook to the Collection and Preservation of Freshwater and Marine Algæ*, &c., Lond.; G. [illegible], *Das Herbarium*, Berlin; and Lasègue's *Musée botanique de M. Benjamin Delessert*, Paris, 1845. (E. M. H.)

HERBART, Johann Friedrich (1776–1841), was born of cultured parents at Oldenburg in 1776. He showed his bent towards philosophy while still a child, and after studying under Fichte at Jena gave his first philosophical lectures at Göttingen in 1805, whence he removed in 1809 to occupy the chair formerly held by Kant at Königsberg. Here he also established and conducted a seminary of pedagogy till 1833, when he returned once more to Göttingen, and remained there as professor of philosophy till his death in 1841. His works were collected and published in twelve volumes by his disciple Hartenstein (Leipsic, 1850–52).

Philosophy, according to Herbart, begins with reflexion upon our empirical conceptions, and consists in the reformation and elaboration of these,—its three primary divisions being determined by as many distinct forms of elaboration. Logic, which stands first, has to render our conceptions and the judgments and reasonings arising from them clear and distinct. But some conceptions are such that the more distinct they are made the more contradictory their elements become; so to change and supplement these as to make them at length thinkable is the problem of the second part of philosophy, or Metaphysics. There is still a class of conceptions requiring more than a logical treatment, but differing from the last in not involving latent contradictions, and in being independent of the reality of their objects, the conceptions, viz., that embody our judgments of approval and disapproval; the philosophic treatment of these conceptions falls to Æsthetic.

In Herbart's writings logic receives comparatively meagre notice; he insisted strongly on its purely formal character, and expressed himself in the main at one with Kantians such as Fries and Krug.

As a metaphysician he starts from what he terms "the higher scepticism" of the Humo-Kantian sphere of thought, the beginnings of which he discerns in Locke's perplexity about the idea of substance. By this scepticism the real validity of even the *forms* of experience is called in question on account of the contradictions they are found to involve. And yet that these forms are "given" to us, as truly as sensations are, follows beyond doubt when we consider that we are as little able to control the one as the other. To attempt at this stage a psychological enquiry into the origin of these conceptions would be directly a mistake; for we should have to use these unrectified conceptions in the course of it, and the task of clearing up these contradictions would still remain, whether we succeeded in our inquiry or not. But how are we to set about this task? We have given to us a conception A uniting among its constituent marks two that prove to be contradictory, say M and N; and we can neither deny the unity nor reject one of the contradictory members. For to do either is forbidden by experience, and yet to do neither is forbidden by logic. We are thus driven to the assumption that the conception is contradictory because incomplete; but how are we to supplement it? What we have must point the way to what we want, or our procedure will be arbitrary. Experience asserts that M is the same [illegible] as N, which logic denies it; and so it being impossible for one and the same M to [illegible] there is but one way open to us, [illegible] Ms. But even now we cannot say [illegible] Ms is the same as N, another is not; for every M must be both [illegible]. We may, however, take the Ms not [illegible], no other course being open to us, [illegible] we must assume that N results from a combination of Ms. This is Herbart's method of relations, the [illegible] Hegelian [illegible].

[illegible] to determine what [illegible] and [illegible] But first [illegible] our experience and [illegible] the "given" [illegible] The [illegible] and [illegible] "[illegible]," which cannot [illegible] the [illegible] and [illegible] were never [illegible], [illegible] of the [illegible] A sub[illegible] of position [illegible] relative to A. [illegible] real must be absolutely simple; for if it contain two detersensations, A and B, then either these are reducible to one, which is the true quality, or they are not, when each is conditioned by the other and their position is no longer absolute. (3) All quantitative conceptions are excluded, for quantity implies parts, and these are incompatible with simplicity. (4) But there may be a plurality of "reals," albeit the mere conception of being can tell us nothing as to this. The doctrine here developed is the first cardinal point of Herbart's system, and has obtained for it the name of "pluralistic realism."

The contradictions he finds in the common-sense conception of inherence, or of "a thing with several attributes," will now become obvious. Let us take some thing, say A, having n attributes, a, b, c . . . : we are forced to posit each of these, because each is presented in intuition. But in conceiving A we make, not n positions, still less $n+1$ positions, but one position simply; for common sense removes the absolute position from its original source, sensation. So when we ask, What is the one position? we are told—the possessor of a, b, c . . ., or in other words, their seat or substance. But if so, then A, as a real, being simple, must $= a$; similarly it must $= b$; and so on. Now this would be possible if a, b, c . . . were but "contingent aspects" of A, as *e.g.*, 2^3, $\sqrt{64}$, $4+3+1$ are contingent aspects of 8. Such, of course, is not the case, and so we have as many contradictions as there are attributes; for we must say A is a, is not a, is b, is not b, &c. There must then, according to the method of relations, be several As. For a let us assume $A_1 + A_1 + A_1$ . . .; for b, $A_2 + A_2 + A_2$ . . .; and so on for the rest. But now what relation can there be among these several As, which will restore to us the unity of our original A or substance? There is but one; we must assume that the first A of every series is identical, just as the centre is the same point in every radius. By way of concrete illustration Herbart instances "the common observation that the properties of things exist only under external conditions. Bodies, we say, are coloured, but colour is nothing without light, and nothing without eyes. They sound, but only in a vibrating medium, and for healthy ears. Colour and tone present the appearance of inherence, but on looking closer we find they are not really immanent in things but rather presuppose a communion among several." The result then is briefly this:—In place of the one absolute position, which in some unthinkable way the common understanding substitutes for the absolute positions of the n attributes, we have really a series of two or more positions for each attribute, every series, however, beginning with the same (as it were, central) real (hence the unity of substance in a group of attributes), but each being continued by different reals (hence the plurality and difference of attributes in unity of substance). Where there is the appearance of inherence, therefore, there is always a plurality of reals: no such correlative to substance as attribute or accident can be admitted at all. Substantiality is impossible without causality, and to this as its true correlative we now turn.

The common-sense conception of change involves at bottom the same contradiction of opposing qualities in one real. The same A that was a, b, c . . . becomes a, b, d . . . ; and this, which experience thrusts upon us, proves on reflexion unthinkable. The metaphysical supplementing is also fundamentally as before. Since c depended on a series of reals $A_3 + A_3 + A_3$ . . . in connexion with A, and d may be said similarly to depend on a series $A_4 + A_4 + A_4$ . . ., then the change from c to d means, not that the central real A or any real has changed, but that A is now in connexion with A_4, &c., and no longer in connexion with A_3, &c.

But to think a number of reals "in connexion" (*Zusammensein*) will not suffice as an explanation of phenomena; something or other must happen when they are in connexion; what is it? The answer to this question is the second hinge-point of Herbart's theoretical philosophy. What "actually happens" as distinct from all that seems to happen, when two reals A and B are together is that, assuming them to differ in quality, they tend to disturb each other to the extent of that difference, at the same time that each preserves itself intact by resisting, as it were, the other's disturbance. And so by coming into connexion with different reals the "self-preservations" of A will vary accordingly, A remaining the same through all; just as, by way of illustration, hydrogen remains the same in water and in ammonia, or as the same line may be now a normal and now a tangent. But to indicate this opposition in the qualities of the reals A + B, we must substitute for these symbols others, which, though only "contingent aspects" of A and B, *i.e.*, representing their relations, not themselves, yet like similar devices in mathematics enable thought to advance. Thus we may put $A = \alpha + \beta - \gamma$, $B = m + n + \gamma$; γ then represents the character of the self-preservations in this case, and $\alpha + \beta + m + n$ represents all that could be observed by a spectator who did not know the simple qualities, but was himself involved in the relations of A to B; and such is exactly our position.

Having thus determined what really is and what actually happens, our philosopher proceeds next to explain synthetically the objective semblance (*der objective Schein*) that results from these. But if this construction is to be truly objective, *i.e.*, valid for all intelligences, ontology must furnish us with a clue. This we have in the forms of Space, Time, and Motion which are involved whenever we think the reals as being in, or coming into, connexion, and the opposite. These forms then cannot be merely the products of our psychological mechanism, though they may turn out to coincide with these. Meanwhile let us call them "intelligible," as being valid for all who comprehend the real and actual by thought, although no such forms are predicable of the real and actual themselves. The elementary spatial relation Herbart conceives to be "the contiguity (*Aneinander*) of two points," so that every "pure and independent line" is discrete. But an investigation of dependent lines which are often incommensurable forces us to adopt the contradictory fiction of partially overlapping, *i.e.*, divisible points, or in other words, the conception of Continuity.[1] But the contradiction here is one we cannot eliminate by the method of relations, because it does not involve anything real; and in fact as a necessary outcome of an "intelligible" form, the fiction of continuity is valid for the "objective semblance," and no more to be discarded than say $\sqrt{-1}$. By its help we are enabled to comprehend what actually happens among reals to produce the appearance of matter. When three or more reals are together, each disturbance and self-preservation will (in general) be imperfect, *i.e.*, of less intensity than when only two reals are together. But "objective semblance" corresponds with reality; the spatial or external relations of the reals in this case must, therefore, tally with their inner or actual states. Had the self-preservations been perfect, the coincidence in space would have been complete, and the group of reals would have been inextended; or had the several reals been simply contiguous, *i.e.*, without connexion, then, as nothing would actually have happened, nothing would appear. As it is we shall find a continuous molecule manifesting attractive and repulsive forces; attraction corresponding to the tendency of the self-preservations to become perfect, repulsion to the frustration of this. Motion, even more evidently than space, implicates the contradictory conception of continuity, and cannot, therefore, be a real predicate, though valid as an intelligible form and necessary to the comprehension of the objective semblance. For we have to think of the reals as absolutely independent and yet as entering into connexions. This we can only do by conceiving them as originally moving through intelligible space in rectilinear paths and with uniform velocities. For such motion no cause need be supposed; motion, in fact, is no more a state of the moving real than rest is, both alike being but relations, with which, therefore, the real has no concern. The changes in this motion, however, for which we *should* require a cause, would be the objective semblance of the self-preservations that actually occur when reals meet. Further, by means of such motion these actual occurrences, which are in themselves timeless, fall for an observer in a definite time—a time which becomes continuous through the partial coincidence of events.

But in all this it has been assumed that we are spectators of the objective semblance; it remains to make good this assumption, or, in other words, to show the possibility of knowledge; this is the problem of what Herbart terms Eidolology, and forms the transition from metaphysic to psychology. Here, again, a contradictory conception blocks the way, that, viz., of the Ego as the identity of knowing and being, and as such the stronghold of idealism. The contradiction becomes more evident when the ego is defined to be a subject (and so a real) that is its own object. As real and not merely formal, this conception of the ego is amenable to the method of relations. The solution this method furnishes is summarily that there are several objects which mutually modify each other, and so constitute that ego we take for the presented real. But to explain this modification is the business of psychology; it is enough now to see that the subject like all reals is necessarily unknown, and that, therefore, the idealist's theory of knowledge is unsound. But though the simple quality of the subject or soul is beyond knowledge, we know what actually happens when it is in connexion with other's reals, for its self-preservations then are what we call sensations. And these sensations are the sole material of our knowledge; but they are not given to us as a chaos but in definite groups and series, whence we come to know the relations of those reals, which, though themselves unknown, our sensations compel us to posit absolutely.

In his *Psychology* Herbart rejects altogether the doctrine of mental faculties as one refuted by his metaphysics, and tries to show that all psychical phenomena whatever result from the action and interaction of elementary ideas or presentations (*Vorstellungen*). The soul being one and simple, its separate acts of self-preservation or primary presentations must be simple too, and its several presentations must become united together. And this they can do at once and completely when, as is the case, for example, with the several attributes of an object, they are not of opposite quality. But otherwise there ensues a conflict in which the opposed presentations comport themselves like forces and mutually suppress or obscure each other. The act of presentation (*Vorstellen*) then becomes partly transformed into an effort, and its product, the idea, becomes in the same proportion less and less intense till a position of equilibrium is reached; and then at length the remainders coalesce. We have thus a statics and a mechanics of mind which investigate respectively the conditions of equilibrium and of movement among presentations. In the statics two magnitudes have to be determined:—(1) the amount of the suppression or inhibition (*Hemmungssumme*), and (2) the ratio in which this is shared among the opposing presentations. The first must obviously be as small as possible: thus for two totally-opposed presentations a and b, of which a is the greater, the *inhibition-sum* = b. For a given degree of opposition this burden will be shared between the conflicting presentations in the inverse ratio of their strength. When its remainder after inhibition = 0, a presentation is said to be on the threshold of consciousness, for on a small diminution of the inhibition the "effort" will become actual presentation in the same proportion. Such total exclusion from consciousness is, however, manifestly impossible with only two presentations,[1] though with three or a greater number the residual value of one may even be negative. The first and simplest law in psychological mechanics relates to the "sinking" of inhibited presentations. As the presentations yield to the pressure, the pressure itself diminishes, so that the velocity of sinking decreases, i.e., we have the equation, $(S - \sigma)\,dt = d\sigma$, where S is the total inhibition, and σ the intensity actually inhibited after the time t. Hence $t = \log \frac{S}{S-\sigma}$, and $\sigma = S(1 - e^{-t})$.

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[1] Hence Herbart gives the name Synechology to this branch of metaphysics, instead of the usual one, Cosmology.

From this law it follows, for example, that equilibrium is never quite obtained for those presentations which continue above the threshold of consciousness, while the rest which cannot so continue are very speedily driven beyond the threshold. More important is the law according to which a presentation freed from inhibition and rising anew into consciousness tends to raise the other presentations with which it is combined. Suppose two presentations p and π united by the residua r and ρ; then the amount of p's "help" to π is r, the portion of which appropriated by π is given by the ratio $\rho : \pi$; and thus the initial help is $\frac{r\rho}{\pi}$.

But after a time t, when a portion of ρ represented by ω has been actually brought into consciousness, the help afforded in the next instant will be found by the equation

$$\frac{r\rho}{\pi}\cdot\frac{\rho-\omega}{\rho}\,dt = d\omega,$$

from which by integration we have the value of ω,

$$\omega=\rho\left(1-e^{-\frac{rt}{\pi}}\right).$$

So that if there are several πs connected with p by smaller and smaller parts, there will be a definite "serial" order in which they will be revived by p; and on this fact Herbart rests all the phenomena of the so-called faculty of memory, the development of spatial and temporal forms, and such like. Emotions and volitions, he holds, are not directly self-preservations of the soul, as our presentations are, but variable states of such presentations resulting from their interaction when above the threshold of consciousness. Thus when [illegible] tend to force a presentation into consciousness, and [illegible] at the same time tend to drive it out, that presentation is the seat of painful feeling, when, on the other hand, its entrance is facilitated [illegible] pleasure results. Desire [illegible]

[illegible]

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[1] [illegible]

to be carefully distinguished from the allied conceptions of the useful and the pleasant, which vary with time, place, and person; whereas beauty is predicated absolutely and involuntarily by all who have attained the right standpoint. Ethics, which is but one branch of æsthetics, although the chief, deals with such relations among volitions (*Willensverhältnisse*) as thus unconditionally please or displease. These relations Herbart finds to be reducible to five, which do not admit of further simplification; and corresponding to them are as many moral ideas (*Musterbegriffe*), viz.:—(1) *Internal Freedom*, the underlying relation being that of the individual's will to his judgment of it; (2) *Perfection*, the relation being that of his several volitions to each other in respect of intensity, variety, and concentration; (3) *Benevolence*, the relation being that between his own will and the thought of another's; (4) *Right*, in case of actual conflict with another; and (5) *Retribution* or *Equity*, for intended good or evil done. The ideas of a final society, a system of rewards and punishments, a system of administration, a system of culture, and an "animated society," corresponding to the ideas of law, equity, benevolence, perfection, and internal freedom respectively, result when we take account of a number of individuals. Virtue is the perfect conformity of the will with the moral ideas; of this the single virtues are but special expressions. The conception of duty arises from the existence of hindrances to the attainment of virtue. A general scheme of principles of conduct is possible, but the subsumption of special cases under these must remain matter of tact. The application of ethics to things as they are with a view to the realization of the moral ideas is moral technology (*Tugendlehre*), of which the chief divisions are Pædagogy and Politics.

In *Theology* Herbart held the argument from design to be as valid for divine activity as for human, and to justify the belief in a supersensible real, concerning which, however, exact knowledge is neither attainable nor on practical grounds desirable.

Among the post-Kantian philosophers Herbart doubtless ranks next to Hegel in importance, and this without taking into account his very great contributions to the science of education. His disciples speak of theirs as the "exact philosophy," and the term well expresses their master's chief excellence and the character of the chief influence he has exerted upon succeeding thinkers of his own and other schools. His criticisms are worth more than his constructions; indeed for exactness and penetration of thought he is quite on a level with Hume and Kant. His merits in this respect, however, can only be appraised by the study of his works at first hand. But we are most of all indebted to Herbart for the enormous advance psychology has been enabled to make, thanks to his fruitful treatment of it, albeit as yet but few among the many who have appropriated and improved his materials have ventured to adopt his metaphysical and mathematical foundations. (J. W.*)

HERBELOT, Barthélemy d' (1625-1695), Orientalist, was born December 4, 1625, at Paris. As soon as he had completed the ordinary course in classics and philosophy at the university of his native city, he devoted himself to the study of the Oriental languages, and went to Italy to perfect himself in them by converse with the Orientals who frequented its seaports. There he made the acquaintance of his fellow-savants Lucas Holstenius and Leo Allatius, and attracted the favourable notice of the cardinals Grimaldi and Barberini. On his return to France after a year and a half, he was received into the house of Fouquet, superintendent of finance, who gave him a pension of 1500 livres. Losing this on the disgrace of Fouquet in 1661, he was appointed secretary and interpreter of Eastern languages to the king. A few years later he again visited Italy, when the grand-duke Ferdinand II. of Tuscany presented him with a large number of valuable Oriental MSS., and tried to attach him to his court. Herbelot, however, was recalled to France by Colbert, and received from the king a pension equal to the one he had lost. In 1692 he succeeded D'Auvergne in the chair of Syriac in the Collège de France. He died at Paris, December 8, 1695. His great work is the *Bibliothèque Orientale, ou dictionnaire universel contenant tout ce qui fait connaître les peuples de l'Orient*, which occupied him nearly all his life, and was published in 1697 by Galland. It is based on the immense Arabic dictionary of Hajji Khalfa, of which indeed it is largely an abridged translation, but it also contains the substance of a vast number of other Arabic and Turkish compilations and manuscripts. With all his learning, the author seems to have been deficient in critical [illegible], and there is frequently a want of [illegible] and of harmony between its various parts. It is, however, even yet the most valuable account [illegible] than Oriental [illegible], and [illegible].

[illegible] (d. 1737), [illegible]

HERBERT, George (1593–1633), one of the best of English religious poets, was born near the town of Montgomery on the 3rd of April 1593. He was a brother of Lord Herbert of Cherbury, noticed below. Educated privately till the age of twelve, he was then sent to Westminster School, and in 1609 he became a student at Trinity College, Cambridge, where he was made B.A. in 1611, M.A. and minor fellow of the college in 1615, and orator for the university in 1619. In his capacity as orator he was brought into close contact with King James. About the same time also he appeared as the champion of Anglicanism against Andrew Melville, the famous Scotch Presbyterian. He numbered among his friends Dr Donne, Sir Henry Wotton, Izaak Walton, Bishop Andrewes, and Francis Bacon, who consulted Herbert about several of his works, and dedicated to him his translation of the Psalms. During his youth he was a courtier, dancing attendance on King James, and "[illegible] for clothes"; and the king rewarded his attentions by the gift of a sinecure worth £120 a year. The death of his patrons the duke of Richmond, the marquis of Hamilton, and King James, destroyed his ambition, and the influence of his mother finally induced him, not without a struggle, to take holy orders. In July 1626 he was appointed prebendary of Leighton Bromswold, in the county of Huntingdon. Shortly before his induction (1630) to the parsonage of Bemerton, near Salisbury, he married Miss Jane Danvers after three days' acquaintance. Mr Danvers had been set on the marriage for a long time, and had often spoken of his daughter Jane to Herbert, and "so much commended Mr Herbert to her that Jane became so much a Platonic as to fall in love with Mr Herbert unseen." The story of the poet's life at Bemerton, as told by Walton, is one of the most exquisite pictures in literary biography. He devoted much time to explaining the meaning of the various parts of the Prayer-Book, and held services twice every day, at which many of the parishioners attended, and some "let their plough rest when Mr Herbert's saints-bell rung to praise, that they might also offer their devotions to God with him." Next to Christianity itself he loved the English Church. He was passionately fond of music, and usually went twice a week to attend the cathedral service at Salisbury. Walton illustrates Herbert's kindness to the poor by many touching anecdotes. He had not been three years in Bemerton when he succumbed to ill-health. He died in 1633.

Herbert's works are *The Temple* (1633); a few miscellaneous poems; a collection of proverbs entitled *Jacula Prudentum* (1640), and *The Country Parson*, which did not appear till 1652. *The Temple* is a collection of religious poems marked by unity of sentiment and conception. The chief faults of the book are obscurity, [illegible] and a forced ingenuity which shows itself in [illegible] and occasional want of taste. In spite of these drawbacks the quaint beauty of Herbert's style and his genuine poetical feeling give *The Temple* a high place in literature. The following poems are the most characteristic:—"The Church Porch," "The Agony," "Sin," "Sunday," "Virtue," "Man," "The British Church," "The Quip," "The Collar," "The Pulley," "The Flower," "Aaron," and "The Elixir." The finest of all is the poem on "Man," which is Miltonic in its sublimity of conception, and shows how poets, in their loftier moods, often anticipate the discoveries of science and the most far-reaching speculations of philosophy. Herbert [illegible] of the period of Anglican theology. [illegible] of the Church of England than *The Temple*. [illegible] marked by transparent sincerity, and [illegible] the honoured character of "holy George Herbert."

Among the [illegible] of Herbert's works the following may be mentioned:—[illegible], with life by Izaak Walton, and notes by S. T. Coleridge, 1835; Grosart's edition, in his "Fuller Worthies Library," 1874; Willmott's edition, 1854; [illegible], 1835; and the Aldine edition, by the Rev. A. B. Grosart. [illegible] Walton's *Life*, and [illegible] by George MacDonald, 1871.

HERBERT, Henry William (1807–1858), novelist and writer on sports, son of the Hon. and Rev. William Herbert, dean of Manchester, a son of the first earl of Carnarvon, was born in London, April 7, 1807. He was educated at Eton and at Caius College, Cambridge, where he graduated M.A. in 1828. Having become involved in debt he emigrated to America, and from 1831 to 1839 was teacher of Greek in a private school in New York. In 1833 he commenced the *American Monthly Magazine*, which he edited till 1835. In 1834 he published his first novel, *The Brothers, a Tale of the Fronde*, which was followed by a number of others, all of them obtaining a certain degree of popularity. He was also successful in a series of historical studies, such as *The Cavaliers of England*, *The Knights of England, France, and Scotland*, *The Chevaliers of France*, and *The Captains of the Old World*, and wrote numerous contributions to magazines; but he is best known for his works on sporting, published by him under the pseudonym of Frank Forester. These include *The Field Sports of the United States and British Provinces* (1849), *Frank Forester and his Friends* (1849), *The Fish and Fishing of the United States* (1850), *The Young Sportsman's Complete Manual*, and *The Horse and Horsemanship in the United States and British Provinces of North America* (1858). Herbert was a man of varied accomplishments, but of somewhat dissipated habits. He died by his own hand at New York, May 17, 1858.

HERBERT, Sir Thomas (1606–1682), traveller and author, was born at York in 1606. Several of his ancestors were aldermen and merchants in that city, and they could trace their connexion with the great Herbert family represented by the earl of Pembroke. His grandfather, Alderman Herbert, who died in 1614, left him real estate of considerable value. He went to Oxford in 1621, and became a commoner of Jesus College, but afterwards removed to Cambridge at the invitation of his mother's brother, Dr Ambrose Akroyd. Having gone to London, he was introduced to the earl of Pembroke, through whose influence he obtained an appointment in the suite of Sir Dodmore Cotton, who was about to leave as ambassador for Persia in company with Sir Robert Shirley. Sailing in March 1627, they visited the Cape, Madagascar, Goa, and Surat; having landed at Gombroon, they travelled inland to Asharoff, and thence to Cazbeen, where both the chiefs of the expedition died. Herbert reached England again in 1629, and in 1630, to his great disappointment, his patron the earl of Pembroke died suddenly. After this he travelled on the Continent for more than a year. From his return in 1631 till about two years after his marriage in 1632 he retained his ambition for court favour, but failing in this he retired, probably to his estate of Tintern in Monmouthshire, till the outbreak of the civil war, when he sided with the parliament. In 1646 he was appointed to attend the king with his other servants. Becoming a devoted royalist, he continued with his majesty during the last two eventful years of his life, and at the Restoration he was rewarded with the title of baronet (1660). He resided at Westminster till the great plague, when he returned to York and bought Petergate House, where he died on the 1st March 1682.

It was in 1634 that Herbert first published his *Description of the Persian Monarchy now beinge: the Orientall Indyes, Iles and other parts of the Greater Asia and Africk*. Four years later a new and enlarged edition appeared under the title of *Some Yeares Travels into Africa and Asia the Great*; a third edition followed in 1664, and a fourth in 1677. The work is evidently the production of a man of considerable scholarship and activity of mind, and altogether ranks as one of the best records of 17th century travel. It is illustrated with woodcuts, among which the sketch of the dodo, the specimen of the cuneiform inscriptions, and the view of Persepolis deserve to be mentioned. Herbert's *Threnodia Carolina, or Memoirs of the two last years of the reign of that unparallell'd prince of ever blessed memory King Charles I.*, was in great part printed at the author's request in Wood's *Athenæ Oxonienses*, but it did not appear in its entirety till Dr Charles Goodall published his Collection of Tracts in 1702. A reprint was issued by G. and W. Nicol in 1813. Sir William Dugdale is acknowledged to have received assistance from Herbert in preparing the fourth volume of the *Monasticon Anglicanum*; and Mr Drake has printed in the appendix to his *Eboracum* two papers from Herbert's pen on the church of St John at Beverley and the collegiate church of Ripon. The best account of Sir Thomas Herbert is that by Robert Davies, F.S.A., York, which appeared in *The Yorkshire Archæological and Topographical Journal*, part iii., pp. 182-214 ([illegible]). It contains a facsimile of the long inscription on Herbert's tomb.

HERBERT, Lord, of Cherbury (1582-1648). Edward Herbert, Lord Herbert of Cherbury, soldier, diplomatist, historian, and religious philosopher, was born at Eyton in Shropshire in 1582, and was descended from an ancient line of illustrious soldiers, to which the earls of Pembroke belonged. Sent to Oxford in his twelfth year, he married an heiress, his kinswoman, in his fifteenth, and returned to the university to prosecute his "beloved studies." He was knighted soon after the accession of James I., and for a year or two fulfilled the functions of sheriff of his county. In 1608 he went abroad, at Paris gaining the esteem and love of the old Constable de Montmorency, and beginning an acquaintance with scholars like Casaubon, Gassendi, and Grotius. Next year he served as a volunteer in the Low Countries under the prince of Orange, whose intimate friend he became, and also took part in the campaigns of 1614 and 1615. Between the latter campaigns he visited Italy, and on his return was arrested in France for recruiting Huguenots for the service of the duke of Savoy. In 1618 he was sent as ambassador extraordinary to the court of France; and, though recalled for a few months through the hostility of the French king's favourite, he soon returned to Paris as ordinary ambassador. In 1625 he came back to England, where, with the exception of one or more short visits to Paris, he spent the rest of his life. Created Lord Herbert of Castle Island in 1625, he was raised by Charles I. to the English peerage in 1631 as Baron Herbert of Cherbury. In the civil war he sided at first with the court, and subsequently declared for the parliament, but the part he played was not a prominent one. His castle of Montgomery was, however, [illegible] during the war, and he received [illegible] for the loss from the parliament. He died 20th August 1648.

"It is impossible to draw his picture well who hath several countenances," Herbert says of Henry VIII.; Horace Walpole made a bold attempt to sketch Herbert's character by declaring that in him "the history of Don Quixote was the life of Plato." To his contemporaries Herbert was mainly known as a high-minded man of the world, of great learning and considerable accomplishments, who, though proud and touchy, was [illegible] and able to defend his honour with his sword [illegible] the character of ambassador with dignity, but his diplomacy was not attended by much success. [illegible] Herbert [illegible] De Veritate [illegible] of the history of [illegible] up to [illegible] As a resolute opponent of empiricism in philosophy, he is unquestionably entitled to rank as one of the heralds of the philosophy of Reid and the Scottish metaphysicians. In the theological sphere he is justly claimed as the father of English deism, and doubtless exercised a strong influence on the religious thought of England. His views were not so novel as he thought them to be, but he was an original and very independent thinker; and, as his chief work was published but a few years after the *Novum Organum*, and many years before any of the works of Descartes or Hobbes, Herbert deserves a marked place in the van of modern speculation.

Herbert's first and most important work is the *De Veritate prout distinguitur a Revelatione, a Verisimili, a Possibili, et a Falso* (Paris, 1624; translated into French, but never into English). It combines a theory of knowledge with a partial psychology, a methodology for the investigation of truth, and a scheme of natural religion. The author's method is prolix and often far from clear; the book is no compact system, but it contains the skeleton and much of the soul of a complete philosophy. Giving up all past philosophizing as useless, Herbert professedly endeavours to constitute a new and true system. Truth, which he defines as a just conformation of the faculties with one another and with their objects, he distributed into four classes or stages:—(1) truth in the thing or the truth of the object; (2) truth of the appearance; (3) truth of the apprehension (*conceptus*); (4) truth of the intellect. The faculties of the mind are as numerous as the differences of their objects, and are accordingly innumerable; but they may be arranged in four groups. The first and fundamental and most certain group is the *Natural Instinct*, to which belong the κοιναὶ ἔννοιαι, the *Notitiæ Communes*, which are the "received principles of demonstration," existing in every sane and sound man, against which it is *nefas* to dispute. The second group, the next in certainty, is the *Sensus Internus* (under which head Herbert discusses amongst others love, hate, fear, conscience with its *communis notitia*, and free will); the third is the *Sensus Externus*; and the fourth is *Discursus*, reasoning, to which, as being the least certain, we have recourse when the other faculties fail. The ratiocinative faculties proceed by division and analysis, by questioning, and are slow and gradual in their movement; they take aid from the other faculties, those of the *instinctus naturalis* being always the final test. Herbert's categories or questions to be used in investigation are ten in number,—whether (a thing is), what, of what sort, how much, in what relation, how, when, where, whence, wherefore. No faculty, rightly used, can err "even in dreams"; badly exercised, reasoning becomes the source of almost all our errors. The discussion of the *notitiæ communes* is the most characteristic part of the book. The exposition of them, though highly dogmatic, is at times strikingly Kantian in substance. "So far are these elements or sacred principles from being derived from experience or observation that without some of them, or at least some one of them, we can neither experience nor even observe." Unless we felt driven by them to explore the nature of things, "it would never occur to us to distinguish one thing from another." It cannot be said that Herbert proves the existence of the common notions; he does not deduce them, or even give any list of them. But each faculty has its common notion; and they may be distinguished by six marks, their *priority*, *independence*, *universality*, *certitude*, *necessity* (for the well-being of man), and [illegible]. Law is based on certain common notions; so is religion. Though Herbert expressly limits the scope of his book as dealing with the intellect and truth, it is the common notions of religion he has [illegible] it is plain that it is in this part of his system that he is chiefly interested. The common notions of religion are the famous five articles, which became the charter of the English deists:—(1) that there is a supreme god; (2) that he ought to be worshipped; (3) that virtue and piety form the chief part of that worship; (4) that men should be repentant of sin; (5) that there are rewards and punishments in a future life. The five articles, which constitute the faith of the [illegible] and catholic church, it is not easy to find anything [illegible]. There is little polemic against the received form of Christianity, but Herbert's attitude towards the church's doctrine is distinctly negative, though he [illegible] superstitious [illegible]. In the *De* [illegible] (Lond., 1645) [illegible] history of [illegible] articles [illegible] the tracts *De Causis Errorum* and *De Religione Laici*. Herbert's last historical work is the *Expeditio Buckinghami Ducis* (1656), an account of Buckingham's ill-fated expedition in 1627. The [illegible] of King Henry VIII. (1649), in great [illegible], [illegible] by Walpole, "a masterpiece of historic biography," but [illegible] and [illegible]. It [illegible] that [illegible] and [illegible] the [illegible] and the [illegible] is so [illegible] as to suggest a lack of keen sympathy with [illegible]. Herbert's [illegible] is very [illegible]. The [illegible] of Lord Herbert, [illegible] published by Horace Walpole in 1764, [illegible] and interesting account of his [illegible] down to the [illegible], dwelling mainly, [illegible] and [illegible] vanity, [illegible] in his career. Herbert's poems, [illegible] of small value.

There are sketches of Herbert in Leland's *Deistical Writers*, [illegible] and elsewhere; but the only adequate work is M. Charles de Rémusat's *Lord Herbert de Cherbury*, [illegible], Paris, 1874.

HERCULANEUM. The ruins of the buried city of Herculaneum are situated about two-thirds of a mile from the Portici station of the railway from Naples to Pompeii. They are less frequently visited than the ruins of the latter city, not only because they are smaller in extent and of less obvious interest, but also because they are more difficult of access. The history of their discovery and exploration, and the artistic and literary relics which they have yielded, are worthy, however, of particular notice. The small part of the city which has been restored to the light of day in the spot called *Gli scavi nuovi* (the new excavations) was discovered in the present century. But the more important works were executed in the last century; and of the buildings then explored at a great depth, by means of tunnels, none are visible except the theatre, the orchestra of which lies 85 feet below the surface of the soil.

The brief notices of the classical writers inform us that Herculaneum[1] was a small city of Campania between Neapolis and Pompeii, that it was situated between two streams at the foot of Vesuvius on a hill overlooking the sea, and that its harbour was at all seasons safe. With regard to its earlier history nothing is known. The account given by Dionysius repeats a tradition which was most natural for a city bearing the name of Hercules. Strabo follows up the topographical data with a few brief historical statements—Ὄσκοι εἶχον καὶ ταύτην καὶ τὴν ἐφεξῆς Πομπηΐαν . . . εἶτα Τυῤῥηνοὶ καὶ Πελασγοί, μετὰ ταῦτα Σαυνῖται. But leaving the questions suggested by these names, such as that of the domination of the Etruscans in Campania,[2] as well as the other questions recently discussed in regard to the origin of Pompeii, which might have an intimate relation with our subject, it is sufficient here to say that the first historical record about Herculaneum has been handed down by Livy (viii. 25), where he relates in what manner the city fell under the power of Rome during the Samnite wars. It remained faithful to Rome for a long time, but it joined the Italian allies in the Social War. Having been admitted anew in June of the year 665 (88 B.C.), it appears to have been less severely treated than Pompeii, and to have escaped the imposition of a colony of Sulla's veterans, although Zumpt has suspected the contrary (*Comm. Epigr.*, i. 253). It afterwards became a municipium, and enjoyed great prosperity towards the close of the republic and in the earliest times of the empire, since many noble families of Rome selected this pleasant spot for the construction of splendid villas, one of which indeed belonged to the imperial house (Seneca, *De Ira*, iii.). By means of the Via Campana it had easy communication northwestward with Neapolis, Puteoli, and Capua, and thence by the Via Appia with Rome; and southwards with Pompeii and Nuceria, and thence with Lucania and the Bruttii. In the year 63 A.D. it suffered terribly from the earthquake which, according to Seneca, "Campaniam nunquam securam hujus mali, indemnem tamen, et toties defunctam metu magna strage vastavit. Nam et Herculanensis oppidi pars ruit dubieque stant etiam quæ relicta sunt" (*Nat. Quæst.*, vi. 1). Hardly had Herculaneum completed the restoration of some of its principal buildings (*cf.* Mommsen, *I. N.*, n. 2384; *Catalogo del Museo Nazionale di Napoli*, n. 1151) when it fell beneath the great eruption of the year 79, described by Pliny the younger (*Ep.* vi. 16, 20), in which Pompeii also was destroyed with other flourishing cities of Campania. According to the commonest account, on the 23d August of that year Pliny the elder, who had command of the Roman fleet at Misenum, set out to render assistance to the soldiers stationed at Retina, near Herculaneum, as there was no escape except by sea, but, the little harbour having been on a sudden filled up so as to be inaccessible, he was obliged to abandon to their fate those people of Herculaneum and Retina who had managed to flee from their houses, overwhelmed in a moment by the material poured forth by Vesuvius. But the text of Pliny the younger, where this account is given, has been subjected to various interpretations; and from the comparison of other classical testimonies and the study of the excavations it has been concluded that it is impossible to determine the date of the catastrophe, though there are satisfactory arguments to justify the statement that the event took place in the autumn. The opinion that immediately after the first outbreak of Vesuvius a torrent of lava was ejected over Herculaneum was refuted by the scholars of the last century, and their refutation has been recently confirmed by Beulé (*Le Drame du Vésuve*, p. 240 *sq.*). And if the last recensions of the passage quoted from Pliny are to be accepted, Retina is not the name of the harbour described by Beulé (*ib.*, p. 122, 247), but the name of a lady who had implored succour, the wife of Cæsius Bassus, or rather Tascius (*cf.* Pliny, ed. Keil, Leipsic, 1870; Aulus Persius, ed. Jahn, *Sat.* vi.). The shore, moreover, according to the new and accurate studies of the engineer Michele Ruggiero, director of the excavations, was not altered by the causes adduced by Beulé (p. 125), but by a simpler event. "It is certain," he says (*Pompei e la Regione Sotterrata dal Vesuvio l'anno* 79, Naples, 1879, p. 21 *sq.*), "that the districts between the south and west, and those between the south and east, were overwhelmed in two quite different modes. From Torre Annunziata (which is believed to be the site of the ancient Oplontii) to San Giovanni à Teduccio, for a distance of about 9 miles, there flowed a muddy eruption which in Herculaneum and the neighbouring places, where it was most abundant, raised the level of the country more than 65 feet. The matter transported consisted of soil of various kinds,—sand, ashes, fragments of lava, pozzolana, and whitish pumice, enclosing grains of uncalcined lime, similar in every respect to those of Pompeii. In the part of Herculaneum already excavated, the corridors in the upper portions of the theatre are compactly filled, up to the head of the arches, with pozzolana and pumice transformed into tuff (which proves that the formation of this stone may take place in a comparatively short time). Tuff is also found in the lowest part of the city towards the sea in front of the few houses that have been discovered, and in the very high banks that surround them, as also in the lowest part of the theatre, there are plainly to be seen earth, sand, ashes, fragments of lava and pumice, with little distinction of strata, almost always confused and mingled together, and varying from spot to spot in degree of compactness. It is clear that this immense concourse of earth and stones could not flow in a dry state over those 5 miles of country (in the beginning very steep, and at intervals almost level), where certainly it would have been arrested and all accumulated in a mound; but it must have been borne along by a great quantity of water, the effects of which may be distinctly recognized, not only in the filling and choking up even of the most narrow, intricate, and remote parts of the buildings, but also in the formation of the tuff, in which water has so great a share that it cannot be supposed that so much of it has filtered through so great a depth of earth. The torrent ran in a few hours to the sea, and formed that hollow or lagoon called by Pliny [illegible] *Portus*, which protected the ships approaching the shore." Hence it is that, while many made their escape from Pompeii (which was overwhelmed by the fall of the small stones and afterwards by the rain of ashes), comparatively few can have managed to escape from Herculaneum, and these, according to the interpretation given to the inscription preserved in the National Museum (Mommsen, *I. N.*, n. [illegible]), found shelter in the neighbouring city of Neapolis, where they inhabited a quarter called that of the buried city (Suetonius, *Titus*, 8). The name of Herculaneum, which for some time remained attached to the site of the disaster, is mentioned in the later itineraries; but in the course of the Middle Ages all recollection of it perished.

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[1] A fragment of L. Sisenna calls it "Oppidum tumulo in excelso loco propter mare [illegible], inter duas fluvios, infra Vesuvium [illegible]" ([illegible], 53, Peter). Of one of these rivers the [illegible] in the [illegible] where probably he [illegible] Herculaneum, by M[illegible] M[illegible] T. [illegible] Nonius Balbus [illegible] n. 2[illegible]. Further topographical details are supplied by Strabo, who, after [illegible] Naples, continues:— [illegible] Ἡράκλειον ἐκκειμένην εἰς τὴν θάλατταν [illegible] ὑγιεινὴν ποιεῖν τὴν κατοικίαν. Dionysius of Halicarnassus relates that Hercules, in the [illegible] voyage from Iberia, [illegible] to which he gave his own name; and [illegible] by the Romans, and [illegible] Neapolis and Pompeii [illegible] λιμένας ἐν παντὶ καιρῷ [illegible] (i. 44).

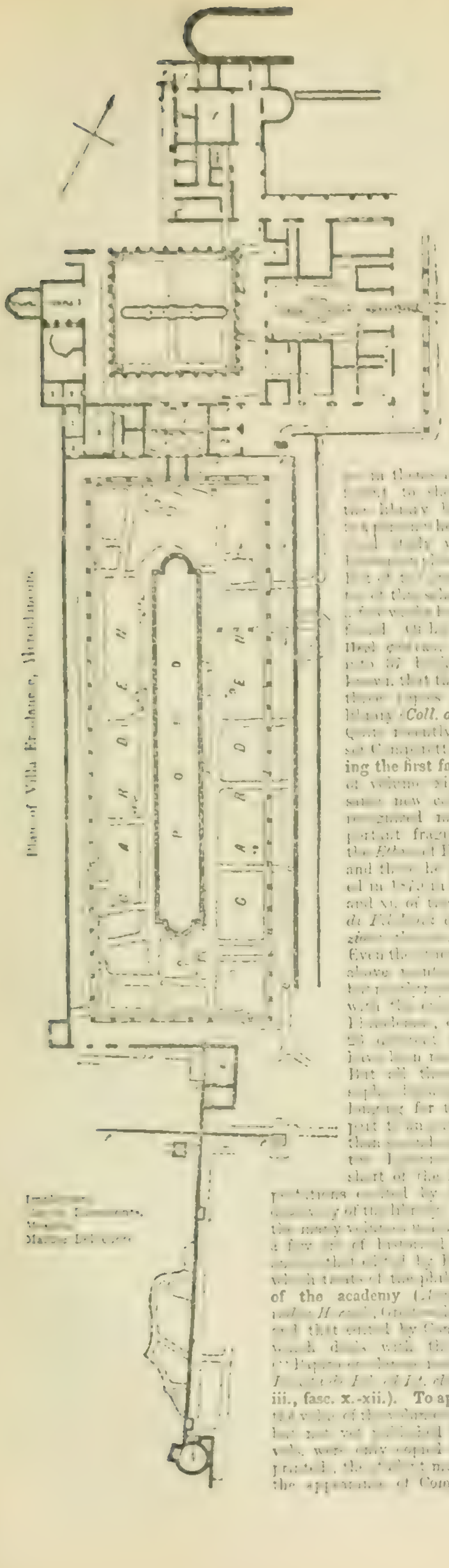
[2] [illegible] *Hist. of Rome*, [illegible], and by Mommsen, *Die Unteritalischen Dialekte*, 1850, p. 314.

In 17[illegible] [illegible] VI. [illegible]

[illegible]

from that time the investigations at Herculaneum were intermitted. [illegible] King Victor Emmanuel [illegible] Charles III. [illegible] Ferdinand IV. [illegible]

[illegible]



Plan of Villa Ercolanese, Herculaneum.

[illegible] these are sufficient to show that the library belonged to [illegible] From [illegible] it is known that there were three copies in the library (*Coll. alt.*, vi.). Quite recently Professor Comparetti, in editing the first fasciculus of volume xi. of the same new collection, recognized most important fragments of the *Ethics* of Epicurus, and these he published in 1879 in Nos. ix. and x. of the *Rivista di Filologia ed Istruzione classica*, Turin. Even the [illegible] above [illegible], with the exception of Philodemus, of whom [illegible] have been recovered. But all these papyri, belonging for the most part to one author, [illegible] fall short of the high expectations excited by the first discovery of the library. Among the many volumes we find only a few of historical importance, [illegible] which treats of the philosophers of the academy (*Index acad. philos. Hercul.*, Greifswald, [illegible]), and that edited by Comparetti, which deals with the Stoics ("Papiro ercolanese inedito," in *Rivista di Filologia*, anno iii., fasc. x.-xii.). To appreciate the value of the papyri unrolled but not yet published (for [illegible] vols. were only copied and not printed), the student must await the appearance of Comparetti's paper, "Relazione sui papiri ercolanesi," read in the Reale Accademia dei Lincei, which will appear in the "Memorie" of the academy for 18[illegible]. [illegible] have been made to the study of Herculaneum [illegible] by Spengel ("Die Herculanischen Rollen," in *Philologus*, [illegible]), and Comparetti ([illegible] *Studien*, [illegible] 1877 [illegible], 2). There [illegible] which, according [illegible], Amsterdam, [illegible] Of these we know [illegible] any of them can [illegible] to the [illegible] Actium [illegible] Rome. The [illegible] pre-[illegible] but quite [illegible] that the [illegible] (Comparetti [illegible] *e la* [illegible], Naples, 1879, p. 1.9 *sq.*). A new [illegible] by the [illegible] by De Petra (ib., p. 251 *sq.*), but Dr [illegible] is the first to [illegible], and shows that [illegible] must have another interpretation (*Bull.* [illegible], 1880). Professor De Petra has also published the [illegible] upon the antiquities unearthed in the sumptuous villa, [illegible] the plan executed by Weber and recovered by chance [illegible] Michele Ruggiero. This plan, which is here reproduced from De Petra's monograph,[1] is the only [illegible] document for the topography of Herculaneum; for the plan of the theatre published in the [illegible] *Ercolano* (Naples, 1861, [illegible]) was executed in 1747, when the excavations were not completed. And even for the history of the [illegible] made in the [illegible] the necessity for further [illegible] there is a [illegible] between the [illegible] by Alcubierre and Weber and those communicated to the *Philosophical Transactions* (London, vol. x.) by Camillo Paderni, conservator of the Portici Museum. It is hoped, therefore, that among the papers recovered by Ruggiero there may be other [illegible] light on [illegible] the topography of the [illegible].

Among the [illegible] relating to Herculaneum, in addition to those already quoted, may be mentioned [illegible] *Lettre sur* [illegible] *d'Herculane*, Paris, 175[illegible]; Seigneux de Correvon, [illegible] *d'Herculane*, Yverdon, 177[illegible]; David, [illegible] *d'Herculanum*, Paris, 1780; D'Ancora Gaetano, [illegible] *d'Ercolano e di Pompei*, Naples, 1803; Venuti, [illegible] *di Ercolano*, Rome, 1748; and Romanelli, *Viaggio ad Ercolano*, Naples, 1811. A full list will be found in vol. i. of *Museo Borbonico*, Naples, 1824, pp. 1-11. (F. B.)

HERCULES (Old Latin, *Hercoles*, *Hercles*) is the Latinized form of the mythical Heracles, the chief national hero of Hellas, who has part in all the most important myths of the generation before that which embraces the Homeric warriors at Troy. The name Ἡρακλῆς is compounded of *Hera*, the goddess, and the stem of κλέος, "glory." The thoroughly national character of Heracles is shown by his being the mythical ancestor of the Dorian [illegible] tribe, while revered by Ionian Athens, Lelegian [illegible], and [illegible] Phœnician Thebes, and closely associated with the Achæan heroes Peleus and Telamon. The Perseid Alcmene, wife of Amphitryon of Tiryns, was Hercules's mother, Zeus his father (see ALCMENE). After his putative father he is often called Amphitryoniades, and Alcides too, after the Perseid Alcæus, father of Amphitryon. His mother and her husband lived at Thebes in exile as guests of King Creon. By the craft of Hera, his foe through life, his birth was delayed, and that of Eurystheus, son of Sthenelus of Argos, hastened, Zeus having in effect sworn that the elder of the two should rule the realm of Perseus. Hera sent two serpents to destroy the new-born Hercules, but he strangled them. He was trained in all manly accomplishments by heroes of the highest renown in each, until he slew Linus, his instructor in music, with the lyre. Thereupon he was sent to tend Amphitryon's oxen, and at this period slew the lion of Mount Cithæron. By the subjection of the Minyans of Orchomenus he won Creon's daughter, Megara, to wife. Her children by him he killed in a frenzy induced by Hera. After purification he was sent by the Pythia to serve Eurystheus. The apologue of Prodicus on the *Choice of Hercules* between pleasure and virtue was founded on his obedience to the oracle. Thus began the cycle of the twelve labours:—

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[1] [illegible] shows the arrangement and proportions of the Villa Ercolanese; *p* marks the pictures, *b* bronzes, *m* marble statues or busts, *p* papyri, and *f* fountains. The dotted lines show the course taken by the excavations which began at the lower part of the plan.

1. Wrestling with the Nemean lion.
2. Destruction of the Lernean hydra.
3. Capture of the Arcadian hind (a stag in art).
4. Capture of the boar of Erymanthus, while chasing which he fought the Centaurs and killed his friends Chiron and Pholus, this homicide leading to Demeter's institution of *mysteries*.
5. Cleansing of the stables of Augeas.
6. Shooting the Stymphalian birds.
7. Capture of the Cretan bull subsequently slain by Theseus at Marathon.
8. Capture of the man-eating mares of the Thracian Diomedes.
9. Seizure of the girdle of Hippolyte, queen of the Amazons.
10. Bringing the oxen of Geryones from Erythia in the far west, which errand involved many adventures in the coast lands of the Mediterranean, and the setting up of the "Pillars of Hercules" at the Straits of Gibraltar.
11. Bringing the golden apples from the garden of the Hesperides.
12. Carrying Cerberus from Hades to the upper world.

Most of the labours lead to various adventures called πάρεργα. Their common order and selection, due to Apollodorus and Diodorus Siculus, are later than Euripides, who omits 5, 6, and 7, and seems to count the victory over Cycnus in Phthiotis, the bearing of the heavens for Atlas, and the freeing of the seas from dangerous monsters. In Homer we read of unspecified labours for Eurystheus, of the struggle with the sea monster of the Troad, and of wars. Hesiod mentions labours 1, 2, and 10, and the freeing of Prometheus. It is a mistake to suppose that legends of Hercules's struggles with monstrous embodiments of evil are not of high antiquity, though we cannot say positively which are old and which comparatively late. Some enumerations give only 10 labours. The late lists probably rest partly on astronomical ideas.

On Hercules's return to Thebes he gave his wife Megara to his friend and charioteer Iolaus, son of Iphicles, and by beating Eurytus of Œchalia and his sons in a shooting match won a claim to the hand of his daughter Iole, whose family, however, except her brother Iphitus, withheld their consent to the union. Iphitus persuaded Hercules to search for Eurytus's lost oxen, but was killed by him at Tiryns in a frenzy. He consulted the Pythia about a cure for the consequent madness, but she declined to answer him. Whereupon he seized the oracular tripod, and so entered upon a contest with Apollo, which Zeus stopped by sending a flash of lightning between the combatants. The Pythia then sent him to serve the Lydian queen Omphale. He then with Telamon, Peleus, and Theseus took Troy. He next helped the gods in the great battle against the giants. He took part in the Argonauts' voyage and the Calydonian boar hunt, made war against Augeas, and against Neleus and the Pylians, and restored Tyndareus to the sovereignty of Lacedæmon. He sustained many single combats, one very famous struggle being the wrestling with the Libyan Antæus, son of Poseidon and Ge (Earth), who had to be held in the air, as he grew stronger every time he touched his mother, Earth. Hercules wounded Ares, Poseidon, and Hera, as well as Apollo. The close of his career is assigned to Ætolia and Trachis. He wrestled with Achelous for Deianeira [illegible] to [illegible], daughter of Œneus, king of Calydon, vanquishes the river-god, and breaks off one of his horns, which as a horn of plenty is found as an attribute of Hercules in art. Driven from Calydon for homicide, he goes with Deianeira to Trachis. On the way he slays the centaur Nessus, who persuades Deianeira that his blood is a love-charm. From Trachis he wages successful war against the Dryopes and Lapithæ as ally of Ægimius king of the Dorians, who promised him a third of his realm, and after his death adopted Hyllus, his son by Deianeira. Finally Hercules attacks Eurytus, takes Œchalia, and carries off Iole. Thereupon Deianeira, prompted by love and jealousy, sends him a tunic dipped in the blood of Nessus, and the unsuspecting hero puts it on just before sacrificing at the headland of Cenæum in Eubœa. Mad with pain, he seizes Lichas, the messenger who had brought the fatal garment, and hurls him on the rocks; and then he wanders in agony to Mount Œta, where he mounts a pyre, which, however, no one will kindle. At last Pœas, father of Philoctetes, takes pity on him, and is rewarded with the gift of his bow and arrows. The immortal part of Hercules passes to Olympus, where he is reconciled to Hera and weds her daughter Hebe.

In one aspect Hercules is clearly a sun-god, being identified, especially in Cyprus and in Thasos (as Makar), with the Tyrian Melkarth. He is again a representative of endurance and effort in the cause of Hellenic civilization and enterprise. Sundry of his exploits may be based on actual achievements of tribes and leaders of men, but it is impossible to unravel satisfactorily the tangled strands which make up this highly elaborate myth, though the separate existence of some is clearly discernible. The close connexion of the hero with both Thebes and Argos suggests actual relations between the two states. The Lydian episode shows traces of Eastern influence. The second, fifth, and sixth labours may be solar, but yet they suggest reclamation of marsh land. The third and twelfth are the most obviously solar, the horned hind representing the moon, and the carrying of Cerberus to the upper world an eclipse. It may be admitted as highly probable that the last episode of the hero's tragedy is a complete solar myth developed at Trachis. The winter sun is seen rising over the Cenæan promontory to toil across to Mount Œta and disappear over it in a bank of fiery cloud. The fatality by which Hercules kills so many friends as well as foes recalls the destroying Apollo; while his career frequently illustrates the Delphic views on blood-guiltiness and expiation. As Apollo's champion Hercules is Daphnephoros, and fights Cycnus and Amyntor to keep open the sacred way from Tempe to Delphi. As the Dorian tutelar he aids Tyndareus and Ægimius. As patron of maritime adventure (ἡγεμόνιος) he struggles with Nereus and Triton, slays Eryx and Busiris, and perhaps captures the wild horses and oxen, which may stand for pirates. As a god of athletes he is often a wrestler (παλαίμων), and founds the Olympian games. In comedy and occasionally in myths he is depicted as voracious (βουφάγος). He is also represented as the companion of Dionysus, especially in Asia Minor. The "Resting" (ἀναπαυόμενος) Hercules is, as at Thermopylæ and near Himera, the natural tutelar of hot springs in conjunction with his protectress Athena, who is usually depicted attending him on ancient vases. The glorified Hercules was worshipped both as a god and a hero. In the Attic deme Melite he was invoked as ἀλεξίκακος ("Helper in ills"), at Olympia as καλλίνικος ("Nobly-victorious"), in the rustic worship of the Œtæans as κορνοπίων [illegible], by the Erythræans of Ionia as [illegible] [illegible]. In Italy he was, like Apollo, Musagetes ("Leader of the Muses"). He was [illegible] [illegible], a protector of voyagers, at Tyre and Smyrna, and in Italy, where tithes were vowed to him to [illegible]. Contests in his honour were held at Thebes and Marathon. In early poetry, as often in art, he is an archer, afterwards a club-wielder and [illegible] wearer. In early art the adult Hercules is bearded, but [illegible]. Later he is [illegible] and [illegible] with short curly hair and thick neck, the lower part of the brow prominent. A lion's skin is generally worn or carried. Lysippus worked out the finest type of sculptured Hercules, of which the Farnese by Glycon is a grand specimen. The infantine struggle with serpents was a favourite subject.

Quite distinct was the Idæan Hercules, a Cretan Dactyl connected with the cult of Rhea or Cybele. The Greeks recognized Hercules in an Egyptian deity Chon and an Indian *Dorsanes*, not to mention personages of other mythologies. Hercules is supposed to have visited Italy on his return from Erythia, when he slew Cacus, son of Vulcan, the giant of the Aventine mount in Rome, who had stolen his oxen. To this victory was assigned the founding of the *Ara maxima*. With respect to the Roman relations of the hero, it is manifest that the native myths of Recaranus, or Sancus, or Dius Fidius, were transferred to the Hellenic Hercules.

The best account of the Hercules myths and cults is by L. Preller, *Griechische Mythologie*, 3d ed., Berlin, 1875. See also Hullan, *De Herculis* [illegible] *et cultu*, Münster, 1850; and Bréal, *Hercule et Cacus*, Paris, 1863. (C. A. M. F.)

HERDER, JOHANN GOTTFRIED VON (1744–1803), one of the most prolific and influential writers that Germany has produced, was born in Mohrungen, a small town near Konigsberg, in 1744. Like his contemporary Lessing, with whose literary aims his own had so much in common, Herder had throughout his life to struggle against adverse circumstances. His father was poor, having to put together a subsistence by uniting the humble offices of sexton, choir singer, and petty schoolmaster. Gottfried seems to have got some rudimentary instruction from his father, after which he was sent to the grammar school (gymnasium) of his native town. The mode of discipline practised by the pedantic and irritable old man who stood at the head of this institution was not at all to the young student's liking, and the impression made upon him stimulated him later on to work out his projects of school reform. The hardships of his early years drove him to introspection and to solitary communion with nature, and thus favoured a more than proportionate development of the sentimental and poetic side of his mind. When quite young he expressed a wish to enter the church, but his aspirations were somewhat rudely discouraged by the local clergyman. In 1762, at the age of eighteen, he went up to Königsberg with the intention of studying medicine, but finding himself unequal to the operations of the dissecting-room, he abandoned this object, and by the help of one or two friends and his own self-supporting labours, followed out his earlier idea of the clerical profession by joining the university. There he came under the influence of Kant, who was just then passing from physical to metaphysical problems. Without becoming a disciple of Kant, the young Herder was deeply stimulated to fresh critical inquiry by that thinker's revolutionary ideas in philosophy. To Kant's lectures and conversations he further owed something of his large interest in cosmological and anthropological problems. Among the writers whom he most carefully read were Plato, Hume, Shaftesbury, Leibnitz, Diderot, and Rousseau. Another personal influence under which he fell at Königsberg, and which was destined to be far more permanent, was that of Hamann, "the northern Mage." This writer had already won a name, and in the young Herder he found a mind well fitted to be the receptacle and vehicle of his new ideas on literature. From this vague, incoherent, yet clever writer our author acquired some of his strong feeling for the natural naïf element in poetry, and for the earliest developments of national literature. Even before he went to Konigsberg he had begun to compose verses, and at the age of twenty he took up the pen as a chief occupation. His first published writings were occasional poems and articles contributed to the *Königsberg Journal*. Soon after this he got a desirable appointment at Riga, as assistant master at the cathedral school, and as curate to the suburban churches. In this busy commercial town, in somewhat improved pecuniary and social circumstances, he developed the main ideas of his writings. In the year 1767 he published his first considerable work *Fragmente über die neuere deutsche Literatur*, which at once made him widely known and secured for him the favourable interest of Lessing. From this time he continued to pour forth a number of critical writings on literature, art, &c. His bold ideas on these subjects, which were a great advance even on Lessing's doctrines, naturally excited hostile criticism, and in consequence of this opposition, which took the form of aspersions on his religious orthodoxy, he resolved to leave Riga. He was much carried away at this time by the idea of a radical reform of social life in Livonia, which (after the example of Rousseau) he thought to effect by means of a better method of school training. With this plan in view he began (1769) a tour through France, England, Holland, &c., for the purpose of collecting information respecting their systems of education. It was during the solitude of his voyage to France, when on deck at night, that he first shaped his idea of the genesis of primitive poetry, and of the gradual evolution of humanity. Having received an offer of an appointment as travelling tutor and chaplain to the young prince of Eutin-Holstein, he abandoned his somewhat visionary scheme of a social reconstruction of a Russian province. He has, however, left a curious sketch of his projected school reforms. His new duties led him to Strasburg, where he met the young Goethe, on whose poetical development he exercised so potent an influence. At Darmstadt he made the acquaintance of Caroline Flachsland, to whom he soon became betrothed, and who for the rest of his life supplied him with that abundance of consolatory sympathy which his sensitive and rather querulous nature appeared to require. The engagement as tutor did not prove an agreeable one, and he soon threw it up (1771) in favour of an appointment as court preacher and member of the consistory at Bückeburg. Here he had to encounter bitter opposition from the orthodox clergy and their followers, among whom he was received as a freethinker. His health continued poor, and a fistula in the eye, from which he had suffered from early childhood, and to cure which he had undergone a number of painful operations, continued to trouble him. Further, pecuniary difficulties, from which he never long managed to keep himself free, by delaying his marriage, added to his depression. The correspondence between Herder and Caroline Flachsland indicates a relationship which offers a curious parallel and contrast to that of Lessing and his future wife under very similar circumstances. Notwithstanding these trying circumstances he resumed literary work, which his travels had interrupted. For some time he had been greatly interested by the poetry of the north, more particularly Percy's *Reliques*, the poems of "Ossian" (in the genuineness of which he like many others believed), and the works of Shakespeare. Under the influence of this reading he now finally broke with classicism and became the leader of the new "Sturm und Drang" movement. He co-operated with a band of young writers at Darmstadt and Frankfort, including Goethe, who in a journal of their own sought to diffuse the new ideas of Herder. His marriage took place in 1773. In 1776 he obtained through Goethe's influence the post of upper court preacher and upper member of the consistory at Weimar, where he passed the rest of his life. There he enjoyed the society of Goethe, Wieland, Jean Paul (who came to Weimar in order to be near Herder), and others, the patronage of the court, with whom as a preacher he was very popular, and an opportunity of carrying out some of his pet ideas of social reform. Yet the social atmosphere of the place did not suit him. His personal relations with Goethe again and again became embittered. He had not the poet-minister's liking for the elegant frivolities of court life, while the efforts of Goethe and Schiller to make Weimar a dramatic centre repelled his austerely moral nature. All this, added to ill-health, served to intensify a natural irritability of temperament, and the history of his later Weimar days is a rather dreary page in the chronicles of literary life. He had valued more than anything else a teacher's influence over other minds, and as he began to feel that he was losing it he grew jealous of the success of those who had outgrown this influence. Yet while presenting these unlovely traits, Herder's character was on the whole a worthy and attractive one. This seems to be sufficiently attested by the fact that he was greatly liked and esteemed, not only in the pulpit but in private intercourse, by cultivated women like the countess of Bückeburg, the duchess of Weimar, and Frau von Stein, and what perhaps is more, was exceedingly popular among the gymnasium pupils, in whose education he took so lively an interest. While during the last years of his life he produced much that is of little value, he wrote also some of his best works, among others his collection of popular poetry, *Stimmen der Völker*; his most notable original poem, the *Cid*; his celebrated work on Hebrew poetry, *Vom Geist der hebräischen Poesie*; and his *opus magnum*, the *Ideen zur Philosophie der Geschichte*. Towards the close of his life he occupied himself like Lessing with speculative questions in philosophy and theology. The boldness of some of his views cost him some valuable friendships, as that of Jacobi, Lavater, and even of his early teacher Hamann. He died in the year 1803, full of new literary schemes up to the very last.

Herder's writings were for a long time regarded as of temporary value only, and fell into neglect. Recent criticism, however, [illegible] their value by [illegible]. The number of publications relating to Herder that have appeared during the last few years shows that there is a revival of interest in this writer. His writings are very voluminous, and to a large extent fragmentary and devoid of artistic finish; nevertheless they are nearly always worth reading for the brilliant suggestions in which they abound. His place in German literature has already been briefly indicated in tracing his mental development. [illegible] he was a pioneer [illegible] of that literature. Lessing had given the first impulse to the formation of a national literature by exposing the folly of the current imitation of French models. [illegible] method [illegible]

and spontaneity of those early impulses which, since they are the oldest, easily come to look like the most real and precious. Yet even in this way he helped to found the historical school in literature and science, for it was only after an excessive and sentimental interest in primitive human culture had been awakened that this subject would receive the amount of attention which was requisite for the genetic explanation of the later acquisitions of the species. This historical idea was carried by Herder into the regions of poetry, art, religion, language, and finally into human culture as a whole. It colours all his writings and is intimately connected with some of the most characteristic attributes of his mind, a quick sympathetic imagination, a fine feeling for local differences, and a scientific instinct for tracing the sequences of cause and effect.

Herder's works easily arrange themselves [illegible], corresponding to the way in which the central historical idea was developed and extended. First come the works on poetic literature, art, language, and religion [illegible] development. Secondly, we have [illegible] of the process of human evolution. [illegible] In the region of poetry [illegible] both by example and precept [illegible] His own poetry [illegible] and as a whole has but little value. [illegible] His [illegible] translations [illegible] in which he shows [illegible] In his sweeping [illegible] he does not except even [illegible] sympathy [illegible] He [illegible] the people, which [illegible] Homer [illegible] native [illegible] does not make that

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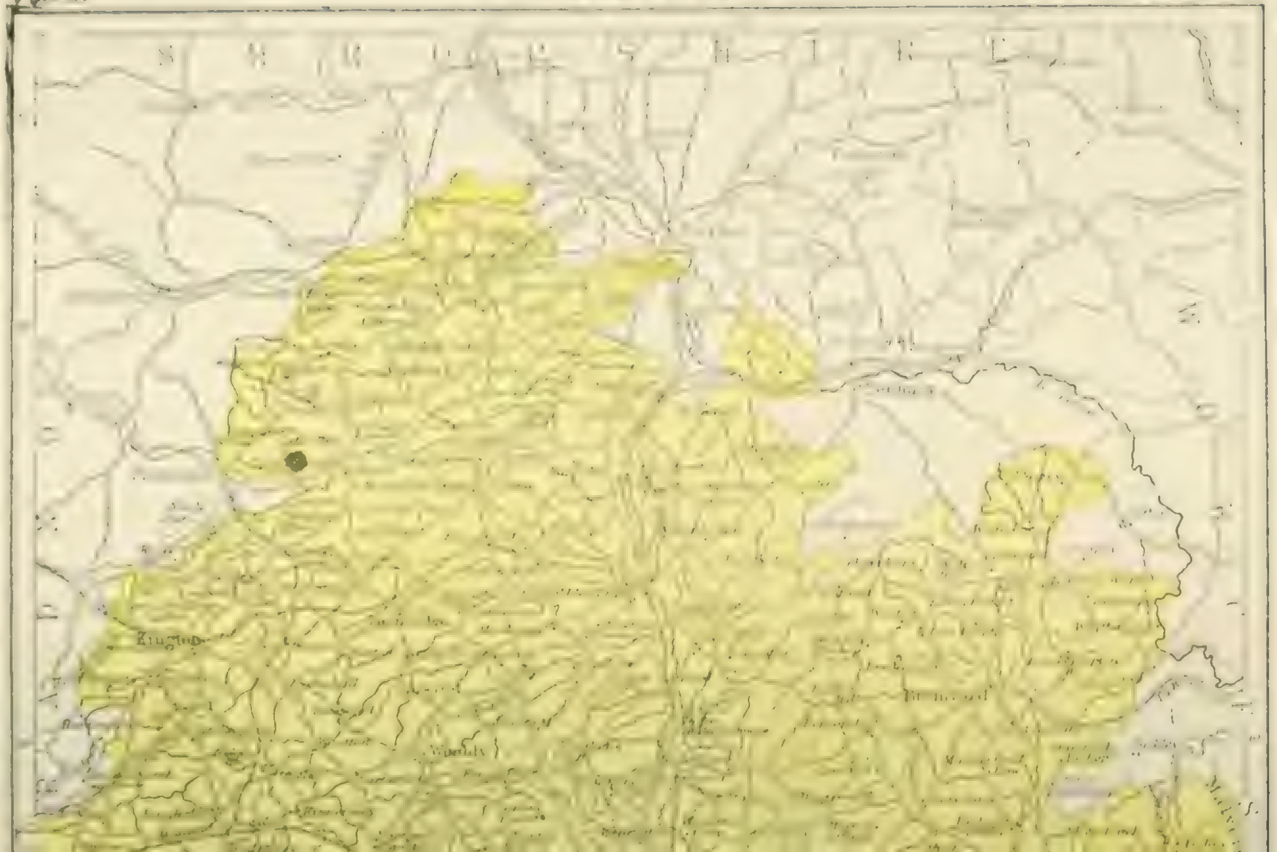
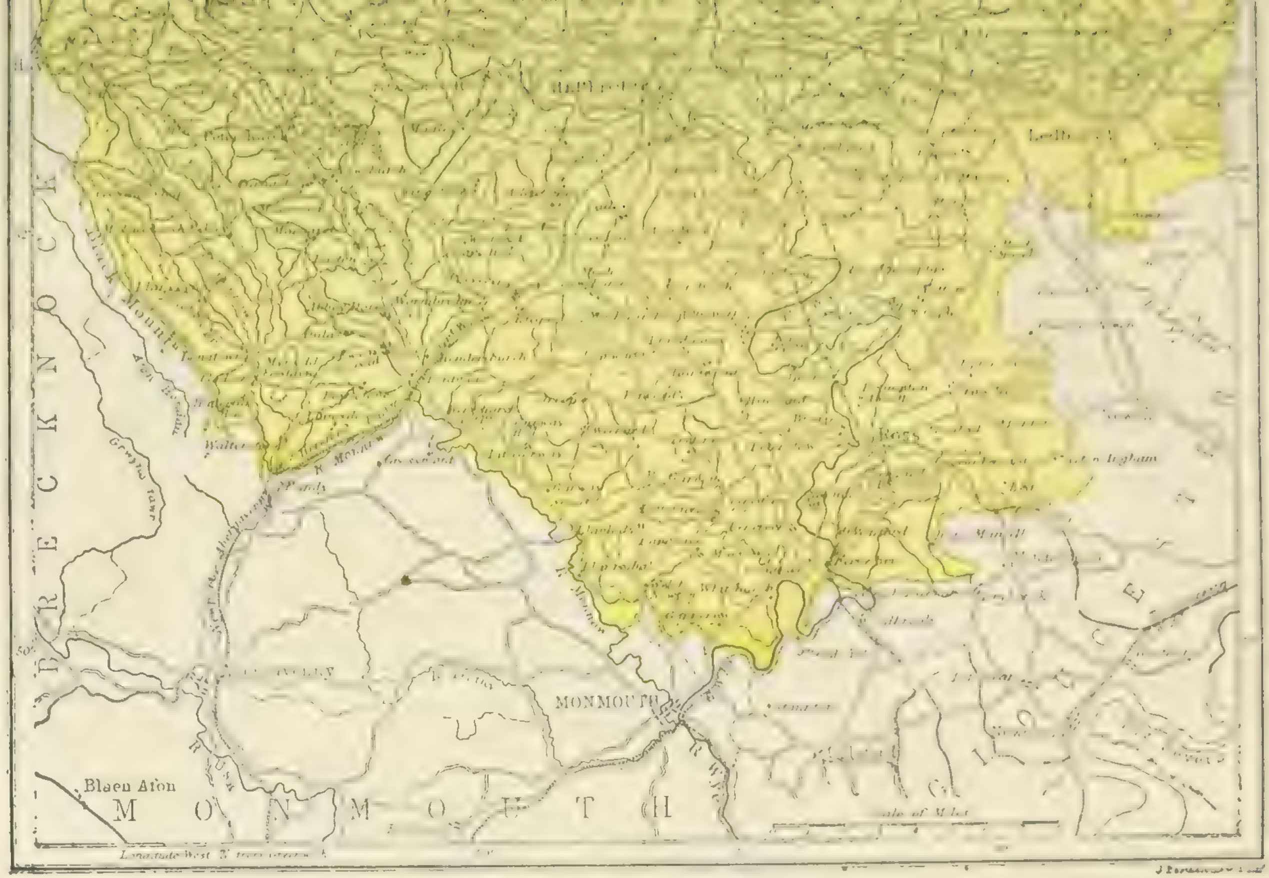
HEREFORD

PLATE XIV





ENCYCLOPÆDIA BRITANNICA. NINTH EDITION

[illegible] which [illegible] general [illegible] of the [illegible] of [illegible] phenomena. He [illegible] deep [illegible] In his [illegible] he found his way to a speculative [illegible] Herder's conception, [illegible] explaining the whole of human development [illegible] with the history of man's physical environment. Man is viewed as a part of nature, and all his [illegible] forms of development [illegible] the natural process. It thus stands in sharp contrast to the ethical [illegible] of Kant, which opposes [illegible] of a growing [illegible] of rational free will to the operations of physical nature. Herder defines human history as "a pure natural history of human powers, actions, and propensities, modified by time and place." This theory shows us that Herder is an evolutionist after the fashion of Leibnitz, and not after that of more modern evolutionists.[1] The lower forms of life prefigure man in unequal degrees of approximation; they exist for his sake, but they are not regarded as representing necessary antecedent conditions of human existence. The genetic method is applied to varieties of man, not to man as a whole. It is worth noting, however, that Herder in his provokingly tentative way of thinking comes now and again very near ideas made familiar to us by Mr Spencer and Mr Darwin. Thus in a passage in book xv. chap. ii., which unmistakably foreshadows Mr Darwin's idea of a struggle for existence, we read: "Among millions of creatures whatever could preserve itself abides, and still after the lapse of thousands of years remains in the great harmonious order. Wild animals and tame, carnivorous and graminivorous, insects, birds, fishes, and man are adapted to each other." With this may be compared a passage in the *Ursprung der Sprache*, where there is a curious anticipation of Mr Spencer's idea that intelligence, as distinguished from instinct, arises from a growing complexity of action, or, to use Herder's words, from the substitution of a more for a less contracted sphere.[2] Herder is more successful in tracing the early developments of particular peoples than in constructing a scientific theory of evolution. Here he may be said to have laid the foundations of the science of primitive culture as a whole. His account of the first dawnings of culture, and of the ruder Oriental civilizations, is marked by genuine insight. On the other hand the development of classic culture is traced with a less skilful hand. Altogether this work is rich in suggestion to the philosophic historian and the anthropologist, though marked by much vagueness of conception and hastiness of generalization. Of Herder's [illegible] speculations little needs to be said. He was too [illegible] the [illegible] of feeling and concrete imagination to be capable of great things in abstract thought. It is generally admitted that he had no accurate knowledge either of Spinoza, whose system he advocated, or of Kant, whose critical philosophy he so fiercely attacked. His sympathy with the one and his antipathy to the other were intimately connected with the essential character of his mind, which was more synthetic than analytic, regarded things in their concrete surroundings rather than in abstract isolation. It was but one step more to the man who had learnt to view poetry, art, language, &c., in their connexion with social and physical surroundings, and to conceive of human history in its relation to physical events, to bring together the great aggregates of material and spiritual phenomena under one total conception of a single substance or God. Herder's Spinozism, which is set forth in his little work, *Vom E[illegible]en und Empfindung der menschlichen Seele*, is much less logically conceived than Lessing's. It is the religious aspect of it which attracts him, the presentation in God of an object which at once satisfies the feelings and the intellect. With respect to his attack on the critical philosophy in the *Metakritik*, it is easy to understand how his concrete mind, ever alive to the unity of things, instinctively revolted against that analytic separation of the mental processes which Kant attempted. However crude and hasty this critical investigation, it helped to recall philosophic reflexion to the unity of mind, and so to develop the post-Kantian [illegible] Herder [illegible]

[illegible] (J. S.)

HEREFORD, an inland English county on the south Welsh border, is bounded on the N. by Salop, S. by Monmouthshire and Gloucestershire, E. by Worcestershire, and W. by Radnorshire and Brecknockshire. Its circular shape is indented by spurs of adjacent counties, and its outlying parts have by an Act of William IV. 7 and 8 been incorporated with the counties in which they are situated. Its greatest length from Ludford by Ludlow to the Deward Hills, near Monmouth, is 38 miles; its greatest breadth from Cradley to Clifford, near Hay, 35. Its area according to the census of 1871 is 532,898 statute acres, or 832 square miles. It is divided into 11 hundreds and 221 parishes, and is a bishop's see, of which the cathedral city is the centre of the county. Plate XIV.

Its chief rivers are the Wye and Lug. The former, rising near the source of the Severn on the summit of Plinlimmon, forms the boundary between Brecon and Radnor ere it enters Herefordshire near Clifford, and, flowing past Hereford, Ross, and Monmouth, falls into the Severn near Chepstow. A striking feature of the Wye is its sinuosity especially between Hereford and Monmouth. Its never very effectual navigation has been put an end to by railway enterprise, and its salmon fisheries are now so protected by legal enactment that there is no longer a danger of Hereford apprentices being fed on salmon "ad nauseam." The Lug, a first-rate trout stream, rising in Radnorshire, enters Herefordshire near Presteign, and, passing by Aymestry, Kingsland, and Leominster, joins the Wye below Mordiford Bridge, south-east of Hereford. The Arrow also rises in Radnorshire, and flowing past Kington and Pembridge joins the Lug near Monkland, and the Frome, having its source near Bromyard, joins the same river near Mordiford, while the Ledden runs past Ledbury to join the Severn near Gloucester. All these, as well as the Teme, a boundary line of the north-east of the county, are more or less famous trout streams.

The soil is generally marl and clay, but in various parts contains calcareous earth in mixed proportions. Westward the soil is tenacious and retentive of water; on the east it is a stiff and often reddish clay. In the south is found a light sandy loam. The subsoil is mostly limestone, in some parts the Old Red Sandstone, and a species of red and white veined marble. Where the soil does not rest on limestone, it is sometimes a silicious gravel, or contains fuller's earth and yellow ochres. Limestone, quarried at Aymestry and Nash to the north-west of the county, and at Ledbury, Woolhope, and elsewhere, is successfully applied as a manure for arable land and pasture. For the physical history of the county reference must be made to Murchison's *Siluria*, or Symonds's *Records of the Rocks*, where the upheaval and denudation in the Woolhope valley and over the central dome of Haughwood and similar questions are discussed.

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[1] [illegible] EVOLUTION, vol. viii. pp. 760, 761.

[2] [illegible] modern evolutionists is dealt with in F. von B[illegible] *H[illegible] Darwin[illegible]*

The climate is variable, owing to the damp and fogs, which moisten the earth and account for its great verdure, as well as to its large proportion of timber, not only in parks and on landed estates, but almost on every hedgerow. In spite, however, of the prevalence of rheumatism, Herefordshire is reckoned healthy, ranks high in the statistics of longevity, and enjoys a comparative immunity from diseases of the respiratory organs.

The surface of the county is undulated in long ridges, as if by [illegible] ripples. Ash and oak coppices and larch plantations on the [illegible] hill-sides and crests. Its lowlands are studded with pear and apple orchards, of such productiveness that Herefordshire sometimes, as well as Kent, is called the garden of England. The apple crop, generally large, is enormous one year out of four. Twenty hogsheads of cider, which is the county beverage, have been made from an acre of orchard, twelve being the ordinary yield. Hops are another staple of the county, the vines of which are planted in rows on ploughed land. As early as Camden's day a Herefordshire adage coupled Weobley ale with Leominster bread, indicating the county's capacity to produce fine wheat and barley, as well as hops. On the Worcestershire border above 10,000 acres are taken up in hop-plantations, and about Ledbury the clay lands are noted for wheat and hops.

Herefordshire is also famous as a breeding county for its cattle of bright red hue, with mottled or white faces and sleek silky coats. The Herefords are stalwart and healthy, and, though not good milkers, put on more meat and fat at an early age, in proportion to food consumed, than almost any other variety. They produce the finest beef, and are more cheaply fed than Devons or Durhams, with which they are advantageously crossed. As a dairy county Hereford does not rank high. Its small, white-faced, hornless, symmetrical breed of sheep known as "the Ryelands," from the district near Ross, where it was bred in most perfection, made the county long famous both for the flavour of its meat and the [illegible]-like texture of its wool. Fuller says of this that it was best known as "Lempster ore," and the finest in all England. In its original form the breed is extinct, crossing with the Leicester having improved size and [illegible] at the cost of the fleece, and the chief breeds of sheep on Herefordshire farms at present are Shropshire Downs, Cotswolds, and Radnors, with their crosses. Agricultural horses of good quality are bred in the north, and saddle and coach horses may be met with at the fairs, especially Orleton, Brampton Bryan, and Huntington. Herefordshire has progressed greatly in farming within the last half century. Turnip and green crop husbandry, with improved rotation, is the general rule, and an average yield of wheat is from 28 to 30 bushels an acre, while about Ross and the "Old Red" districts a yield of 40 bushels is obtained. Breeders' names from the county are famous at the national cattle shows, and the number, size, and quality of the stock [illegible] in the supply of the metropolitan and other markets. Prize Herefords are constantly exported to the colonies.

The county has no manufactures to speak of. Woollen goods have never been a [illegible] staple of trade at Hereford; yarns and [illegible] are made, however, in small quantities at Leominster and [illegible]. There are manufactories for agricultural implements at [illegible] and Ross.

The agricultural returns of Great Britain for 1879 give the following statistics for Herefordshire:—

Corn crops [illegible] (wheat and barley)	103,252	acres.
Green crops [illegible] turnips and swedes	31,671	„
Grass under rotation	[illegible]	„
Permanent pasture	[illegible]	„
Hops	5,917	„
Bare fallow, and uncropped arable land	[illegible]	„

Live Stock.

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

According to the [illegible] return of 1873 the county was [illegible] [illegible] Emily Foley, Stoke Edith Park, 5660; Sir Henry Cotterell, Garnons, 5066; Sir Henry E. Scudamore Stanhope, Holm Lacy, 5039; Major Peploe, Garnstone, 4928.

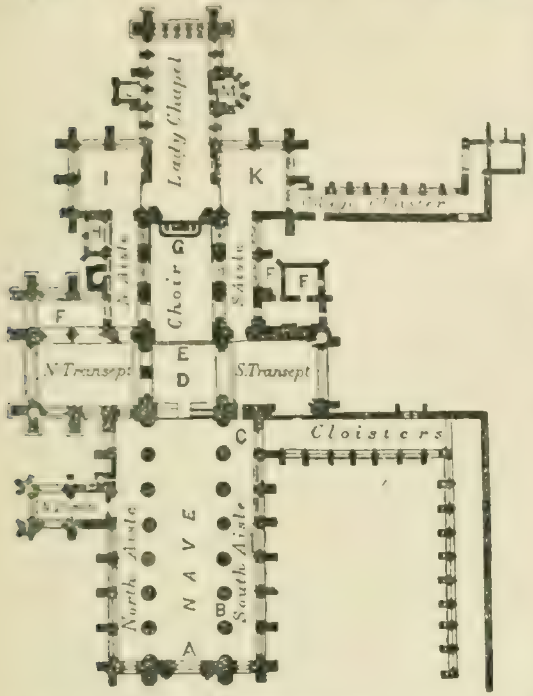
In Herefordshire inland navigation was represented in the early part of the century by the Gloucester and Newent and Ledbury canal; but this has been bought up for railway purposes, and the canal from Leominster to Woofferton, and thence eastward to Tenbury and Stourport, has also ceased to exist. Hereford is an important railway centre: the Hereford, Ross, and Gloucester line is now amalgamated with the Great Western; the Shrewsbury and Hereford railway traverses the county southward from Woofferton, via Leominster, to Hereford. The Worcester line from Hereford, via Malvern, connects the county town with Oxford and London by an alternative route of the Midland and Great Western; and the west of the county is served by the Midland line from Hereford to Brecon, while the Hereford, Abergavenny, and Newport line accommodates the south-west. Branch lines run from [illegible] to Kington and Presteign, from Ross to Monmouth, from Worcester to Bromyard, and from Leominster to Kington.

The latest statistics of public elementary schools show about 135 Church of England national or parochial schools, 6 board schools, 3 British and Foreign and 3 Roman Catholic schools in the county. Its population, which was [illegible] in 1851, had increased in 1871 to 125,370. Herefordshire is represented in parliament by 6 members—3 for the county, 2 for Hereford city, and 1 for the burgh of Leominster. Its towns, besides Hereford, are Ross, Leominster, Ledbury, Kington, and Bromyard; of these, Ross and Leominster are the most considerable, though Kington, from its position on the Welsh border, drives a brisk trade. In Kington, Bromyard, Ledbury, and Ross, and such larger villages as Weobley and Orleton, survive many picturesque timber and plaster houses of the 15th and 16th centuries.

History.—The earliest known inhabitants of the county were the Silures, whose stout resistance to the Romans provoked the emperor Claudius to the war of extermination in which Ostorius Scapula took Caractacus prisoner. Coxwall Knoll, Caer Caradoc, and other heights contest the claim to have been the final standpoint against the Romans. Traces of the Danes are found at Wigmore, and in 912 they sailed up the Wye, and carried off from Archenfield the bishop of St David's, who had to be redeemed with a large ransom. By the Normans the county was held on the tenure of repelling the Welsh, and for centuries the Marches of Wales were a debateable ground for Welsh and English. In the struggle between Maud and Stephen there was fighting in and around Herefordshire. When the barons rose against Henry III. their hostilities affected this county, and it was the success of a plot of the earl of Gloucester, Roger Mortimer, and others to effect Prince Edward's escape out of De Montfort's hands that led to his flight to Wigmore, and the subsequent defeat of the barons at Evesham. In the Wars of the Roses a battle was fought on February 2, 1461, at Mortimer's Cross, near Kingsland, between Edward, earl of March (afterwards Edward IV.), and Jasper Tudor and James Butler, earls of Pembroke and Wiltshire, in behalf of Queen Margaret, which resulted in the victory of the Yorkists. The Marches were incorporated in the reign of Henry VIII. In the war between Charles I. and his parliament Herefordshire suffered severely for its loyalty, and Hereford, Goodrich, and Ledbury endured sieges, all but the last ending in disaster to the king's party.

Antiquities.—The only prehistoric monument in the county is the cromlech of Arthur's Stone on the [illegible]. A line of British entrenchments [illegible] from the Severn and from Malvern, where an earthwork is still known as the "Herefordshire Beacon," to Wapley, Croft Ambrey, and Coxwall Knoll, in the north of the county. A branch of the Watling Street road from [illegible] and South Shropshire crosses Herefordshire [illegible]. [illegible] Abergavenny [illegible]. Offa's Dyke, [illegible] against the Welsh, [illegible] Kington. [illegible] Among [illegible] Abbey Dore, and [illegible] Ledbury and Leominster.

HEREFORD, the capital city of the above county, is situated on the left bank of the Wye, which is crossed there by a bridge of six arches. The see of Hereford was detached from Lichfield in 673, Putta being its first bishop. The removal of murdered Ethelbert's body from Marden to Hereford led to the foundation of a superior church, reconstructed by Bishop Athelstan, and burnt by the Welsh in 1055. Recommenced in 1079 by the first Norman bishop, Robert of Lorraine, it was carried on by Bishop Reynelm, and completed in 1148 by Bishop R. de Betun. The lady chapel, clerestory of the choir, and north transept date between 1226 and 1269, while successive additions and reconstructions have extended over 450 years. In 1786 the great western tower fell and carried with it the west front and the first bay of the nave, since which date there have been two modern restorations in 1842 and 1863. The total length of the cathedral outside is 342 feet, inside 327 feet 5 inches, the nave being 158 feet 6 inches, the choir from screen to reredos 75 feet 6 inches, and the lady chapel 93 feet 5 inches. The breadth of the nave (span of roof) is 31 feet 4 inches, the nave and aisles, internally, 73 feet 4 inches, and the central transept 146 feet 2 inches. The height of choir is 64 feet 6 inches, of nave 64 feet, of lantern 96 feet, of tower to top of the leads 140 feet 6 inches, and to the top of the pinnacles 165 feet. The pillars and arches of the nave, the north and south arches of the choir, and the triforium are Norman in their architecture, as is also the font; the lady chapel, the clerestory, and stone vaulting, Early English. The north transept is of the date of Bishop Aquablanca (1245–68), the south-east transept of Late Decorated. As the late Sir Gilbert Scott pointed out at Hereford to the Archæological Institute, but for the fall of the western tower, the consequent curtailment of the nave, and other solecisms, few cathedrals could offer so complete a field of progressive architectural study from Early Norman to latest Perpendicular. The cathedral can boast some fine monuments, notably St Thomas of Cantilupe's shrine in the north transept, and Bishop Aquablanca's tomb. The "Mappa Mundi" compiled in 1300 or thereabouts by a monk of Lincoln, one of the largest and most curious of all the old maps, is preserved in the south choir aisle. The bishop's palace overlooks the Wye on the south of the cathedral, and to the left of it lies the castle green, the site of the historic castle, which is utterly effaced. One only of the six gates of the old walls is still to be seen, but there are ruins of the Black Friars' Monastery in Widemarsh, and a mile out of Hereford on the Brecon Road, the White Cross, erected in 1347 by Bishop Charlton, and restored by Archdeacon Lord Saye and Sele, commemorates the departure of the Black Plague. For its loyalty and sufferings in the civil war Charles I. gave the city its motto "Invictæ fidelitatis præmium." It was incorporated in 1189 by Richard I., and is governed by a municipal council, consisting of a mayor, 6 aldermen, and 18 councillors. It has no manufactures. Its population at the census of 1871 numbered 18,355, or an increase of more than a third in twenty years; its area was 4969 acres. Its public buildings are the shire hall in St Peter's Street, in the Grecian Doric style, with a statue of Sir George Cornewall Lewis in front of it; the corn-exchange (1858), the Rankin free library and Woolhope Club museum in Broad Street, and the Herefordshire middle-class college. The most noteworthy churches are All Saints and St Peter's.



Plan of Hereford Cathedral.

A. West Door.
B. Font.
C. Door to Cloisters.
D. Central Tower.
E. Choir Screen.
F. Vestries.
G. Altar.
H. Bp Stanbery's Chantry.
I. N.E. Transept.
K. S.E. Transept.
L. Entrance to Crypt.
M. Audley Chapel.

For the bibliography of the city and county of Hereford, see Duncumb's *Collections for a History*; Robinson's *Castles, Manors, and Mansions*, 2 vols., 1869 and 1873; Webb's *History of the Civil War in Herefordshire*, 1879; Havergal's *Fasti Herefordenses*; *Quarterly Review*, art. "Herefordshire" July 1879; and the *Woolhope Transactions*. (J. DA.)

HERENCIA, a town of Spain in the province of Ciudad Real, New Castile, is situated in a fertile, hilly region, near the junction of the rivers Giguela and Valdespino, about 80 miles south of Madrid. Soapmaking is the chief industry; coarse cloth, wax, and chocolate are also manufactured. Wheat, barley, vines, and olives are grown in the neighbourhood, where also there is excellent pasturage. Population about 7300.

HEREROLAND, or DAMARALAND, a region of South-Western Africa, stretching north from the Kuisip to the Cunene, so called from the native race known to the Namaqua as Herero and to the Cape colonists as Damara (Damra, or Dama). The north-west portion is also known as Kaokoland.

According to the treaty of Okahandya, by which, in 1876, the country came in some sort under British protection,[1] the boundary line is fixed as coinciding in the south with the line of latitude passing through Rehoboth or Annis (a mission station in 17° 5′ E. long. and about 165 miles from the coast), thence in a straight line to Otyimbinde (Tunobis or Riet Fontein), in 20° 53′ E. long. and 22° 5′ S. lat., thence northwards to Otyiondarmie, and finally from that place westwards along the Omuramba Ovambo to the Cunene. The territory thus defined has an estimated area of 100,000 square miles; and of this about 35,000 square miles were marked out as a British reservation, bounded by a line drawn from Rehoboth to Otyimbinde, thence north-west to Otyituo, about 19° E. long. and 20° S. lat., thence west to Otyahevita, and south to the neighbourhood of Mount Erongo. According to Palgrave the total population of Hereroland is 121,150, of whom 85,000 are Herero proper, 30,000 Hill Damara, 3000 Bushmen, 1500 Namaqua, 1500 Bastards, and 150 Europeans. In a paper in *Petermann's Mittheilungen*, 1878, based on information from the Rhenish missionaries, the total is given as 184,000, of whom 110,000 are Herero (80,000 Ova Herero and 30,000 Ova-mbanderu),

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[1] See *Damara and Namaqua Land: Report of W. Coates Palgrave, Special Commissioner to the tribes north of the Orange River, of his mission to Damaraland and Great Namaqualand in* 1876, Cape Town, 1877.

30,000 Hill Damara, 2500 Namaqua, 2000 Bastards. 20,[illegible] Bushmen, and 3[illegible] whites.

Hereroland has a coast-line of 400 miles, but the only point where it offers shelter and access to ships is Walfish Bay, a safe but comparatively shallow harbour formed by Pelican Point immediately to the south of the mouth of the Kuisip. The country consists of three distinct physical regions—first, a long and narrow coast district backed by a very regular line of hills, of which the highest point appears to be Mount Messum or [illegible]; secondly, a broad mountainous tract, containing in the south such peaks as Omatako, 8800 feet, Ombotozu (Diambotodzu), 7300, Etyo, 4000, and far in the north [illegible], 4000; and thirdly, a steppe region which stretches away into the Kalahari desert. The rivers of Hereroland, of which the most important, passing from south to north, are the Tsoachaub, the Eisib or Omaruru, the Ugab, and the Huab, are mere wadies, which only at intervals succeed in bringing water as far as the sea. Except in the half dry river-beds, the coast district is almost destitute of vegetation, the only edible fruit being the naras, which grows on the sand downs, and is, according to Andersson, eaten by oxen, mice, men, ostriches, and lions. In the mountainous tract there are places of considerable fertility; large trees, as sycamores, &c., grow along the river-beds, and euphorbias, tamarisks, and a variety of strong-spined bushes prevail. In a few favoured spots wheat can be cultivated, and from a single grain as many as 150 stalks may be produced. The coast range and many of the mountains, such as Okonyonyo and Omatako, are composed of granite and gneiss, broken by intrusive quartz and porphyry; further east limestone formations, both Carboniferous and Oolitic, are predominant; and these again give place to sandstone strata, which are weathered into table-shaped eminences. The granite and gneiss are being disintegrated with great rapidity. Both iron and copper are said to occur in considerable abundance, though the mineral exploitation of the country has had no satisfactory result. About 25 mineral springs, both hot and cold, are known to exist among the mountains.

An interesting sketch of the climate was contributed by Dr A. von Danckelman to the *Zeitschr. der österr. Gesellsch. für Meteor.*, 1878. Owing, it would appear, to the cold current in the neighbouring sea, the coast region is almost rainless; though occasionally, in the rainy season of the interior, [illegible] with thunder and lightning come from the east, and from September to March south-west winds laden with heavy mist blow almost without interruption. In the interior the year is divided into a regular dry and wet season, the former lasting from May to November. From [illegible] that the planet Venus can be [illegible] distinct that it is almost impossible to calculate distances correctly. Even during the [illegible] the nights are usually cloudless. Not unfrequently [illegible] "sand spouts," or, as they are [illegible] [illegible] in Hereroland [illegible] [illegible] From September [illegible] [illegible] 75 or 7[illegible] [illegible]

The Herero [illegible] they are well formed [illegible] [illegible] or "[illegible]" [illegible] leather [illegible] [illegible] cattle. [illegible] its own totem, and thus to one man it is a sin to partake of the flesh of a red cow and to another a one-horned sheep is equally sacred. By their language, Otjiherero, the Herero belong to the great Bantu family. For our acquaintance with it we are mainly indebted to the Rhenish missionaries, and more particularly to Dr Hahn, who published *Grundzüge einer Grammatik des Herero*, Berlin, 1857. A spelling book (Cape Town, 1848) appears to be the earliest work printed in the tongue.

The Herero would seem to have come from the north, and they probably first appeared to the south of the Cunene about 150 years ago, in the territory of the Hill Damara (Haukoin, [illegible], Ovaserondu), a peculiar race who now occupy the fastnesses of the country, and speak the Nama or Hottentot language with a foreign accent, though there is no tradition of their having had any other. The Herero were subjugated by Jonker Afrikaner, and for a time were scattered among the Namaqua tribes, but about 1860 they recovered their independence. They are still unfriendly to the Hill Damara, who steal their cattle, and they are beginning to hunt down the Bushmen. A single tribe of the Namaqua, which sided with them in their war of liberty, is still settled near Mount Erongo.

Besides the works already mentioned, and the travels of Baines, Galton, and Andersson, see [illegible] in *Zeitschr. für Erdkunde*, [illegible] Reise im Lande der Herero, in Petermann's *Mittheilungen*, 1859.

HERESY is the English equivalent of the Greek word αἵρεσις, which has had a somewhat varied ecclesiastical use. The first employment of the word in the New Testament is to denote a sect or school of opinion among the Jews. We read of the heresy of the Sadducees (αἵρεσις τῶν Σαδδουκαίων, Acts v. 17), the heresy of the Pharisees (αἵρεσις τῶν Φαρισαίων, Acts xv. 5), and St Paul speaking to Agrippa says, "After the straitest heresy of our religion I lived a Pharisee" (κατὰ τὴν ἀκριβεστάτην αἵρεσιν τῆς ἡμετέρας θρησκείας, &c., Acts xxvi. 5). Christianity itself was in the beginning looked upon as one of those sects or schools of Jewish opinion, and the "heresy" of the Nazarenes (Acts xxiv. 5) is spoken of as well as the heresy of the Pharisees (*cf.* Acts xxiv. 14, Acts xxviii. 22). This use of the term is plainly borrowed from classical Greek, where αἵρεσις frequently means a school of Roman jurists or a school of philosophy (*cf.* Cic., *Epis. ad Fam.* xv. 16; Diog. Laert., *Proœm.*, 13). In the New Testament the word is used in another sense which is purely ecclesiastical. Thus in Titus iii. 10 the apostle says: "A man who is an *heretic* after the first and second admonition reject"; in 2 Pet. ii. 1 the church is warned against false teachers, "who privily shall bring in damnable *heresies*, even denying the Lord that bought them," and these heretics and false teachers are evidently the same as those of whom Paul, in the Epistle to the Galatians, says that they are to be anathematized. They are men who in the name of Christ preach such doctrines as tend to frustrate the grace of Christ, who preach "another gospel" (Gal. i. 8, 9); they are compared to the false prophets of the Old Testament Scriptures; they cause divisions and schisms in the church (1 Cor. xi. 18, 19); and the heresies they are guilty of are classed along with grave moral offences (Gal. v. 20). It is this second New Testament use of the word which was taken over into ecclesiastical terminology, and it is in this sense that the early Christian writers speak of heresy and heretics. This early ecclesiastical use has continued down to the present, save that in earlier times schism was generally included under heresy, the names and the things not being separated by definition. It is interesting, however, to note that the earlier New Testament use of the word seems to have lingered on. Tertullian (*Apol.*, c. 1) calls the church a sect, which is the Latin equivalent for *heresy*, and in the same way Constantine called the church (Eusebius, *H. E.*, x. 5, §§ 21, 22) ἡ αἵρεσις ἡ καθολική, ἡ ἁγιωτάτη αἵρεσις.

Heresy means a grave error in matters of faith, but it is much more than a theological or ecclesiastical term. From the days of the emperor Theodosius at the latest, the Christian religion has been intimately connected with law, and heresy is a legal term, with a definite meaning attaching to it; a heresy was a crime with punishment annexed, and therefore was capable of legal definition. It was an offence in canon law, and it was also for long an offence according to civil law. The theological meaning, and the definitions according to canon law and according to civil law respectively, are all different from each other and must be separately explained.

1. *The Theological Sense of the Term.*—The early Christian writers say a great deal about heresy, but commonly refrain from telling what it is. They describe heresies, but they only denounce heresy. It is vain to look for a definition of it in Irenæus's *Against Heresies*, in Hippolytus's *Refutation of all Heresies*, in Tertullian's *Prescription against Heretics*. It is possible, indeed, to collect from these one or two leading tests of heresy, but no definition is to be found. The common features of heresy are too well known to call for specific enumeration. We can gather from Irenæus that heretics are those who reject Scripture, who refuse to accept the "doctrina tradita," who deny the authority of the clergy who have come in regular succession from the apostles, who keep aloof from the Catholic Church, the sole depositary of apostolic doctrine (*Against Heresies*, iii. 2–4). Tertullian, in his usual succinct manner, calls every man a heretic who does not at once accept the "Regula Fidei," and he refuses to argue with such a man even though the heretic proceeds to adduce arguments from Scripture. "A controversy over Scripture with heretics can clearly produce no other effect than to help to upset either the stomach or the brain" (*Præscr. adv. Hær.*, 16). In the Eastern Church, after the period of the œcumenical councils, Tertullian's test was the touchstone of heresy. The church had her rule of faith expanded into the Nicæo-Constantinopolitan creed, with the various explanations added in the symbols of the remaining œcumenical councils, and a heretic was one who denied this creed in whole or in part. In the Western Church, on the other hand, theologians were accustomed to define heresy in a vague way. Thus Jerome calls heresy "perversum dogma"; a heretic, with him, is one who interprets Scripture in other fashion than according to the witness of the Spirit of God; and Augustine summarily defines heresy to be the invention or retention of new and false opinions. But whatever the definition, the rough and ready test was always nonconformity to the "formula fidei præscripta ab ecclesia Romana." Instead of definition the Eastern Church simply points to the creed and the œcumenical councils, the Western Church to the rule of faith enjoined by Rome.

These meagre definitions, extracted from the writings of early theologians, all of them going back in the last resort to the recognized creed of the church for the time being, imply, in spite of their vagueness, that there is a certain essential kernel of doctrine in Christianity, which cannot be denied or challenged without involving the destruction of Christianity itself, and they all point the way to a fuller description of what is meant by heresy in the theological use of the word. Heresy is a doctrine which, with the appearance of Christian doctrine, is really contradictory to the essential nature of Christianity, and, if persisted in, would in the end make Christianity something very different from what it really is. In order, therefore, to say what heresy is, it is necessary to know what the essential nature of Christianity is, and therefore heresy is generally described by reference to the fundamental nature of Christianity, while the real nature of Christian doctrine is commonly brought out by contrasting it with heresy.

When we look at the matter historically we see that Christianity has always taken the shape of a community thinking and acting for the most part together, and that it has always implied a common life, common work, common ideas. Christianity appears in history as a community whose common work is to confess and to adore God because of what He has done for His people in salvation. This twofold work of confession and worship has manifested itself in a double organization,—an organization of thought and an organization of work,—doctrine and polity. There may be the church without a creed, and the heart-church without the *congregatio*; but that is not the way in which Christianity has taken actual historical shape. It is possible to conceive the entrance of a heterogeneous element into this organization on either side. A heterogeneous element, something really foreign to it, may become organized with the church's doctrine, or may have become incorporated in the church's polity, and whenever this happens there is a doctrine, apparently Christian, which is really subversive of Christianity, there is a polity which, apparently Christian, is really opposed to the real life of the *congregatio*. This possibility is the historical root of the origin both of heresy and of schism; for heresy is just a heterogeneous element imbedded in the organized dogmatic of the church, and schism is a foreign element which has found its way into church polity. This description, however, is somewhat misleading, because it may happen that an element which seems heterogeneous is not really so, but is on the contrary a true part of the organization. Heresy is not only apparently but really foreign to the system in which it has become incorporated. Its nature is different, and its source is different. Mere apparent incongruity, therefore, does not prove heresy. A doctrine must be seen to be really contradictory to the fundamental facts of Christianity, and to have come from a different source, before it can be called a heresy. It has frequently happened, accordingly, that doctrines have been judged heretical which a better acquaintance with the nature of Christianity would have pronounced orthodox.

Christianity, under the many forms which it assumes, has always implied the reconciliation of God and man through the person and work of Christ. It implies that Jesus Christ the Saviour has so brought it about that He has established a new kingdom of God which will last, in which men have communion with God through His Spirit. Christianity is complete when the kingdom of God is fully established. "Thy kingdom come" is its aspiration. It therefore implies a moral separation between God and man—a separation which is overcome by the work of Christ the Mediator. The idea of reconciliation is the central thing in Christianity, the essential part in its description. God, man unable to approach God until reconciliation has been made, Christ the Mediator who reconciles, and His people brought again into communion with God,—all Christian doctrine rings the changes on these four fundamental ideas. Whatever contradicts or tends to destroy these, or their relations to each other, is incompatible with Christianity. Whenever any of these four ideas—God, man, Christ, and the kingdom of God—are so misread as to introduce notions incompatible with the relations in which they stand to each other in Christianity, then heresy enters. Theology therefore (and Protestant theology only carries the idea somewhat further) has usually recognized four kinds of heresy, corresponding to the four fundamental ideas on which Christian doctrine rests. The nature and character of God and of His relation to the universe and to man may be so misread as to make reconciliation an impossible thing, and so also may the nature of Christ, the nature of man, and the nature of the results of Christ's work among men. Hence arise heresies about God, about the person of Christ, about the nature of man, and about the results of Christ's work—all of them being doctrines which are incompatible with the idea of reconciliation.

I. Reconciliation implies that man has been separated by sin from God, and that God can overcome this separation. All descriptions of God, of His nature, character, and works, which contradict this fact may give rise to heresies. Thus God cannot overcome the separation if it be impossible for Him to project Himself beyond Himself for salvation. The nature of the Godhead may be so described as to contradict the idea of reconciliation, as, *e.g.*, in the Arian heresy. Again, all descriptions of God's relations to the universe which imply that the universe and all things are not absolutely dependent on Him, which imply that His gracious purpose can be thwarted, contradict the idea of reconciliation, and so may give rise to heresies, *e.g.*, the Gnostic doctrine that matter is independent of God. Misstatements about God's relation to Himself and about His relation to the universe give rise to two different kinds of heresy.

II. Reconciliation implies a real mediator who can accomplish the reconciliation on both its sides, and so heresies may arise about the nature of Christ. The Saviour may be so described that there is no real mediation, and no real reconciliation. These errors may arise in two ways, as one or other side of the mediator is described. The Saviour may be represented so that He has no real relation to God on the one hand or to man on the other. He may be described in such a way that there is no solidarity between Him and God, as *e.g.*, in the Ebionite heresy; or He may be described in such a way that there is no solidarity between Him and man, as in the Docetist heresy. Misstatements about the relation of Christ to God and the relation of Christ to man give rise to two different kinds of heresy.

III. Reconciliation implies that man is so separated from God by sin that there is real need for salvation, and yet not so separated that he cannot be brought into communion with God again; and the nature of man, and especially the presence of sin in man, may be so described as to set aside these requirements. The fact of sin and its presence in man may be so explained away as to leave little ground for the necessity of reconciliation, *e.g.*, in the Pelagian heresy. Again, on the other hand, the fact and presence of sin may be so described that there is no capacity in man for salvation; it may be alleged that sin belongs to the essential nature of man and cannot be removed, *e.g.*, in the Manichæan heresy. These two misstatements about the connexion between man and sin give rise to two kinds of heresy.

IV. The results of the reconciliation effected by Christ may also be misrepresented in two ways. The separation between man and God, which is the formal occasion of the reconciliation, was caused by sin; and the distance between God and man is a moral one. It is not such a separation as might arise from the difference between the divine and the human nature, or from the inevitable distance between Creator and creature. And so reconciliation has for its effect, not mere absorption into God, but the restoration of moral communion between God and His people. The intercourse was broken by sin, and the result of reconciliation must be moral; it must take effect in a change of will, in the creation of a life of new obedience. False ideas arise when this is misrepresented, and these misrepresentations can arise in two ways:—when it is said that the action of divine grace impregnates the nature in a magical way, instead of taking effect on the will in a moral fashion, *e.g.*, the magical idea of sacramental efficacy; or when it is said that the result of the reconciliation is to raise man above the necessity of living a moral life and of conforming to the laws of morality, *e.g.*, the Antinomian heresy.

Thus theology finds at least eight separate kinds of heresy, arising from the entrance of foreign elements into the four fundamental ideas of Christianity. All heresies may be reduced to one or other of these eight classes. In point of fact, however, most heresies which have actually arisen cannot be said to belong purely to any one of them. The class only denotes the type; for one error is apt to bring others in its train, and so most heresies are mixed, and do not in all respects conform to their type.

Theologians, however, have not rested content with the mere theoretical or genetic description of heresy and heretics, and have commonly borrowed distinctions first laid down by jurists in canon law to distinguish more narrowly the characteristic marks of heresy. Thus a false doctrine to be a heresy must be an *intellectual* error, it must be held *voluntarily*, it must contradict a doctrine *already defined* by the formula of the church, it must be held *pertinaciously*, and the heretic must be professedly *within the church*; but these distinctions belong properly to the legal aspect of heresy, and must be referred to again.

Many theologians, Schleiermacher among others, have attempted to describe the actual origin of heresies, and a common mode of explanation is as follows. Heresies arise in that province of theology called dogmatic, and commonly appear during the definition of some important part of dogmatic theology. Dogmatic theology is the rationale of the spiritual events and forces which have called Christianity into being. In the attempt made by the church to understand these events and forces which have called it into being, its attention has commonly been confined to the more outstanding portions. The history of dogmatic shows us that from time to time the church has endeavoured to master one doctrine, not the whole round of doctrines; it has endeavoured to make distinct single points, instead of working at the various relations of all the doctrines to each other. This very natural mode of work has the one disadvantage that it concentrates attention on isolated portions of doctrine rather than on the whole mass, and between the consecutive portions there are gaps. The mind of man, however, like nature, abhors a vacuum, and summarily fills these vacua up with material usually drawn from the prevailing philosophical or scientific theories of the day. These summary explanations or theories may or may not be in accordance with the spirit of Christianity, and when they are not they become a fruitful source of heresies. One of the best illustrations of this is the introduction into theology of the Aristotelian doctrine of τὸ ἑκούσιον, which gave the church the Pelagian heresy along with some others.

So much for the general theological conception of heresy, of its nature, divisions, and sources; but before proceeding to describe the use of the term in canon law, it should be observed that the theological does not always correspond with the ecclesiastical meaning of the word. It is generally acknowledged that Holy Scripture is the source of doctrine, and that for the due understanding thereof the enlightening guidance of the Holy Spirit is required; though, of course, the precise meaning of this statement varies in different systems of theology. Holy Scripture and the witness of the Spirit of God are thus the touchstone of heresy. In the Roman Catholic and Greek Churches, however, it is held that the enlightening guidance of the Holy Spirit in this respect is restrained within the limits of certain ecclesiastical machinery (the œcumenical council, the pope *ex cathedra*, &c.), which are the only channels through which the Spirit comes to the church, and hence the creed of the church rather than Scripture is the real touchstone of heresy. Protestant theologians, on the other hand, do not believe either that the guidance of the Spirit is always present within this ecclesiastical machinery or that it is given in this way only, and so they make a distinction between mere ecclesiastical and real theological heresies. Ecclesiastical heresies arise when a fundamental statement made in the creed or confession is contradicted. But it may happen, since creeds and councils may err, that the error is not in the contradiction but in the creed, and therefore there is always an appeal from the creed to the Scripture. The ecclesiastical idea of heresy has always the theological idea behind it, and may at any time be corrected by it. Roman Catholic and Greek theologians, on the other hand, do not admit any going behind the record; they do not allow any appeal from the creed to Scripture. According to their ideas the creed is the infallible digest of Scripture, and therefore heresy is to be tested by the creed and not by Scripture—that is, the ecclesiastical and theological ideas of heresy are exactly the same.

2. *Heresy according to Canon Law.*—Canon law was the ecclesiastical law of mediæval Europe, and is still the law of the Roman Catholic Church, and its description of heresy and of heretics is almost more important than the theological in the investigation of the matter from the historical side. Canon law regards heresy

from the practical side of ecclesiastical procedure and legal enactment. Its view is much narrower than the theological, but much more precise. Orthodoxy is the doctrine maintained by the infallible Roman Church and assented to by all its faithful members; heresy is dissent from the articles of faith established by the Roman pontiffs and by the councils of the Roman Church. Canon law also is mainly concerned with heresy in order to punish it, and therefore is obliged to treat the whole subject with severe legal accuracy of statement. It proceeds from strict definitions. Perhaps the commonest definition is the following:—heresy is "error intellectus voluntarius contra aliquam propositionem catholicam cum pertinacia assertus ab eo qui baptismum accepit." Jurists are accustomed to expand this general definition in a variety of qualifying statements. (*a*) All heresy is error, but every error is not a heresy. It is an error according to canon law to take usury; it is heresy to say that to take usury is not a sin, but taking usury is no heresy. Heresy is intellectual error. It is intellectual error believed to be truth, and that in spite of predominant opinion. Canonists distinguish between members of the Roman Church who refuse, *e.g.*, to accept the "filioque" clause in the creed, and members of the Greek Church who make the same refusal. The refusal is in both cases an error, but it is a heresy only in the Roman Church, for there only the predominant opinion is against the error. (*b*) An error also only becomes heresy when it is held voluntarily. To be a heretic a man must stick to his error, although he knows that it has been condemned by the church. A heretic not only errs, but knows that he errs, and wishes to err. (*c*) Nor is every voluntary error a heresy; the heretic must contradict a doctrine which has been clearly stated in the creed and has become part of the defined faith of the church. (*d*) Nor is an erroneous opinion voluntarily professed in opposition to the creed of the church heresy, unless the heretic persists in it. Pertinacity, all canonists insist, is an essential element in heresy, and unless it is present no process for heresy can legally proceed. (*e*) And lastly, a heretic must be a member of the church. He must have been baptized. Neither a Jew, a Mahometan, nor a heathen can be a heretic. They may be unbelievers, they may hold erroneous opinions, but their opinions are not heresies.

From the first qualification, that heresy is an intellectual error, canonists deduce the ground of their enactments against the suspicion of heresy and against those suspected. Canon law uniformly proceeds on the idea that heresy is not merely an error but a crime. It is a crime, however, which belongs to the invisible part of man, to his intellect. It is not something done with his hands or his feet which witnesses can see, and they argue that direct proof is therefore almost impossible, and that the commission of the crime must almost always be proved from suspicions. This suspicion of heresy occupies a very large space in the dissertations of canonists, and the weakness of their position has made them bring in a very great number of reasons which they seem to think strengthen it (see especially Dandinus, *De suspect. de hæresibus*). They carefully define the degrees of suspicion with the conduct appropriate to each: where the suspicion is only "light," the suspected are simply to be watched; where it is "vehement," they are to be denounced; where it is "violent," they are to be treated as heretics. Canonists have carefully analysed and arranged what are reasonable grounds of suspicion. Pope Innocent III. declared that to lead a solitary life, to refuse to accommodate one's self to the prevailing manners of society, and to frequent unauthorized religious meetings were abundant grounds of suspicion; while later canonists were accustomed to give lists of deeds which made the doers suspect:—a priest who did not celebrate mass, a layman who was seen in clerical robes, those who favoured heretics, received them as guests, gave them safe conduct, tolerated them, trusted them, defended them, fought under them, or read their books, were all to be suspect. The canonist rules for suspicion became a sort of inquisitor's *vade mecum*, and when really practised produced a reign of terror.

Since canon law regarded heresy with such horror and detestation, it is not surprising that it gives many directions, which have the force of legal enactments, whereby men may avoid the dangers of heresy. Pope Alexander IV. prohibited laymen from arguing about matters of faith. The council of Toledo (1129), anxious to put down the Albigenses, ordained that every man above fourteen and every woman above twelve years of age should solemnly swear to abjure every heresy and to maintain in its completeness the Catholic faith. Pope Pius IV. ordered the laity to abstain from reading the Scriptures in the vulgar tongue. The promiscuous reading of books was forbidden, and an index of prohibited books believed to be dangerous to faith or morals was formed.

Canon law regards heresy as a crime, and while it recognizes that the power of the church is spiritual, and that the church visits offences with spiritual punishments such as excommunication, it proceeds on the idea that the state should assist the church in suppressing heresy, and visit heretics with civil pains and penalties, including torture and capital punishment; but this side of the history of heresy belongs as much to civil as to canon law. The church, however, did what it could against heretics. The council of Laodicea (can. 6–9) prohibited them from attending service, though from subsequent acts this could not have been enforced. They were not allowed to give evidence in an ecclesiastical court; a father was prohibited from allowing his son or daughter to marry a heretic; social intercourse with them was prohibited, &c.

3. *Heresy according to Civil Law.*—Civil law treats heresy in a still simpler fashion. The legal idea seems to have been that, since the state approved of one creed and gave it public recognition, to profess any other creed was in some sense civil disaffection or a kind of treason, and manifested lack of loyalty. This notion, however, was supplemented by another and much deeper one in the public law of the mediæval empire. According to the ideas of the earlier mediæval jurists, civil government and ecclesiastical government were equally and in the same sense ordinances of God; and this thought found expression in the twin conceptions of world-king and world-priest, emperor and pope, who were God's vicars, and ruled in His name over church and state. God was the king of the world; the emperor was His vicar, and treason, therefore, included treason against God, or heresy, as well as treason against the emperor. This idea lingered long, and indeed still lingers, and complicates the simpler civil notion of heresy. For all practical purposes, however, the deeper thought may be discarded. In civil law, heresy is pertinacious dissent from the creed approved of for the time being. For example, the Lutheran creed, the *Confessio Augustana*, was heresy in all parts of Germany up to the peace of Augsburg, when it was recognized as a creed which might be professed. It then became orthodox in the civil sense of the term, in the same way that the Roman Catholic creed was orthodox, while the Calvinist creed, still unrecognized, was heresy.

Civil punishment followed religious offences as early as the time of Constantine, who enacted severe penalties against the Donatists, and ordained that all possessing Arian books should burn them on the pain of death. Laws against the reading of heretical books became very frequent during and after the 4th century. Arcadius made the reading of books written by the Eunomians a capital offence. Theodosius and Valentinian proscribed Nestorian books, and Valentinian and Marcian the books of Eutyches and Nestorius. The custom became so common that the condemnation of any heresy by the church was followed by the proscription of the writings of members of the sect. The *Codex Theodosianus*, bk. xvi. tit. 5, "De hæreticis," enumerates a great variety of laws against heresy with penalties more or less severe. They had the practical effect of declaring heretics outlaws, who could not hold offices of dignity or value, receive or bequeath money, enforce contracts, &c. In some cases death was the punishment for heresy. Justinian made it impossible for any heretic to bear witness in the civil courts of the land. This legislation may all be traced back to the action of Theodosius, who imposed the Nicene creed upon all his subjects, and made it a law of the land. It continued in force during the Middle Ages, and in consequence heretics who could not accept the Nicene creed were outlaws also. This perhaps explains the curious fact that almost all the mediæval heretics were also revolutionists. During the Middle Ages, especially from the time of Innocent III. onwards, civil interference in cases of heresy was much increased. In the early church the power of discipline belonged to the presbytery, and was afterwards usurped by the bishops, who continued to exercise it in matters of heresy until Innocent III. appointed the Inquisition to deal with heretics. So long as the empire was not Christian, the civil law had nothing to do with the punishment of erroneous opinions, but as soon as Christianity became the authorized religion of the state, the old pagan idea that the state has power to punish *religiones novas et illicitas* was revived. The state, either instructed by the church or, as in the Theodosian code, without instruction, visited with civil pains and penalties all such opinions. This came to a height when the Inquisition was established, and civil courts and national assemblies one after another decreed that whatever penalties were imposed by the Inquisition should be imposed by the state, or else handed over all cases of heresy to the Inquisition to be dealt with as matters deserving the infliction of civil penalties, fines, imprisonment, torture, and death. There is no sadder page in the history of the church than her alliance with the state for the purpose of torturing men out of opinions different from her own. Since the Reformation the persecuting spirit, although tenacious of life, has been gradually dying out.

Principal Heresies.—Early Christian theologians wrote a great many books against heretics in which they enumerated the various heresies which had sprung up in the church up to their own time. St Augustine tells us (*Ep.* 222) that Philastrius, bishop of Brescia, had discovered 28 heresies among the Jews before the coming of Christ, and 128 in the Christian Church afterwards; and many other orthodox writers have given very long lists of these erroneous opinions. It was natural that the early centuries of the Christian era, especially the first five, should be somewhat prolific in heresies, because that was the very period when the church was occupied in defining the principal doctrines of Christianity. A history of heresies must spend most time upon the early centuries. The first dogmatic work of the church was to define the nature of Christ, who occupied the central place in its thought, and it had to steer its way between two opposite views, both of which interfered with the full dogmatic expression of the nature of the Mediator. On the one hand, many of the Jewish converts never rose to the height of the Christian idea of the person of Christ, and it is evident that these must have been very numerous from the emphasis with which it is [illegible]. These Jewish converts preferred to regard our Saviour as the last of the prophets, one who bore the same relation to God and to man as the prophets did; they shrank from the idea of the incarnation; they seemed to feel no need for the divine Saviour. This theory was of course accompanied by other views about the nature of Christianity, but the main element was opposition to the Christian doctrine of the real divinity of Christ, God who has become man. This Ebionite heresy has been maintained by men who wish to call themselves Christians since these early days, and has taken a great variety of shapes, but whether it is held by Jew or Unitarian, there is the same outline of opinion and the same steadfast repugnance to the doctrine of the incarnation. On the other hand, the philosophic doctrine of the repugnance between matter and spirit, the idea, which runs through all Greek philosophy, that matter is the source of evil, induced many of the early Gentile converts to Christianity to think of the incarnation as a metaphor rather than as a fact. Christ, they thought, did not take, but only seemed to take, a human body. These Docetists, as they were called, had a whole series of successors in the early church. When Christian theology advanced step by step in the definition of the doctrine of the person of Christ, it was this old idea of the repugnance between the divine spirit and human nature embodied that lay at the root of the Apollinarian, Eutychian, and Monophysite heresies. Apollinaris denied that the Theanthropos had a "reasonable" soul; he denied the full humanity of the Saviour. Eutyches denied that the Theanthropos had a human nature; and the Monophysites, in their various theories, held strongly by the same idea. All these theories, however different in form and expression, denied the full and true humanity of Christ, and so contradicted the church's yearning for a Saviour truly man as well as truly God. These heresies, along with the Nestorian, were all finally condemned at the council of Chalcedon (the fourth œcumenical).

But long before the church had definitely set forth the doctrine of the person of Christ, its attention was turned to the doctrine of the essential nature of the Godhead. At first this doctrine was scarcely considered apart from Christology. It is impossible to separate the history of the doctrine of the Trinity from the doctrine of the person of Christ; for long the two separate problems were inextricably mixed. At length it became evident to the mind of the church that there were two doctrines, and Christian theology turned aside to discuss, and if possible settle, the doctrine of the essential nature of the Godhead before it proceeded to exhaust the doctrine of the person of Christ. For the real problem in the Arian controversy was not the divinity of the Mediator but the nature of God. Is God to be thought of as a Trinity or as a Unity? what is the relation of the Second Person in the Trinity to the First Person? The real gain to Christian theology which came from the discussions in the Arian controversy was to thrust out the Greek conception of Deity as the Absolute who cannot be described save by negations, and to put in its stead a Christian conception which shows that there are relations within the Deity which, however incomprehensible, enable us to know that God may be in sympathy with men, and that all things may live, move, and have their being in Him.

The philosophical idea that matter is the source of evil, that matter has always some stubborn element in it by which it can defy the ideal, gave rise to a whole series of ancient and mediæval heresies. The Gnostics in all their various sects distinguished between God and the Creator. The good God, they held, could not defile Himself by contact with matter, and therefore could not be the God of creation and providence. Christian theology, on the other hand, has always confessed God to be the Almighty Maker of heaven and earth, and all things seen and unseen, and the necessity for such a doctrine of creation consists in the fact that the Christian consciousness demands the absence of anything that might come in between God and the furtherance of His plan of salvation. It demands that all things be thought of as dependent on God, in order that He may be able to make all things work together for the good of His people; and so it has strenuously asserted the doctrines of creation and providence in opposition to an independent matter and the reign of fate. The Gnostic ideas were repeated by the Manichæans and by several mediæval sects, such as the Paulicians and Messalians, and, in the Eastern Church, by the Bogomili.

The Pelagian and Manichæan heresies principally concern the Christian doctrine of man and of the presence of sin in man, and contradict the church's creed, because they do away with the Christian doctrine of reconciliation. Pelagianism, it was held, denied the need of God's grace by insisting that man was free from indwelling sin at the beginning of his career, and followed good, when he did follow it, by the power of his own will; while Manichæism, by asserting that sin belonged to the essential nature of man, seemed to paralyse the whole divine action in reconciliation. It was held by the orthodox opponents of Pelagius that his opinions really implied that there was no real need for the Saviour and the salvation which Christianity describes, and that semi-Pelagianism, although much nearer orthodox doctrine, very inadequately comprehended that sinfulness in man which rendered reconciliation indispensable ere there could be a restoration of communion with God.

The Antinomian and various kinds of mystical theories about the Christian life all proceed upon a view of the effects of Christ's work which is at variance with fundamental Christian ideas. Christian doctrine teaches that men reconciled to God will strive to live a life of new obedience to Him, and it holds that this life of new obedience comes under the same moral laws as the ordinary life of man. But many Christian sects have professed theories about this life of new obedience which seem to imply that it is not under the laws of ordinary morality, that Christian freedom means licence to do what ordinary morals forbid. The Epistles to the Corinthians seem to say that such theories were held in the apostolic church, and were denounced by the apostles; many of the Gnostic and Manichæan sects undoubtedly professed them. The same views occur again and again in mediæval heresy, and were held by many of the enthusiastic sectaries in Reformation times and later. The Brethren of the Free Spirit in the 13th and 14th century, the Anabaptists during the Reformation period, and some of the followers of Molinos are examples. The mystical theories which so largely entered into the mediæval church, and which have continually clung to the skirts of Christianity, have in many instances proceeded on the principle that the new life is implanted in man in a physical way, and magical ideas of the means of grace have been very destructive to the moral theory of the Christian life.

The history of the mediæval heretical sects is by far too complicated to be entered on here. Many of them did no more than protest against the hierarchical constitution of the church of the Middle Ages. Most of them only sought room to carry out to the full their ideas of a true "Imitatio Christi," but it is also certain that a good many Gnostic and Antinomian tenets were held. The Friends of God, the Fratricelli, the Beghards, were all mystics, but their mysticism was of a very harmless description; while the Brethren of the Common Life were worthy forerunners of the pietists of the 18th century (see MYSTICS).

The heretics of the Reformation Church scarcely call for separate remark. The Zwickau prophets and the Anabaptists held opinions at variance with the ordinary notions of what is meant by the Christian life. Schwenkfeld, the Quietists, the followers of Madame Bourignon, all revived types of mysticism which had appeared long before; and the Quakers had their forerunners in mediæval times. Many of these sects, though called heretical, seem to have arisen simply from the desire to live purer and more spiritual lives than the church organization of their times permitted, and in order to do so were led to lay stress upon the idea of personal guidance by the Spirit of God, and on the necessity of the "house and heart church" in opposition to the external church life of their time, on the need of personal as opposed to official religion.

In this article Christian heresy alone has been described. Heresy, however, arises wherever there is doctrine, and there are Mahometan and Buddhist heresies and sects as well as Christian.

The best history of sects and heresies from the sympathetic side is Gottfried Arnold's *Unpartheyische Kirchen- und Ketzer-Historie*, 1699-1700, best ed. that of Schaffhausen, 1740. A very good list of writers on heresy, ancient and mediæval, is given in Burton's *Bampton Lectures on Heresies of the Apostolic Age*, 1829. The various Trinitarian and Christological heresies may be studied in Dorner's *History of the Doctrine of the Person of Christ*, 1845-56, Eng. tr. 1861-62; the Gnostic and Manichean heresies in the works of Mansel, Matter, and Beausobre; the mediæval heresies in Hahn's *Geschichte der Ketzer im Mittelalter*, 1846-50, and Preger's *Geschichte der deutschen Mystik*, 1875; Quietism in Heppe's *Geschichte der quietistischen Mystik*, 1875; the Pietist sects in Palmer's *Gemeinschaften und Secten Württembergs*, 1875; the Reformation and 17th century heresies and sects in the *Anabaptisticum et enthusiasticum Pantheon und Geistliches Rüst-Haus*, 1702. Böhmer's *Jus Ecclesiasticum Protestantium*, 1714-23, and Van Espen's *Jus Ecclesiasticum*, 1702, detail at great length the relations of heresy to canon and civil law. On the question of the baptism of heretics see Smith and Cheetham's *Dict. of Eccl. Antiquities*, "Baptism, Iteration of;" and on that of the readmission of heretics into the church, compare Martene, *De Ritibus*, and Morinus, *De Pœnitentia*. (T. M. L.)

Heresy according to the Law of England.—The highest point reached by the ecclesiastical power in England was in the Act *De hæretico comburendo* (2 Henry IV. c. 15). Some have supposed that a writ of that name is as old as the common law, but its execution might be arrested by a pardon from the crown. The Act of Henry IV. enabled the diocesan alone, without the cooperation of a synod, to pronounce sentence of heresy, and required the sheriff to execute it by burning the offender, without waiting for the consent of the crown.[1] A large number of penal statutes were enacted in the following reigns, and the statute 1 Eliz. c. 1 is regarded by lawyers as limiting for the first time the description of heresy to tenets declared heretical either by the canonical Scripture or by the first four general councils, or such as should thereafter be so declared by parliament with the assent of convocation. The writ was abolished by 29 Car. II. c. 9, which reserved to the ecclesiastical courts their jurisdiction over heresy and similar offences, and their power of awarding punishments not extending to death. Heresy became henceforward a purely ecclesiastical offence, although disabling laws of various kinds continued to be enforced against Jews, Catholics, and other dissenters. The temporal courts have no knowledge of any offence known as heresy, although incidentally (*e.g.*, in questions of copyright) they have refused protection to persons promulgating irreligious or blasphemous opinions. As an ecclesiastical offence it would at this moment be almost impossible to say what opinion, in the case of a layman at least, would be deemed heretical. Apparently, if a proper case could be made out, an ecclesiastical court might still sentence a layman to excommunication for heresy, but by no other means could his opinions be brought under censure. The last case on the subject (Jenkins *v.* Cook, *Law Reports*, 1 Probate Division 80) leaves the matter in the same uncertainty. In that case a clergyman refused the communion to a parishioner who denied the personality of the devil. The judicial committee held that the rights of the parishioners are expressly defined in the statute of 1 Edw. VI. c. 1, and, without admitting that the canons of the church, which are not binding on the laity, could specify a lawful cause for rejection, held that no lawful cause within the meaning of either the canons or the rubric had been shown. It was maintained at the bar that the denial of the most fundamental doctrines of Christianity would not be a lawful cause for such rejection, but the judgment only queries whether a denial of the personality of the devil or eternal punishment is consistent with membership of the church. The right of every layman to the offices of the church is established by statute without reference to opinions, and it is not possible to say what opinions, if any, would operate to disqualify him.

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[1] Stephen's *Commentaries*, bk. iv. c. 7.

The case of clergymen is entirely different. The statute 13 Eliz. c. 12, § 2, enacts that "if any person ecclesiastical, or which shall have an ecclesiastical living, shall advisedly maintain or affirm any doctrine directly contrary or repugnant to any of the said articles, and being convented before the bishop of the diocese, or the ordinary, or before the queen's highness's commissioners in matters ecclesiastical, shall persist therein or not revoke his error, or after such revocation eftsoons affirm such untrue doctrine," he shall be deprived of his ecclesiastical promotions. The Act it will be observed applies only to clergymen, and the punishment is strictly limited to deprivation of benefice. The judicial committee of the privy council, as the last court of appeal, has on several occasions pronounced judgments by which the scope of the Act has been confined to its narrowest legal effect. The court will construe the Articles of Religion and formularies according to the *legal rules for the interpretation of statutes and written instruments*. No rule of doctrine is to be ascribed to the church which is not distinctly and expressly stated or plainly involved in the *written law of the Church*, and where there is no rule, a clergyman may express his opinion without fear of penal consequences. In the *Essays and Reviews* cases (Williams v. the Bishop of Salisbury, and Wilson v. Fendall) it was held to be not penal for a clergyman to speak of merit by transfer as a "fiction," or to express a hope of the ultimate pardon of the wicked, or to affirm that any part of the Old or New Testament, however unconnected with religious faith or moral duty, was not written under the inspiration of the Holy Spirit. In the case of Noble v. Voysey in 1871, the committee held that it was not bound to affix a meaning to articles of really dubious import, as it would have been in cases affecting property. At the same time any manifest contradiction of the Articles, or any obvious evasion of them, would subject the offender to the penalties of deprivation. In some of the cases the question has been raised how far the doctrine of the church could be ascertained by reference to the opinions generally expressed by divines belonging to its communion. Such opinions, it would seem, might be taken into account as showing the extent of liberty which had been in practice, claimed and exercised on the interpretation of the articles, but would certainly not be allowed to increase their stringency. It is not the business of the court to pronounce upon the absolute truth or falsehood of any given opinion, but simply to say whether it is formally consistent with the legal doctrines of the Church of England. Whether convocation has any jurisdiction in cases of heresy is a question which has occasioned some difference of opinion among lawyers. Hale, as quoted by Phillimore, says that before the time of Richard II., that is, before any Acts of Parliament were made about heretics, it is without question that in a convocation of the clergy or provincial synod "they might and frequently did here in England proceed to the sentencing of heretics." But later writers, while adhering to the statement that convocation might declare opinions to be heretical, doubted whether it could proceed to punish the offender, even when he was a clerk in orders. Phillimore states that there is no longer any doubt, even apart from the effect of the Clergy Discipline Act, 3 and 4 Vict. c. 86, that convocation has no power to condemn clergymen for heresy. The supposed right of convocation to stamp heretical opinions with its disapproval was recently exercised on a somewhat memorable occasion. In 1864 the convocation of the province of Canterbury, having taken the opinion of two of the most eminent lawyers of the day, Sir Hugh Cairns and Mr Rolt, passed judgment upon the volume entitled *Essays and Reviews*. The judgment purported to "synodically condemn the said volume as containing teaching contrary to the doctrine received by the United Church of England and Ireland, in common with the whole Catholic Church of Christ." These proceedings were challenged in the House of Lords by Lord Houghton, and the lord chancellor (Westbury), speaking on behalf of the Government, stated that if there was any "synodical judgment" it would be a violation of the law, subjecting those concerned in it to the penalties of a *præmunire*, but that the sentence in question was "simply nothing, literally no sentence at all." It is thus at least doubtful whether convocation has a right even to express an opinion unless specially authorized to do so by the crown, and it is certain that it cannot do anything more. Heresy or no heresy, in the last resort, like all other ecclesiastical questions, is decided by the judicial committee of the council.

The English lawyers, following the Roman law, distinguish between heresy and apostasy. The latter offence is dealt with by an Act which still stands on the statute book, although it has long been virtually obsolete,—the 9 and 10 Will. III. c. 35. If any person who *has been educated in or has professed the Christian religion* shall, by writing, printing, teaching, or advised speaking, assert or maintain that there are more Gods than one, or shall deny any of the persons of the Holy Trinity to be God, or shall deny the Christian religion to be true or the Holy Scriptures of the Old and New Testament to be of divine authority, he shall for the first offence be declared incapable of holding any ecclesiastical, civil, or military office or employment, and for the second incapable of bringing any action, or of being guardian, executor, legatee, or grantee, and shall suffer three years' imprisonment without bail. Unitarians were saved from these atrocious penalties by a later Act 53 Geo. III. c. 160, which permits Christians to deny any of the persons in the Trinity without penal consequences. (E. R.)

HERFORD, a town of Prussia, capital of a circle in the government district of Minden, province of Westphalia, is situated in a beautiful and fruitful district at the confluence of the Werra and Aa, and on the Minden and Cologne railway, 10 miles south-west of Minden. It possesses five evangelical churches, among which may be mentioned the Munsterkirche, a Romanesque building with a Gothic apse of the 15th century; the Marienkirche, in the Gothic style, and the Johanniskirche, with a tower 280 feet high. The other principal buildings are the Catholic church, the synagogue, the gymnasium founded in 1540, the agricultural school, and the theatre. The industries include cotton and flax spinning, and the manufacture of linen cloth, furniture, sugar, tobacco, and leather. The population of the town in 1875 was 11,967.

Herford owes its origin to a nunnery which is said to have been founded in 832, and was confirmed by Louis the Pious in 839. From the emperor Frederick I. the abbess obtained princely rank and a seat in the imperial diet. The foundation was secularized in 1803. Herford was a member of the Hansa League. In 1631 it became a free imperial town, but in 1647 it was subjugated by the elector of Brandenburg. It came into the possession of Westphalia in 1807, and in 1813 into that of Prussia.

HERIOT. See COPYHOLD.

HERIOT, GEORGE (1563–1623), the founder of Heriot's Hospital, Edinburgh, was descended from an old family of some consideration in the county of Haddington; and his father, a goldsmith in Edinburgh, for some time represented the city in the Scottish parliament. George was born in 1563, and after receiving a good education was apprenticed to his father's trade. In 1586 he married the daughter of a deceased Edinburgh merchant, and with the assistance of her patrimony set up in business on his own account. At first he occupied a small "buith" at the north-east corner of St Giles's Church, and afterwards a more pretentious shop at the west end of the building. To the business of a goldsmith he joined that of a money-lender, and in 1597 he had acquired such a reputation that he was appointed goldsmith to Queen Anne, consort of James VI. In 1601 he became jeweller to the king, and on the removal of the court to London, he followed his royal master thither, and occupied a shop opposite the Exchange. Heriot was largely indebted for his fortune to the extravagance of the queen, and to the imitation of this extravagance by the nobility. Latterly he had such an extensive business as a jeweller that on one occasion a Government proclamation was issued calling upon all the magistrates of the kingdom to aid him in securing the workmen he required. He died in London, 10th February 1623. In 1608, having some time previously lost his first wife, he married Alison Primrose, daughter of James Primrose, grandfather of the first earl of Rosebery, but she died in 1612; by neither marriage had he any issue. The surplus of his estate, after deducting legacies to his nearest relations and some of his more intimate friends, was bequeathed to found a hospital for the education of freemen's sons of the town of Edinburgh, and its value afterwards increased so greatly as to supply funds for the erection of several Heriot foundation schools in different parts of the city. For a notice of Heriot's Hospital, see EDINBURGH, vol. vii. p. 686.

Heriot takes a leading part in Scott's novel, *The Fortunes of Nigel* (see also the Introduction). *A History of Heriot's Hospital, with a Memoir of the Founder*, by William Steven, D.D., appeared in 1827, 2d ed. 1859.

HERISAU, the largest town in the Swiss half canton of Appenzell ausser Rhoden, is situated at the confluence of the Glatt and Brulbach, 7 miles north-west of Appenzell, and about 2500 feet above sea level. The town is irregularly built, and extends over a large area. The church tower, in which the archives are kept, is referred to the 7th century. Herisau has a public library, an arsenal, a new town-house, and a hospital, and is the seat of the cantonal council and of a district court of justice. The manufactures comprise muslin, cotton, and silk. Christianity was introduced at Herisau (a name during the Middle Ages Latinized as Augia Domini) about the beginning of the 7th century. The nobles of Herisau were its first superiors, but their power passed in 1390 into the hands of the abbots of St Gall, from whose somewhat oppressive rule the people bought themselves free in 1463. The population in 1870 was 9736. In the neighbourhood beautiful walks lead to the interesting ruins of the castles of Rosenberg and Rosenburg. The baths and goat's-whey cure of Heinrichsbad are about a mile to the north-east.

HERISTAL. See HERSTAL.

HERITABLE JURISDICTIONS, in the law of Scotland, were grants of jurisdiction made to a man and his heirs. They were a usual accompaniment to feudal tenures, and the power which they conferred on great families, being recognized as a source of danger to the state, led to frequent attempts being made by statute to restrict them, both before and after the Union. They were all abolished by the Act 20 Geo. II. c. 43, which enacts (§ 1) that all heritable jurisdictions of justiciary, and all regalities and heritable baileries, and all heritable constabularies, other than the office of high constable of Scotland, and all stewartries, being parts only of shires and counties, and all sheriffships and deputy-sheriffships of districts, being parts only of shires and counties, belonging to or possessed by any subject or subjects, shall be taken away and totally dissolved and extinguished. At the same time, constabularies and other jurisdictions having been recognized as rights of property by the Treaty of Union, the Act provides that compensation shall be awarded to all persons lawfully possessed of such jurisdictions, and the sum of £150,000 was afterwards voted by parliament to pay the claims for compensation for loss of jurisdiction, as settled by a report of the Court of Session (see Erskine's *Institutes*, by Nicholson, p. 92).

HERLEN, FRITZ, of Nördlingen, was an artist of the early Swabian school, who tempered the rudeness of his native art with some of the delicacy of the masters of Bruges. The date and place of his birth are unknown, but his name is on the roll of the tax-gatherers of Ulm in 1449; and in 1467 he was made citizen and town painter at Nördlingen, "because of his acquaintance with Flemish methods of painting." One of the first of his acknowledged productions is a shrine on one of the altars of the church of Rothenburg on the Tauber, the wings of which were finished in 1466, with seven scenes from the lives of Christ and the Virgin Mary. In the town-hall of Rothenburg is a Madonna and St Catherine of 1467; and in the choir of Nördlingen cathedral a triptych of 1488, representing the Nativity and Christ amidst the Doctors, at the side of a votive Madonna attended by St Joseph and St Margaret as patrons of a family. In each of these works the painter's name certifies the picture, and the manner is truly that of an artist "acquainted with Flemish methods." We are not told under whom Herlen laboured in the Netherlands, but he probably took the same course as Schongauer and Hans Holbein the elder, who studied in the school of Van der Weyden. His altarpiece at Rothenburg contains groups and figures, as well as forms of action and drapery, which seem copied from those of Van der Weyden's or Memling's disciples, and the votive Madonna of 1488, whilst characterized by similar features, only displays such further changes as may be accounted for by the master's constant later contact with contemporaries in Swabia. Herlen had none of the genius of Schongauer. He failed to acquire the delicacy even of the second-rate men who handed down to Matsys the traditions of the 15th century; but his example was certainly favourable to the development of art in Swabia. By general consent critics have assigned to him a large altarpiece, with scenes from the gospels and figures of St Florian and St Floriana, and a Crucifixion, the principal figure of which is carved in high relief on the surface of a large panel in the church of Dinkelsbühl. A Crucifixion, with eight scenes from the New Testament, is shown as his in the cathedral, a Christ in Judgment, with Mary and John, and the Resurrection of Souls in the town-hall of Nördlingen. A small Epiphany, once in the convent of the Minorites of Ulm, is in the Holzschuher collection at Augsburg, a Madonna and Circumcision in the National Museum at Munich. Herlen's epitaph, preserved by Rathgeber, states that he died on the 12th of October 1491, and was buried at Nördlingen.

HERMANN, the popular modern name in Germany for the ancient German hero Arminius. See GERMANY, vol. x. p. 475.

HERMANN, commonly distinguished as Hermannus Contractus, *i.e.*, Hermann or Heriman the Lame, an old German chronicler and scholar, was born in 1013, a son of the Swabian Count Wolverad (Wolfrat) of Vehreningen (Veringen or Voringen), and died in 1054, at the family residence of Aleshusen near Biberach. Educated at the monastery of Reichenau, and afterwards admitted a member of the fraternity, he added greatly to that reputation for learning which the establishment had maintained from the time of Abbot Berno. Besides the ordinary studies of the monastic scholar, he devoted himself to mathematics, astronomy, and music, and constructed watches and instruments of various kinds.

His chief work is a *Chronicon ab urbe condita ad annum* 1054, which in its earlier portion consists of a compilation from previous chronicles, but between 1044 and 1054 furnishes important and original material for the history of Henry III. The first edition, from a MS. no longer extant, was printed by Sichard at Basel in 1529, and reissued in 1530; another edition appeared at St Blaise in 1590 under the supervision of Ussermann; and a third, from a Reichenau MS., forms part of vol. v. of Pertz's *Monumenta Germaniæ historica*. A German translation of the last is contributed by Robbe to *Die Geschichtsschreiber der deutschen Vorzeit*. The separate lives of Conrad II. and Henry III., often ascribed to Hermann, appear to have perished. His treatises *De mensura astrolabii* and *De utilitatibus astrolabii* (to be found, on the authority of Salzburg MSS., in Pez, *Thesaurus anecdotorum novissimus*, iii.) being the first contributions of moment furnished by a European to this subject, Hermann was for a time considered the inventor of the astrolabe. A didactic poem from his pen, *De octo vitiis principalibus*, is printed in Haupt's *Zeitschrift fur deutsches Alterthum* (vol. xiii.); and he is sometimes credited with the composition of the Latin hymns *Veni Sancte Spiritus*, *Salve Regina*, and *Alma Redemptoris*.

HERMANN, FRIEDRICH BENEDICT WILHELM VON (1795–1868), one of the most distinguished of modern writers on political economy, was born on 5th December 1795, at Dinkelsbühl in Bavaria. After finishing his primary education he was for some time employed in a draughtsman's office. He then resumed his studies, partly at the gymnasium in his native town, partly at the universities of Erlangen and Wurzburg. His attention seems principally to have been given to mathematics and political economy. In 1817 he took up a private school at Nuremberg, where he remained for four years. After filling an appointment as teacher of mathematics at the gymnasium of Erlangen, he became in 1823 privat-docent at the university in that town. His inaugural dissertation was on the notions of political economy among the Romans (*Disserta-*

tio exhibens sententias Romanorum ad œconomiam politicam pertinentes*, Erlangen, 1823). He probably did not remain long at Erlangen, for a year or two after this date we find him acting as professor of mathematics at the gymnasium and polytechnic school in Nuremberg, where he continued till 1827. During his stay there he published an elementary treatise on arithmetic and algebra (*Lehrbuch der Arith. u. Algeb.*, 1826), and made a journey to France to inspect the organization and conduct of technical schools in that country. The results of his investigation were published in 1826 and 1828 (*Über technische Unterrichts-Anstalten*). Soon after his return from France he was made professor extraordinarius of political science at the university of Munich, and in 1833 he was advanced to the rank of ordinary professor in the same subject. In 1832 appeared the first edition of his great work on political economy, *Staatswirthschaftliche Untersuchungen* (Economical Researches). In 1835 he was made member of the Royal Bavarian Academy of Sciences.

From this time onwards Hermann's life was one of great and varied practical activity. From the year 1836 he acted as inspector of technical instruction in Bavaria, and made frequent journeys to Berlin and Paris in order to study the methods there pursued. In the state service of Bavaria, to which he devoted himself, he rose gradually but rapidly. In 1837 he was placed on the council for superintendence of church and school work; in 1839 he was entrusted with the direction of the bureau of statistics; in 1845 he was one of the councillors for the interior; in 1848 he sat as member for Munich in the national assembly at Frankfort. In this assembly Hermann, with Heckscher and Sommaruga, was mainly instrumental in organizing the so-called "Great German" party, and was selected as one of the representatives of their views at Vienna. Warmly supporting the customs union (Zollverein), he acted in 1851 as one of its commissioners at the great industrial exhibition at London, and published an elaborate report on the woollen goods. Three years later he was president of the committee of judges at the similar exhibition at Munich, and the report of its proceedings was drawn up by him. In 1855 he became councillor of state (Staatsrath im ordentlichen Dienst), the highest honour in the service to which he could attain.

It is hardly surprising that in the midst of such varied and weighty practical occupations Hermann did not find time for carrying on systematically his work in the pure science of economics. Yet the long series of reviews, mainly of works on economical subjects, published in the *Münchener Gelehrte Anzeigen* from 1835 to 1847, attest his unwearied industry and constant interest in the subject on its theoretical side, while his more elaborate papers in Rau's *Archiv der politischen Oekonomie* and in the *Augsburger Allgemeine Zeitung* show the wide extent of his practical knowledge. As head of the bureau of statistics he published a series of annual reports (*Beiträge zur Statistik des Königreichs Bayern*, Heft 1-17, 1850-1867) which are of very high value, especially as regards the growth of population. His only complete work in economic science, the *Researches*, had gone out of print a very few years after the book was published, but not until near the close of his life did Hermann find an opportunity of undertaking a revision of it. Upon this task he was engaged at the time of his death, 23d November 1868, and he had recast, enlarged, and amended nearly two-thirds of the volume. The second edition, prepared from his MS., and including those parts of the first edition which had not been revised or supplemented, was published in 1870 by his friends Dr Helferich and Dr Mayr. There have since been several reprints.

Although the *Staatswirthschaftliche Untersuchungen* is not a systematic treatise on political economy, it must nevertheless be regarded as in many respects the most important contribution to the science since the *Wealth of Nations*. It cannot, indeed, be said to contain principles which are in themselves novel or original; Hermann's merits are not so much those of a discoverer as of a most acute and subtle critic. Like Ricardo he excels in abstract analysis, in resolution of complex phenomena into their simpler elements, but he has a more firm hold than Ricardo ever seems to have possessed of the true nature of these elementary facts, and a remarkable power of precisely stating and comprehensively combining them. The peculiar value of the *Researches* consists in the strict analysis to which the primary notions of economics are subjected, in the general conception of the method and plan of the science which emerges from this analysis, and in the [illegible] way in which the fundamental principles are carried out in the detailed problems of the science. Only in the fashion indicated by Hermann can we hope to render clear the position of a pure theory of economic facts as an indispensable and integral part of social science. The fault [illegible] of inquiry, [illegible] that has been regarded as distinctive of the abstract or English school of political economy, [illegible] with the elementary facts from which [illegible] start, as stated by Hermann and those Continental writers who have followed him.

The *Researches*, in the 2d edition, consist of ten separate essays, of which the first, [illegible] "Grundlegung," pp. 1-77, the fifth [illegible], on "Production," the sixth (pp. [illegible]-447, on "Price"), the ninth (pp. 448-581, on "Profit"), and the tenth (pp. 582-[illegible], on [illegible]) are of the greatest importance. In the "Grundlegung" [illegible] is given of the simple [illegible], family, community, and state, upon which economical inquiries are founded. Human wants and the satisfaction to be obtained for them by labour exercised on natural [illegible] are the primitive facts. But in the satisfaction of wants there are two aspects, the technical and the economical. Technically we consider solely the process by which commodities of a quality suited to satisfy want are obtained. Economically we have always to estimate the ratio between the effort expended and the result obtained. An "economy" is a distribution of forces so that the greatest satisfaction may be obtained with least expenditure of effort, with least loss of utility. The influence of this economical principle, the institutions to which it gives rise, the conditions under which it is possible, and the circumstances which affect, modify, or counteract it, are traced with reference to the individual, the family, the community, and the state or nation. The increasing complexity of the phenomena does not alter the nature of the principle which lies at the basis of them, and it is the business of economic theory to analyse these phenomena under guidance of the general principle. Economics is therefore defined by Hermann as the "quantitative theory of goods," and, though he is sparing in the use of symbols, his method of treatment is throughout mathematical. Deserving of attention is the manner in which he points out the influence of collective feeling and collective wants as giving rise to special [illegible] in the community. To this first fundamental essay the three succeeding papers "Wants," "Goods," [illegible], pp. 78-142, are appended. The treatment of these, the classification given, the doctrine of [illegible] goods, [illegible], and the distinction drawn between [illegible] the individual or the collective point of view, make [illegible] to the science.

The fifth essay is an elaborate treatise on the theory of production, treating the agents of production, free goods, labour, and capital separately, then the interests of the several parties engaged, and [illegible] to variations in the cost of producing. Under this head is given the most complete [illegible] discussion of [illegible]. Capital is defined so as to include land, but careful reference is made to the distinctive peculiarities of this form of wealth. Especially remarkable is Hermann's treatment of what he calls [illegible], service-[illegible] to which he [illegible] the view of J. B. Say. Under fixed capital a very elaborate treatment of the [illegible] influence of machines is given, where the [illegible] in the cost of production, both here and in the [illegible].

The sixth essay analyses the forces which underlie the supply and demand. [illegible] on the side of the purchaser, (1) his desire for the commodity [illegible] (2) [illegible] the [illegible] on the side of the [illegible] cost of production, (2) [illegible] of the [illegible] the value of the [illegible]. The same [illegible] are shown to hold good in the case of the [illegible] the seventh essay, on "Wages," is incomplete. The eighth essay, on "Profits," [illegible] very [illegible] on the various [illegible] of capital and the [illegible] in general, [illegible] (*[illegible]*). This [illegible]

[illegible]

[illegible]

HERMANN, Johann Gottfried Jakob (1772–1848), classical scholar and philologist, was born at Leipsic on November 28, 1772. Entering the university of his native city at the precocious age of fourteen, Hermann at first studied law, but his inclination to classical learning was too strong to be resisted, and accordingly, after a session spent at Jena in 1793–94, he became a lecturer on classical literature in Leipsic. In 1798 he was appointed professor extraordinarius of philosophy at the university there, and after refusing an invitation to proceed to Kiel as rector of a school, he was in 1803 chosen professor of eloquence. In 1809 he received the chair of poetry in addition. He died, senior of the university, on December 31, 1848.

Hermann devoted his early attention to the classical poetical metres, and [illegible] *De metris poetarum Græcorum et Romanorum* [illegible] in 1796, *Handbuch der Metrik*, in 1798, *Elementa doctrinæ metricæ*, in 1816, of which an *Epitome* appeared in 1818, and *De Metris Pindari*, in 1817, attached to Heyne's edition of that author. Of his influential and valuable writings on Greek grammar the chief are *De emendanda ratione Græcæ grammaticæ*, 1801, *Notes and Excursus to Viger's "De præcipuis Græcæ dictionis idiotismis*," 1802, and *De particula* [illegible] *libri IV.*, 1831. His *[illegible]* appeared in 18[illegible]. His editions of the classics comprise several of the plays of Euripides (see vol. viii. p. 680), the [illegible], 1799, *T*[illegible] of Plautus, 1800, *Poetics* of Aristotle, 1802, *Hymns* of Orpheus, 1805; and the Homeric *Hymns*, 1806. In 1825 Hermann finished the edition of Sophocles begun by Erfurdt. His editions of Bion and Moschus were published posthumously in 1849 and of all the plays of Æschylus in 1852. [illegible] edition of Hermann's smaller writings in Latin appeared in seven volumes between 1827 and 1877.

HERMANN, Karl Friedrich (1804–1856), one of the leading representatives of classical investigation in Germany, was born August 4, 1804, at Frankfort-on-the-Main. His early education was received partly at Frankfort and partly at Weilburg, and his university studies were carried on at Heidelberg and Leipsic. On his return from a tour in Italy he habilitated in 1826 as privat docent in Heidelberg; in 1832 he was called to Marburg as professor ordinarius of classical literature; and in 1842 he was transferred to Göttingen to fill the chair left vacant by the death of Ottfried Müller. Both at Marburg and Göttingen he likewise held the office of director of the philological seminary. He died at Göttingen on the 8th of January 1856. Hermann's scholarship took in a wide and ever-widening horizon; but his vision was clear and steady, and he knew well how to portray for other eyes the scenes that shaped themselves with new life before his own. Among his more important publications are the *Lehrbuch der griechischen Antiquitäten*, of which the first portion (Heidelberg, 1841) deals with political, the second (1846) with religious, and the third (1852) with domestic antiquities; the *Geschichte und System der Platonischen Philosophie* (Heidelberg, 1839); an edition of the Platonic Dialogues (6 vols., Leipsic, 1851–52); and *Culturgeschichte der Griechen und Römer* (Göttingen, 1857–58, 2 vols.), published after his death by G. Schmidt. A collection of *Abhandlungen und Beiträge zur classischen Literatur und Alterthumskunde* appeared in 1849, but the great mass of his essays and brochures, which deal with a vast variety of archæological, artistic, critical, and philosophical subjects, are still unarranged. See Lechner, *Zur Erinnerung an K. F. Hermann* (Berlin, 1864).

HERMANNSTADT (Hungarian *Nagy-Szeben*, Latin *Cibinium*), chief town of an Hungarian county of the same name, is advantageously situated on the Szeben, an affluent of the Aluta, about [illegible] miles S.E. of Kolozsvar (Klausenburg), and is the terminus of the Kapus and Nagy Szeben branch line of railway, in 45° 48′ N. lat. and 24° 9′ E. long. It is the see of a Greek Orthodox bishop, the meeting place of the Lutheran consistory for the Transylvanian circle, and the headquarters both of the honved (or "defence militia") and of the regular infantry and artillery of the district; and it also possesses royal courts of law and assizes, and offices of finance, assay, state survey, and engineering. Hermannstadt has a somewhat mediæval appearance, the streets being often narrow, and the houses built in the old German style. Of the squares the most striking is the large quadrangular market place. The public buildings comprise Roman and Greek Catholic, Greek Orthodox, Calvinist, and Lutheran churches, a royal law academy, both Roman Catholic and Lutheran gymnasia, a Greek Orthodox seminary for priests, a hospital for the insane, foundling and orphan homes, Franciscan and Ursulan retreats, a house of correction, civil and military hospitals, county and town halls, the infantry and large new artillery barracks, the town theatre, the "Transylvania" assurance office, the "Albina" bank, and, above all, the Bruckenthal palace with its fine museum and library. Among the industrial establishments are factories for the preparation of soap, candles, soda, sulphuric acid, bone-dust, paper, cloth, linen, leather, caps, boots, combs, and building materials. There are also printing houses, tanneries, and rope-walks, several distilleries, and a large brewery. A brisk trade is carried on both at the regular weekly markets and at the special fairs. The civil population in 1870 was 18,998, of whom about two-thirds were of German (Saxon) and the remainder of Roumanian and Magyar extraction.

The German name of the town is traceable to Hermann, a citizen of Nuremberg, who about the middle of the 12th century established a colony on the spot. In the 13th century it bore the name of *Villa Hermanni*. Under the last monarchs of the native Magyar dynasty Hermannstadt enjoyed exceptional privileges, and soon became a thriving centre of trade, its commerce with the East rising to considerable importance. In the course of the 15th and 16th centuries it was several times besieged by the Turks. In 1610 it suffered at the hands of the Transylvanian prince Gabriel Bathori. At the beginning of 1849 it was the scene of several engagements between the Austrians and Hungarians; and later in the year it was several times taken and retaken by the Russians and Hungarians, the latter being eventually forced to yield to overwhelming numbers, August 6.

HERMAS. See Apostolic Fathers, vol. ii. p. 197.

HERMENEUTICS, Biblical, is that branch of theological science which treats of the principles of Scripture interpretation. Variously described as the theory of the discovery and communication of the thoughts of Holy Scripture (Lange), the science of attaining clearness both in comprehending and in explaining the sense of the Biblical authors (Ernesti), the methodological preparation for the interpreter and for exegesis (Doedes), the science of the removal of differences between us and the sacred writers (Immer), it has for its task to determine the laws of valid exegetical practice. Schleiermacher and Klausen have limited it to the doctrine of what the interpreter has to observe in order to put *himself* in possession of the mind of Scripture. The former defines it as a discipline which looks simply to the reader's own apprehension, not to the conveyance of the meaning ascertained to others; which latter is to be regarded, he thinks, as but a particular division of the art of speaking and writing. It has been generally taken, however, to have respect to the communication as well as the acquisition of the thoughts of the Biblical writers. This larger definition, which is as ancient at least as Augustine's statement of the two things "quibus nititur omnis tractatio Scripturæ, modus inveniendi quæ intelligenda sunt et modus proferendi quæ intellecta sunt" (*De Doctr. Christ.*, i. 1), has been formally accepted or practically acted on by most modern authorities. It is consonant with the currency of the terms ἑρμηνεύω, ἑρμηνεύς, ἑρμηνευτής (connected it may be with *Hermes*, but not derived from that, such use of a deity's name being probably unexampled).[1] These in the classics express both expounding (Pindar, *O.*, 2, 153) and interpreting or translating a foreign language to others (Xen., *Anab.*, i. 2, 17; Herod., ii. 125); while in the New Testament ἑρμηνεύειν means to translate (John i. 39 43) and διερμηνεύειν to expound, interpret, or translate (Luke xxiv. 27, 1 Cor. xii. 30, Acts ix. 36). The definition is in harmony too with the Protestant idea of exegesis as an art which brings the contents of Scripture to the general understanding, and the Protestant conception of the direct approach of God's word to man's heart by Scripture. As the theory of the interpretative art hermeneutics is usually taken to be an historical science, forming a subdivision of historical theology. Where, however, a fourfold, instead of a threefold, distribution of theological science is adopted, it is assigned to literary theology. It presupposes such disciplines as textual criticism and Biblical introduction, while it may exercise a reflex influence on some of the discussions with which these are conversant. Although practice precedes theory, and only through the use of the art of interpretation can the principles of interpretation be reached, as it is out of Scripture itself that the laws of Scriptural exposition must be drawn, theoretically this science precedes exegesis and forms an indispensable preparation for Biblical theology. Much which it has been the custom to embrace within it belongs really to general hermeneutics. The limits properly assignable to it are comparatively narrow, its immediate object being to decide how the laws of general hermeneutics are related to the particular records known as Scripture. The propriety of a special Biblical hermeneutic is established so far as Scripture is proved to be more than an ordinary literature. The Christian who comes to the Bible with the conviction that it is the record of divine communications, and with the experience that it is the medium through which God has spoken to him and led him into new relations to Himself, has to ask whether the principles of ordinary hermeneutics have to be modified or supplemented when applied to these books. Neither the Christian recognition of the spiritual character of Scripture nor the Protestant assertion of the right of private judgment, the perspicuity of Scripture, and the laity's direct interest in the Bible, warrants the extreme position assumed among some sects, that a scholarly interpretation and, therefore, a science of hermeneutics are [illegible]. Being a literary record composed in languages which demand [illegible] of translation, and produced in [illegible] by writers, and for readers widely removed in date and character from our present [illegible], Scripture [illegible] [illegible] [illegible] so largely used in them, the numerous presuppositions on which their statements of religious truth and fact proceed, suggest the necessity of such a discipline. The qualities of Scripture which render its appeal to the common understanding distinct and immediate are arguments for scientific intelligence in educing from its declarations nothing more and nothing less than their exact intention. The interpreter's function being, not to develop some meaning which the words might bear to present students or which the first readers may have seen in them, but simply to ascertain with precision and completeness the ideas which the writers themselves meant to convey, it may be said with Schleiermacher that in a certain sense the interpreter has to educe more than the author introduced. The former has to bring out into clearness much that influenced the latter half-unconsciously in his composition, and to give objective expression to much that underlies his definite statements. Hence the special need for a scientific hermeneutic in the case of a book like the Bible, in which there is so much that is implicit. The vast variety of results reached in crucial passages, and the wide diversities of method which have been pursued among individual exegetes and in exegetical schools, make the propriety and utility of such a science the more apparent.

Since Christopher Wolle (*Hermeneutica Novi Fœderis acroamatico-dogmatica certissimis defecatæ philosophiæ principiis corroborata eximiisque omnium Theologiæ Christianæ partium usibus inserviens*, Leipsic, 1736) the hermeneutics of the New Testament, for the sake of convenience or on grounds of scientific distinction, has often been separated from the hermeneutics of the Old Testament. The scientific union or disjunction of these disciplines depends on the view entertained of the mutual relations of the Hebrew Scriptures and the Christian. Where the Bible is seen to constitute an organic whole, the hermeneutical principles applicable to the two Testaments are treated in connexion. It then becomes one great object of the science to grasp the differences which are discovered within the unity of Scripture, and exhibit what account has to be taken of these in the art of interpretation. A distinct position, however, naturally belongs to Jewish hermeneutics, which dealt with the Hebrew Scriptures as at once the entire written revelation of God, and the repertory of the highest wisdom on all subjects of human inquiry. The results of the scientific study of the Old Testament, which was carried on with vast activity from Ezra's time by numerous scribes and in great schools and colleges (Jerusalem, Tiberias, Sura, Pumbeditha, Nahardea, &c.), are seen in the Talmudical writings, the *Mishna* giving authoritative enlargements and explanations of the law, and the *Gemara*, in its twofold form of *Jerusalem Talmud* edited at Tiberias, and *Babylonian Talmud* proceeding from Sura, containing further commentaries, fantastic definitions, and explanations of prior explanations (see TALMUD). The most ancient Jewish interpretation of Scripture, the *Midrash* ("study," "investigation"), which assumed a fixed character during the period of the second temple and gradually formed a literature, ran out into two great branches, logical or legal exposition, and practical or homiletical exposition. The former, designated "Halacha" ("rule by which to walk," "binding precept"), brought the law to bear upon points of religious or personal interest on which there was no explicit declaration. It confined itself [illegible] to the Pentateuch, extracting from it by [illegible] expedients a body of "Halachoth" or religious precepts (cf. Matt. xv. 2, Mark vii. 3), which were held authoritative. These, after a long period of oral transmission, gradually assumed written form, and passed finally through a process of [illegible] classification, [illegible] which extended perhaps from about two [illegible] Christ. The latter, styled "Hagada" ("opinion," "free exposition"), was meant for edification, traversed the entire Old Testament, and occupied itself with the application of Scripture to the purposes of practical instruction in all manner of subjects, ethical, political, metaphysical, theosophic, as well as religious. Its expositions were conveyed in forms, symbolical, poetic, parabolic, such as were most likely to arrest attention, and, though of no binding authority, it made itself so attractive to the people that it was often known as "the Midrash" distinctively. The hermeneutical laws followed in these two kinds of exposition are sufficiently well known. Eliezer ben Jose, the Galilean, a distinguished rabbi of the 2d century of our era, has embodied the results of a final reduction of the principles of the Hagadic exegesis in a series of thirty-two rules. Some of these are sound, dealing, *e.g.*, with the use of brachylogy, repetition, parable, the reconciliation of two discrepant texts by a third, &c. Many of them are wholly fantastic, prescribing how explanations are to be sought by reducing the letters of a word to their numerical value, by the transposition of letters, by the substitution of another word of the same numerical value for one which yields no worthy sense, by studying the introduction of superfluous particles, &c. Such principles held a much smaller place in the Halachic exegesis, which, as it aimed at something higher than applications of Scripture, could indulge in fewer freedoms in certain directions, so far as it was true to its idea. In the fixing of the Halachic hermeneutics Hillel I. (died 8 or 10 A.D.) occupies a conspicuous place. He reduced the traditional legal erudition of the Jews, with its bewildering multiplicity of laws, from the 600 or 700 sections over which it is said previously to have spread, to six capital "Sedarim" or orders, forming a manageable basis on which his successors 'Akiba, Simon III., and Jehudah I. could work on to the final codification of the *Mishna*. He was also the first to formulate definite rules by which the rabbinical development of the law should proceed. These canons of interpretation were seven in number, afterwards increased by Rabbi Ismael to thirteen by the addition of seven new rules and the omission of the sixth, and looked to the construction of Biblical warrant for precepts which it was wished to prove implicit in the law. These "Middoth" were instructions to reason (1) *a minori ad majus*, (2) *ex analogia*, (3) by derivation of a principal proposition from a single passage, (4) by derivation of a principal proposition from two passages, (5) by limitation of the general through the particular, (6) by explanation of one passage through another, (7) by the use of the context. The idea that the Old Testament, pre-eminently the law, held hidden in it the highest wisdom on all subjects, was naturally inimical to the rights of the literal sense. The rabbinical hermeneutics drew inevitable distinctions between the proper or innate sense (פְּשָׁט), which again was described as either verbal (פָּשׁוּט) or figurative (רֶמֶז), and the derivative or studied sense (מִדְרָשׁ, דְּרָשָׁה), which was to be sought either by inference (דְּרוּשׁ) or by artificial conjunction ([illegible]). The natural sense, however, though practically robbed of its dues, was not professedly ignored. This regard for it, which was never wholly disowned, ultimately took shape in the improved rabbinical hermeneutics of the Middle Ages. In the writings of such rabbis as Saadias Gaon, Jarchi, Rashi, Kimchi, Maimonides, Abarbanel (a line of expositors extending from the 10th to the 16th century), we find, alongside the traditional rules and explanations, a scientific recognition of the interpreter's duty to give the literal sense as well as a practical application of the principles of grammatical and historical exegesis to the Old Testament.

The hermeneutics developed among the Hellenistic Jews had marked characteristics of its own. These interpreters, departing from the exclusiveness of rabbinical devotion to the Old Testament revelation, and from the pure Hebraism of native Jews, brought to the study of the sacred books a range of ideas derived from Hellenic culture. They had to devise a hermeneutical procedure which would harmonize their new ethnic learning with the traditional estimate of the Jewish Scriptures. To the theosophic Hellenist, and specially to the Alexandrian Jew, acceptance of the plain sense was often an impossibility. A reconciliation was sought by the use of allegorical interpretation. This method was also pursued by the Rabbinical exegetes. It is embraced in the Halachic hermeneutics, and is seen in the distinctions drawn by Palestinian Jews between the body and the soul of texts. But while the allegorical interpretation of native Jews, in consonance with their purer estimate of the Hebrew revelation, moved in the direction of the typical, that of the Hellenists became rather mystical. The coryphæus in this hermeneutical practice was Philo (born perhaps about 20 B.C.), although he had predecessors in Aristobulus, pseudo-Josephus, and others. He devoted himself mainly to the exposition to the Pentateuch, with the view of explaining the realism and anthropomorphism of the Old Testament in a way to suit the philosophy of the time. Wishful to retain the Alexandrian Jew's regard for Moses as the supremely inspired prophet of God and the oracle of all mysteries along with adherence to the current Platonism and theosophy, he supposed that the Mosaic writings contained a twofold mode of teaching, a popular representation of God and divine things and a spiritual. It was the task of wisdom to penetrate through the envelope of the literal history to the secret sense which it shielded. The verbal sense was acknowledged, but held to be for the illiterate. The outstanding facts in the records of the creation, the deluge, the careers of the patriarchs and Moses, were accepted in an historic sense, but the details of all these narratives were spiritualized. Sometimes the figurative meaning was made the only meaning, but in other cases the objective meaning was allowed to be the intended meaning. The hermeneutical rule, however, was to rise by allegory from the superficial anthropomorphic sense (τὸ ψυχικόν) to the higher or spiritual sense (τὸ πνευματικόν). The simple histories were symbols of abstract truths. To the enlightened they were so many modes of soul (τρόποι ψυχῆς)—Adam the figure of the sensuous nature, Rebecca of patience, Leah of despised virtue, Egypt an emblem of the body, and Canaan of piety.

Two later chapters in the history of Jewish hermeneutics deserve notice. On the one hand the rabbinical procedure was decisively departed from by the Karaites, among whom Japhet ben Heli, of Bussorah, belonging to the close of the 10th century, and Aaron ben Joseph, of the 13th century, are notable. In their case interpretation again sought the *via media* between bald literalism and arbitrary spiritualizing. It was prosecuted on the principles of renouncing the quest after a variety of senses, abiding by the natural sense, accepting metaphor where the figurative was intended, and conserving the religious interest. On the other hand an extraordinary development was given to the rabbinical hermeneutics by the Kabbalists of the Middle Ages, who used the devices of artificial interpretation in order to find an Old Testament basis for their mixed Neo-Platonist, Gnostic, and Sabæan culture. The Kabbala ("what has been received," "tradition," see KABBALA) had its roots in the ancient doctrine of numbers, for which the Jews were probably indebted to the Chaldæans. The use of the numerical power of letters as a key to mysteries, which the Palestinian Jews had early favoured and which formed a not inconsiderable element in the Hagadic exposition, expanded into a vast system of fantastic Hebrew Gnosticism in the 8th century of the Christian era. The written Word was regarded as a depository of secret doctrine and absolute truth which could be entered only by the initiated. The mysteries hidden in its letters required for their discovery processes of exchange, more or less intricate, between literal and numerical values. By the combinations and permutations of letters, the interchange of words of equal numerical value, and similar artifices, new meanings were extracted where the proper sense seemed poor, and acceptable meanings found where offence was felt. Where the text, *e.g.*, states (Numbers xii. 1) that Moses married an Ethiopian woman, the veiled sense was shown to be that he married a woman of *beautiful countenance*, and the offence against the law was thus removed. For the letters of כושית added together make the sum 736; the letters in the expression יפת מראה, "beautiful of countenance," yield the same sum; and the enlightened are able to read the latter idea in the former appellative. Distinct titles came to be applied to different branches of the art. The process of reaching hidden truths by the numerical equivalence of letters (as when from the circumstance that א occurs six times in the first and last verses of the Old Testament it is inferred that the world is to last 6000 years) was styled "Gematria." The process of forming new words out of the several letters of some selected term, or one new word by combining the first letters of several words (as when the answer מילה, "circumcision," is discovered in the question in Deut. xxx. 12, "Who shall go up for us to heaven?" by bringing together the letters with which the several words in the query commenced), was called "Notarikon." The use of the anagram or permutation (as when by transposition of מלאכי into מיכאל it is ascertained that "mine angel" of Exod. xxiii. 23 was the angel Michael) was known as "Temurah." The hermeneutical practice of the Kabbalists increased in subtlety as the theosophic system itself grew. Rules were elaborated for exchanging the powers of letters, reading them in a variety of orders, and otherwise conjuring with the literal sense.

The course which Biblical hermeneutics has run outside the purely Jewish pale has been not less changeful or remarkable. The New Testament writings show at large how the apostles and first followers of Christ viewed, interpreted, and quoted the Old Testament. They give little in the shape of formal hermeneutical principles, but allow much to be inferred from usage and example. Conclusions as to authoritative canons of interpretation, so far as these are drawn from New Testament employments of Old Testament Scripture, are weighted with the question whether or how far currency is followed. It is affirmed on the one hand that Paul, *e.g.*, in his hermeneutics, was a pure rabbinist, while on the other the equally extreme position is held that his training is in no way reflected in his use of the Hebrew Scriptures. The citation of the Old Testament in the New, which forms a question in itself and one of great intricacy, takes a variety of forms. Passages are reproduced as direct prophecies of the Messiah and His kingdom (Acts ii. 34, Heb. i. 13), as generic prophecies, or references to the same through partial realizations in their kind (Heb. i. 6-9, 12-13), as illustrations or applications of principles common to both economies (Rom. x. 6-8, 1 Tim. v. 18), as apt expressions, without the character of explicit quotation, in which New Testament writers naturally express themselves (1 Pet. i. 24). The proper contextual sense is adhered to. The recognition of typology and symbolism (Heb. viii. 5, ix. 9) is at the same time exemplified, and the existence of a secondary or hidden meaning in allegorical or other forms (Gal. iv. 24, Eph. v. 32) is to a certain extent recognized. The typical relation of the Old Testament to the New is everywhere presumed. It is exhibited both in the histories and in the institutions, and it is recognized alike in their didactic and prophetic significance (1 Cor. x. 6, 11, Rom. vi. 17, v. 14). The Hebrew revelation is interpreted as a divine preparation for the Christian and as a continuous prophecy bearing onwards towards Christ (Acts. ii. 25). Its official personages and its saints, its ordinances and its events, are real though imperfect exhibitions of Messiah and the Messianic kingdom. Even its minor occurrences and incidental utterances are anticipations or expressions of the purposes of Jehovah realized in the Christian dispensation (Matt. ii. 15, Heb. iv. 7, Eph. iv. 8-12). How far biblical hermeneutics within the Christian Church has gathered its principles from Scripture itself, and what use it has made of the New Testament pattern, will appear from its history. It will be enough here to deal with the capital classes into which the various conflicting methods seem capable of being reduced. We indicate which of these prevailed on the whole in important schools and periods, without attempting a chronological statement or detailing the exact relation of each great name to the subject. It is not to be supposed, however, that any single mode was exclusively dominant at any one time, or that the interpreters whose names are connected with some particular procedure held by that only. On the contrary, in the long-continued absence of a definite settlement of principles the best writers swayed remarkably from method to method, and men who are largely identified with vicious modes exhibit at the same time admirable examples of the opposite. It may be said that three great hermeneutical tendencies have been followed. These may be conveniently designated the subjective, the dependent, the historical.

1. The first, which we have distinguished as the *Subjective* tendency, embraces all those widely diverse schemes which agree in passing beyond the objective intention of the words and seeking veiled or underlying meanings. To this belong the different forms of the allegorical method, by which is meant the imposition of a sense not designed by the writer. It is the adding of a meaning foreign to the intention, rather than the substitution of an improper for the proper sense. The first Christian interpreters were under special temptations in this direction. The idea of the need of exceptional principles of exposition in order to reach the deep significance of divine communications had a great hold of the ancient mind, Greek, Roman, Oriental, and Hebrew. The spell of this idea and the powerful influence of the Rabbinical tradition, acting on the Christian conviction that the Bible is a divine message, readily induced the notion that the ordinary laws of interpretation are inadequate, and that Scripture is honoured when the natural or "lower" sense is made the stepping-stone to a "higher" sense for which special powers are required. Early Christian literature, although its mysticism may sometimes be otherwise explained, adheres decidedly to this idea. The apostolic fathers and the Apologists, while not entire strangers to sound spiritual interpretation, are addicted to the allegorical. The *Epistle of Barnabas* confirms faith and promotes gnosis by spiritualizing the details of such narratives as that of the two goats in Leviticus xvi. The *Shepherd of Hermas* contains various examples. Clement of Rome gives the figurative application of the scarlet line suspended from Rahab's window, which is adopted by so many of the fathers. In this connexion great interest belongs to Justin Martyr, who exhibits acquaintance with several of the distinct senses which were subsequently formulated. Embracing Christianity as the only certain philosophy, and carrying much of his old Platonism with him into his new faith, he dealt with the Scriptures very much as he dealt with the classics. The histories of the Old Testament (he seldom expounds the New) were a drapery covering deep spiritual truths. As the fable of Ephialtes and Otus was a Greek version of the building of the tower of Babel, so Jacob's marriage with Leah and Rachel denoted

[illegible] revelation in the Jewish Church and the Christian, [illegible] in prophecy [illegible] Gen. xlix. 9-12 has a mystical reference to Christ and His salvation, His passion being signified by the washing of the garments in wine, the Jews by the ass, the Gentiles by the colt.

The allegorical method, which thus arose as a natural expedient for the reconciliation of differences between religious truth and philosophical culture, and which had been freely applied to Homer by the Stoics, found a most congenial home in Alexandria, where Platonic influence was strong. It became a recognized principle with the catechetical school there, [illegible] with the distinction which then prevailed between [illegible]. Clement of Alexandria, who seems to have been the first to bring the New Testament no less than the Old under its scope, finds a parabolic character in all Scripture, and affirms that the literal sense supplies only the elementary stage of Christian knowledge and faith, while it is only through the allegorical or mystical interpretation that we can reach that higher wisdom which implies insight into the essence, reason, and relations of Scripture's objects. He speaks of a "tradition of the church," an "ecclesiastical canon," or "canon of the truth," which gives the key to the true understanding of Scripture, and is identified with the gnosis or spiritual apprehension of divine mysteries as that was first communicated by Christ to the apostles in oral form, and by them transmitted to their successors. This canon is described as "the consent and harmony of the law and the prophets with the covenant delivered during the Lord's presence." In accordance with this Clement discovers in the Mosaic law three senses in addition to the natural. The terms in which the precepts are expressed are images of other things, rules for the direction of life, and predictions of the future. The high priest's robe is an emblem of the world of sense; the bells upon it are a symbol of the acceptable year of the Lord. The decalogue itself is spiritualized, the fifth commandment being taken to refer to the Heavenly Father, and that divine Wisdom which is the mother of the just.[1]

A position of commanding importance must be claimed for Origen, whose genius secured wide and long-continued acceptance for his greatest extravagances. Exact grammatical exegesis is by no means alien to his homilies and commentaries, and many of his strangest uses of Scripture may be viewed as practical applications rather than scholarly expositions. Fanciful modes, however, are so predominant that he has been generally regarded as the chief allegorist of the Christian Church. Yet the disservice thus done by his example cannot cloud the lustre of his merits in Biblical studies. His Platonism, his adhesion to the Alexandrian idea of [illegible], his wish to defend and elucidate the Christian religion by reason and philosophy, his [illegible] range of imagination, combined to commend a mystical style of interpretation. In terms of the Platonic division of man into body, soul, and spirit, he held that Scripture had a threefold sense, σωματικός, ψυχικός, πνευματικός. The first, or literal, sense was meant for the edification of the simple. The second, which was to be sought for under the letter, and which had the soul of Scripture, exhibited the bearing of the word upon the practical needs of the moral life, and addressed itself to the more advanced. The third, which lay still deeper, and imparted the spirit of Scripture, disclosed pure unmixed truth, exercised the speculative powers, and was intended only for the perfect, such as are described in 1 Cor. ii. 6, 7. He has been sometimes credited with the promulgation of the fourfold distinction afterwards so current, especially in the Latin Church, and expressed in the couplet (given, *e.g.*, by Lyra)—

Litera gesta docet, quid credas allegoria,
Moralis quid agas, quo tendas anagogia.

Such terms, however, as tropological, mystical, allegorical, pneumatic, anagogical, are rather interchangeable with him. The literal sense, too, is so far from being dispensed with that he has even been regarded (*e.g.*, by Ernesti) as the first who secured for it its primary value, particularly in New Testament exegesis. But, while he maintains that the spirit and the letter are generally to be taken together, and admits that no small portion of the contents of Scripture (*e.g.*, the decalogue, precepts of universal obligation, even many of the narratives) may not be allegorized, his practice is greatly in the direction of esteeming the literal sense only as the protecting shell of secret treasure. Wherever the letter yields a meaning which seems to him unworthy, or opposed to reason and possibility, a mystical sense is discovered. He stumbles at the record of creation when it introduces the sun after the third day, at many of the Mosaic ordinances, at the realism of Christ's temptation. He finds mysteries or figures of spiritual things in Eden, Abraham's wives, Rebecca's visit to the well, the waterpots at Cana, and many other narratives. The later type of Alexandrian hermeneutics is seen in Cyril, who, without wholly abandoning the literal sense, carries typical interpretation into unqualified allegorical extremes in dogmatic and polemic interests.

The Western Church exhibited the same tendency, not only in the marked artificialities of such teachers as Hippolytus, Hilary, and Ambrose, but in the eminent instance of Augustine. Though not the first to attempt a statement of hermeneutical canons (having before him, for instance, the seven rules of Tichonius, which he states and criticizes at length), he constructed more of a system in this line of inquiry as in some others. Many of the principles which are enunciated in different parts of his writings, and most definitely in his *De Doctrina Christiana*, are of permanent value. He conceives the object of interpretation to be the discovery of the thoughts of the writer exactly as he meant to express them. He shows that the real sense is often not to be got by insisting merely on expressions as they stand by themselves; that they must be compared with the immediate context, with similar passages elsewhere, and with the essentials of Christian doctrine; that faith and the aids of the Holy Spirit cannot supersede the use of science; that a reverent and sympathetic mind is indispensable. But along with such rules as these he propounds others which served as grounds for his allegorical procedure. He affirms, *e.g.*, that whatever cannot clearly be seen to bear upon honesty of morals or the truth of faith must be taken figuratively. He speaks of several different modes of interpretation,—the historical, the ætiological, the analogical, the allegorical. He usually practises the first and the last of these. His profound spiritual experience gave him a truer insight than his canons indicated into many parts of Scripture, and above all into the Pauline epistles. Yet over most even of the New Testament he allows the allegorical fancy to range freely. His influence perpetuated the reign of the allegorical method for many centuries throughout the Western Church. In Gregory the Great, the Venerable Bede, Hrabanus Maurus, Hugo de S. Caro, and many others, we see it steadily extending rather than merely maintaining its sway, until in Bonaventura we find the current four senses—historical, tropological, allegorical, anagogical—enlarged to seven by the addition of the symbolical, synecdochical, and hyperbolical.

2. The second great hermeneutical tendency, which we call the *Dependent*, has an equally instructive history. It is easy to understand how extreme allegorizing would lead to a counter movement, and how this would be helped by the exigencies of dealing with heretics who were themselves

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[1] See especially *Strom.*, vi. p. 676 [illegible]; also [illegible], *De Clem.* [illegible] *Gnosi*, and Kaye, *Some Account of the Writings and Opinions of Clement of Alexandria*.

advocates of *γνῶσις*. The appeal soon came to be made to a rule of faith which may at first have meant nothing more than the harmony of Scripture teaching, but which was speedily identified with something outside Scripture, with the contents of doctrinal summaries, or with the verdict of exegetical tradition. The East and the West gave way alike to this bias, but the West first and most positively. In both we find early mention of an ecclesiastical canon or norm of truth. In the Church of the East, indeed, that took originally the form of an authoritative *γνῶσις* or private exposition of the esoteric meaning of Scripture handed down by careful tradition from Christ and the apostles, while in the Church of the West it was rather the voice of the church itself, and that soon the voice as formulated. Both churches, however, more or less distinctly recognized an ecclesiastical tradition represented in compends of doctrine which were used for catechetical and other purposes, and an interpretative tradition embodied in the expositions of influential doctors. Thus hermeneutical independence was sacrificed. In Irenæus and Tertullian we see how a very natural reaction took this direction. The necessity of meeting errorists who were greater adepts in arbitrary spiritualizing than any whom the church could present led them to protest against the practice. They saw the propriety of looking to Scripture itself for hermeneutical guidance, and of rescuing it from the despotism of a mystical philosophy which threatened the life of its cardinal doctrines. They adopted a simpler reading of its message, and so far they deserve the name of pioneers in real historical interpretation. But, as appears in their gross chiliastic expositions, their literalism was carried to excess. It came into conflict with the deeper declarations of Scripture, and this conflict they were tempted to compose by a relapse into fanciful methods. It created difficulties in their controversy with Gnostic opponents, and these they thought to remove by a final appeal to an authoritative tradition fixing the sense in which the sacred books which both parties used as witnesses to their doctrine were to be understood. This was to be found in its integrity in those ancient churches which had enjoyed direct apostolic teaching, and, as Irenæus conceived, in some special way in that of Rome. Gradually the idea of a normative analogy of faith discovered within Scripture was externalized, and the standard of interpretation was looked for in ecclesiastical symbols and the formal decisions of the heads of the church. In this process, which ended in the Tridentine definition of the ultimate determination of the interpretation of Scripture as resident in the church, and the more recent declaration of the infallibility of the pope as the voice of the church, Vincent of Lerins claims particular notice. In his *Commonitorium*, for which we are indebted to the Semi-Pelagian controversy, he lays down rules for the attainment of certitude in belief. Faith is to be settled by two things, the authority of Scripture and the tradition of the church. The former is a perfect and adequate foundation. Yet the caprices of interpretation require it to be supplemented by the latter. The sense of Scripture is the sense in which the church understands it, and this tradition of the Catholic Church, which is to be accepted as the canon of hermeneutics, is defined as "quod ubique, quod semper, quod ab omnibus creditum est." This doctrine, still retained in singular honour by large sections of the Christian Church, exhibits the hermeneutics which had been winning acceptance since the time of Irenæus and Cyprian, and by which the Latin communion was held to [illegible]. The result of the deference paid to the fathers in both churches, and especially in the West, was the rise of a traditional and imitative exegesis and the production of compilations of patristic comments. These were the *Catenæ*, which reproduced the interpretations of [illegible] the great expositors, particularly Origen, Chrysostom, Jerome, and Augustine, and were on the whole more successfully executed in the Greek Church than in the Latin. They were in use by the end of the 5th or beginning of the 6th century. Andreas of Cæsarea, who belongs to the former period, or Olympiodorus, whose date is about the beginning of the 7th century, has sometimes been recognized as the earliest epitomizer; but the position is to be assigned rather to Procopius of Gaza, who comes between these two. For many centuries the most eminent divines took part in the preparation of *Catenæ*, such as Cassiodorus (also a literalist), Bede (already cited as an allegorist), Alcuin, Hrabanus Maurus (often honoured as the most learned interpreter of the 8th and 9th centuries), Haymo, Remigius, Sedulius, Theophylact, Œcumenius, Paschasius Radbertus, and Aquinas. The *Catena aurea* of Aquinas on the gospels was of great value. Redactions of the *Catenæ* were also made in course of time. These were the *Glossæ*, which were known as *marginales* or *extrinsecæ* when the comments were given on the margin, and *interlineares* or *intrinsecæ* when these were introduced in the text. The most influential glossa of the second class was that of Anselm of Laon, who belongs to the end of the 11th and the beginning of the 12th century. Of the former the most important was the *Glossa ordinaria* of Walafrid Strabo, which was esteemed the chief exegetical manual for some six centuries. Throughout the Middle Ages, full as these were of theological activity, dogmatic and polemic, hermeneutics became more and more a tradition. The less the Bible was studied in a free spirit, the more it became the subject of strained panegyric. Aquinas, indeed, though his practice was often in conflict with his theory, could still speak of the literal sense as that on which all the senses of Scripture are founded, and of argument as to be drawn only from that one literal sense and not from those senses which are expressed according to allegory (*Summa*, i. 1, art. 10). But at last independence was so completely resigned that John Gerson, the illustrious chancellor of Paris, was only the exponent of the prevalent opinion, when he declared that those who did not take the literal sense as the church defined it ought to be dealt with not by curious reasonings but by statutory penalties.

3. But alongside these two hermeneutical tendencies there can be traced from the earliest times, however obscurely or fitfully, a third which we term the *Historical*. Men like Irenæus, Origen, Augustine, &c., were not wholly incapacitated for the exercise of a better method by their allegorical or dogmatic bias. There has been a line of interpreters, slender enough as that line has been at times, who have recognized it to be the exegete's object to discover the one sense intended by the writer himself, who have allowed allegory therefore only where the writings themselves indicated their mystical design, and who have laid the first importance on the grammatical sense and on the capacity of transporting oneself into the writer's position. Even Alexandria presents in the great Athanasius and in Isidore notable instances of interpreters who, though given to occasional spiritualizing, proceeded on the principle of the *σκοπός* of Scripture (especially in the case of Athanasius), and on the necessity of considering the occasion of each writing. But in direct antithesis to the allegorizing school of Alexandria stood the school of Antioch, which was grammatical and historical, with a tendency to an extreme literalism, which yielded in not a few cases a jejune and unspiritual exegesis. Theophilus and Julius Africanus may claim a place in this order. But the acknowledged representatives of the Antiochene school are Lucian the martyr, who is sometimes reckoned its real founder, Diodorus of Tarsus, Theodore of Mopsuestia, and [illegible] John Chrysostom and Theodoret of the Syrian [illegible]. The first two, while not [illegible] careful of the

objective exegete, surpassed the others in spiritual insight. Chrysostom abounds in sound hermeneutical statements which strike a happy mean between Alexandrian arbitrariness and the rationalistic superficiality into which extreme Antiochene interpretation sank. He withstands the imposition of foreign senses as a practical dishonouring to the Word of God, and yet shows how much there is that must be taken otherwise than as it stands. He insists upon the importance of ascertaining the "scope" of a writing in order to a correct judgment of its separate declarations, on the necessity of the revelation of the Spirit, on the respect due to the harmony of Scripture with itself. He lays it down as a general principle that, when allegory is employed, the Book also gives its interpretation as a check upon the unbridled desire of those who wish to allegorize (*Hom. in Cap. v.*). Theodoret exhibits a kindred sobriety, and, though occasionally guilty of seeking a secondary sense where the obvious sense seems too bald, ranks deservedly among the very best of ancient exegetes. Principles similar to the Antiochene prevailed for a long period also in the schools of Edessa and Nisibis. The objective tendency found representatives, too, in men like Basil of Cæsarea, Gregory of Nazianzus, Gregory of Nyssa (although he was less decidedly historical, and strongly advocated a non-literal reading of Canticles in particular), Pelagius, and the laborious Jerome. This last-named ornament of the Latin Church, although he too often drifted into fanciful and even puerile interpretations, was strongly opposed both to the allegorists and the extreme literalists. Against the former he affirmed that the grammatical and historical sense must be held the fundamental thing. Against the latter he insisted that the figurative interpretation is not necessarily equivalent to the allegorical, and that the gospel is to be sought not in the words but in the sense of Scripture, not in the surface but in the marrow, not in the leaves of discourses but in the root of the idea (*Comm. in Habac.* iii. 14; *in Epist. ad Galat.* i. 11). In the unproductive centuries which followed, this purer hermeneutical tendency appears occasionally in such instances as those of Druthmar, "the grammarian;" Œcumenius, bishop of the Thessalian Tricca, who belongs to the 10th century; Theophylact, bishop of Achrida in Bulgaria, "the last of the fathers"; Rupert of Deutz and Euthymius Zigabenus, who carry us into the 12th century.

A great impetus was given to independent hermeneutics by the Humanists and the precursors of the Reformation. An eminent position is occupied by Nicolaus de Lyra, to whose *Postillæ*, or brief commentaries on the whole Bible, Luther and the Reformers owed a debt expressed in the familiar distich, "Si Lyra non lyrasset, Lutherus non saltasset." The current fourfold division of the sense of Scripture still appeared in his writings, but for the most part only as a theoretic division. He allowed occasional spiritualizing, but that mostly in the form of professed practical application of the proper sense. He declared anew the necessity of adhering to the plain objective meaning, likening the mystical interpretation which departs from the solid basis of the literal sense to a building which deviates from its foundation and inclines to its fall. On the side of grammar and philology the reaction was helped by Laurentius Valla and other Humanists, although the services of Reuchlin in particular, great as they were in the assertion of exegetical freedom and in the restoration of linguistic science, were impaired by cabbalistic predilections (*cf.* specially his *De verbo mirifico*). On the religious side, something was achieved by men like Wycliffe, Huss, Wessel, who all perceived the primary importance of the grammatical method, and Faber Stapulensis (Lefèvre d'Étaples), who affirmed the sufficiency of the Word, and practised an independent, non-dogmatic exegesis. It is matter of course that Erasmus should claim special notice in this connexion. In this consummate scholar and versatile genius, who continued and vastly excelled all that had been attempted by Valla and others, and whose guidance the Reformers were wise enough to follow, notwithstanding the frequent deficiencies of his exegesis in depth and spiritual insight, we come at length upon a master hand that marks a great epoch. Indecision clings indeed to his utterances on some subjects. He speaks with caution on the infallibility of the church and the church's head, although he lets us see that he rejects it. He admits the existence of occasional inaccuracies in the Scriptures. But he declares that these are so far from being disadvantageous to the gospel that they are turned by the Spirit into a help to truth. He adds at the same time that if the authority of the entire Scripture should be supposed to be impaired by the presence of the smallest error in it, it is more than probable that none of the copies now used by the Catholic Church is so perfect as to be free from the intrusion of all mistakes, accidental or intentional (*cf. Annot. in Matt* ii. 6). But his clear enunciation of the interpreter's independence and the inquirer's obligation to become bound by the authority of no one (*In Luc.* ii. 35), his advocacy of the translation and free circulation of the Scriptures, his repudiation of any other sense than what was meant to be conveyed, his sagacity in dealing with the figurative sections of both Testaments, his recognition of the need of a "pia curiositas" and a "curiosa pietas" in the exposition of the divine word (*cf.* Pref. to *Paraph. in Evang.*), his practice of the true exegetical art in his *Paraphrases* and *Annotations*, contributed powerfully to the diffusion of better hermeneutical ideas.

The mightiest impetus was given by the Reformers. They were the heirs of what was best in the ancient school of Antioch and in the Humanistic revival. But they added to the philology, the grammar, the history, and the independence which were illustrated in these the spiritual insight and the personal religious interest which were so often wanting. The process by which they won their own way to a freer faith lifted them above tradition, mysticism, and unspiritual literalism. Their profound religious experiences, intensified by the forces at work in an unexampled mental upheaval, made the Bible a new thing to them. It came to them as God's message, and they received it as the only rule of faith and life. It spoke immediately to their souls, and they saw it was to be interpreted by itself. They found it a message conveyed in historical form, and recognized the need of the appliances of language and history in order to read it. They perceived it to be a spiritual message, and discovered that the full reception of it could come only by spiritual enlightenment. Believing it to be a message meant for all, they held it perspicuous to the general intelligence of the prayerful in all that concerns faith and morals, and affirmed, with Melanchthon, "unam et certam et simplicem sententiam ubique quærendam esse juxta præcepta grammaticæ, dialecticæ, et rhetoricæ." Each of the great Reformers did something to advance this truer hermeneutical movement. Luther, Zwingli, and Calvin were alike imbued with the historic sense, Luther excelling in spiritual genius and a bold originality which carried him at times to extremes in the independence of his treatment of Scripture, Zwingli in an incisive perception which inclined strangely at times to subjective interpretations, Calvin in a union of qualities which distinguished him as the foremost exegete of the Reformation. Profoundly reverencing Scripture as God's word, submitting to it as authoritative, yet not binding himself to any theory of its inspiration which would preclude the possibility of circumstantial inaccuracies (*cf.* on Matt. xxvii. 9, Acts vii. 16), the Reformer of Geneva excelled all in freedom from arbitrary exposition, in reading the biblical statements in the light of historical [illegible], in laying the foundations of a truer typology, and in exhibiting with its Christward testimony the historical basis of Messianic prophecy. The coryphæi of Protestant exegesis were [illegible] Beza, Bucer, Bullinger, Œcolampadius and others. At length the hermeneutics of the Reformation found symbolical expression in the Protestant definitions of the exclusive sufficiency of Scripture, its perspicuity under the use of the ordinary means and with the teaching of the Holy Spirit, its possession of a sense which is one and not manifold, and its interpretation by itself. In the *Clavis Scripturæ Sacræ* of M. Flacius Illyricus it was cast for the first time into systematic form, and dealt with theoretically.

With the Reformation positive exegesis may be said to have been firmly established. The conditions were provided for further hermeneutical progress. Since then the principles of true grammatico-historical interpretation have been gradually coming to be better understood and more [illegible] applied. This has not been the case, however, without frequent relapses. In various schools there have been revivals of old errors. There has been a return to the subjective tendency, *e.g.*, in the "moral interpretation" of Kant, as well as in various forms of rationalistic and [illegible] exegesis. In accordance with his ideas of the [illegible] as the vehicle of an historical faith and his definition of morality as the essence of religion, Kant held that the judgments of the pure reason must be the test of religious truth, and that the literal sense, when it seemed to convey a meaning adverse to morality, inconsistent with reason, or unworthy of God, must have a new meaning found for it. His interpreters, therefore, did not profess to rest with the sense intended by the writer, but reckoned it legitimate to adopt any possible sense which should be conformable to the interests of practical morality. To the same tendency belong the "psychological interpretation" of Paulus and Eichhorn, and the mythical interpretation of [illegible] and Strauss. Of these the former proposed to [illegible] the task of distinguishing the [illegible] from the [illegible] [illegible] basis of exegesis, the church as [illegible]

[illegible], has been [illegible] with the creeds and employed as an external standard of interpretation.

But with partial retrogression there has been an advance on the whole in Protestant hermeneutics. To this interpreters of very different schools have contributed. Among these are to be mentioned Sal. Glassius, the author of the *Philologia Sacra*, Hugo Grotius, Abr. Calov, G. Calixtus, J. J. Rambach, whose *Institutiones Hermeneuticæ Sacræ* exercised a salutary influence, notwithstanding his inclination to the pietist principle of "emphasis" in interpretation; J. A. Bengel, in whose *Gnomon* a happy union was effected between pietism and science; and J. S. Semler, who did much for the expansion of historical interpretation, notwithstanding the injurious results of his theory of accommodation. Of still greater importance are J. A. Ernesti, to whose celebrated *Institutio Interpretis Novi Testamenti* last century was indebted for the scientific presentation of the soundest hermeneutical principles on the philological side; Friedr. Schleiermacher, whose *Hermeneutik* abounds in fertile suggestions, and brings out for the first time the necessity of recognizing a specifically Christian element in the language of the New Testament; and F. Lücke, who illustrates the just combination of the strictest scientific method with the primary qualification of spiritual sympathy with the Word in the true interpreter. Extensions of hermeneutical method have been attempted, in the form of claiming a special "psychological" ([illegible]), "theological" (Klausen, Landerer), or "dogmatic" ([illegible]) interpretation, or in the form of proposing new modes of interpretation, such as the "æsthetical" of [illegible], the "pneumatical" of Beck, the "panharmonic" of Germar. But whatever is valid in these schemes comes within the ordinary grammatico-historical method. Properly understood the historical side of that method covers all that concerns the transportation of the exegete, not only into the times and circumstances of the composition of the books, but also into the position and personality of the authors. It embraces therefore that subjective quality which, however variously designated as the [illegible] preparation, sympathy with the writer and the [illegible], spiritual tact, or the illumination of the Holy Spirit, has been recognized by the best interpreters to be a primary and essential requisite. The development of these principles has been greatly helped by the grammatical and [illegible] of such men like Gesenius, Ewald, Olshausen, and Böttcher in Hebrew, and Winer and Buttmann in Greek; by the literary, historical, critical, and theological investigations of Herder, Baur, Rothe, Hofmann, and many others; and above all by the exegetical practice of [illegible] expositors such as De Wette, Bleek, Hupfeld, Lücke, Meyer, Godet, Lightfoot, Ellicott, and Delitzsch. [illegible] in new [illegible] of hermeneutical method. A clearer insight is being gained into the genius of the language, which has gradually [illegible] New Testament Greek from [illegible] and Hebraistic [illegible], and into the nature of typology, the [illegible] of prophecy, the relation of the two Testaments to each other, the historical [illegible] and development of their contents, the unity (as distinguishable from uniformity) which [illegible]. In these directions there is the promise of further progress in hermeneutics. [illegible] the presuppositions which underlie the Biblical doctrine and which tell upon the laws of interpretation. [illegible] hermeneutical method, however, [illegible] of conceptions on the [illegible], and the spirit [illegible] of view on the subject of [illegible], as seen in the [illegible] of the churches and in the widely divergent [illegible] of different schools (*cf.*, *e.g.*, those expounded respectively by [illegible],

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[1] [illegible] 131, [illegible]

Beck, Schleiermacher, Martensen, [illegible], Rothe, [illegible]. [illegible] such as can be the result only of [illegible] into the [illegible] [illegible] in Biblical [illegible].

[illegible] 1817; [illegible] 1841; [illegible] 1858; [illegible] 1874; the monograph by [illegible]; C. R. [illegible]; J. J. [illegible] 1829. On the Antiochene [illegible] 1868; Kihn, [illegible] 1867; [illegible] 1871; also the [illegible] by [illegible]. Of the [illegible] M. [illegible] 1874; [illegible] 1723; Ernesti, *Institutio interpr. N. T.* [illegible] Fr. [illegible] 1847. In addition [illegible] S. F. N. [illegible] 1842; [illegible] 1877; [illegible] 1869; [illegible] 1874; [illegible] 1824; J. C. K. von Hofmann, [illegible] 1873; John Keble, [illegible] 1857, and *On the* [illegible] *to the* [illegible] *of the Church*, 1868; Merx, *Eine Rede vom Auslegen ins besondre des Alten Tests.*, 1879. (S. D. F. S.)

HERMES is the name of a Greek god (corresponding to the Roman Mercury) whose origin and real character are perhaps more difficult to define than is the case with any other Greek deity; here it is possible only to give an outline of one definite theory, and refer the reader to the works quoted at the end. He was not a god worshipped by the pure Doric or Ionic races, but is found in most places where Æolian, Achæan, and Pelasgic tribes can be traced. If we begin with the rudest races, summed up generally under the title of Pelasgic, we find Hermes often connected with the mysterious Cabiri. These deities, in the accounts we have, vary in number and sex, being sometimes two, sometimes three or four. We may conclude that originally they were a pair, male and female, whom we may compare with Uranus and Gæa, or with Cronus and Rhea. Often the female is doubled, as mother and daughter, resembling the relation of Demeter and Persephone; while the male also is transformed either into twin brothers, or into a father and his son by one of the female deities. Certainly the male deity seems sometimes to be regarded as Hermes, sometimes as Hephæstus (see Hephæstus), while in other places the two are associated. Hermes and Hephæstus are perhaps local varieties of one type, which after having acquired distinct individuality in their separate homes were brought beside each other by subsequent intercourse. Hence we may understand how the epithet ἄγγελος and the office of messenger between gods and men, which in the *Rig Veda* belong to Agni, the fire, are in Greek mythology attached to Hermes. This Pelasgic Hermes is an ithyphallic deity, the god of fertility and reproductive power, and bestower of riches in flocks and herds. Corresponding to this religious conception we have in mythology such epithets as ἐριούνιος, ἀκάκητα, &c.; and in the hymn to Aphrodite (written perhaps in Æolis in the 9th century B.C.), Hermes and the Sileni (Latin *Silvani*) are the companions of the mountain nymphs. So in Arcadia, one of the chief seats of his worship, where on Cyllene his birthplace was shown, he was by Penelope the father of Pan. Penelope, the "torch-eyed" (Ahrens in *Philol.*, 1879, p. 205), is a form of Athene, Odysseus of Hermes; and Hermes and Athene are associated as Hephæstus with Athene in Attica. In the very mixed Attic people, it is not surprising to find the worship of Hermes widespread; it is sometimes said to have been introduced from Samothrace. In Athens Hermes is the god of social life and intercourse in general, of streets and doorways, and of the palæstra. He is worshipped as ἀγοραῖος and προπύλαιος; and Hermæ, pillars supporting a bearded head and furnished with a phallus, stood all over the city. In Bœotia also we find Hermes, especially at Tanagra, where Hermes the champion, and Hermes κριοφόρος, the averter of diseases, were worshipped. The Doric god Apollo, with the titles Agyieus and Paion, corresponds most closely to these last aspects of Hermes. As god of social intercourse he easily grows into the impersonation of cleverness, and at last into the patron of thieves. If we pass from religion to mythology, where we find all the successive ways of expressing views of nature preserved to us side by side, we find an immense variety of traditions. The most common subject in these tales is the struggle between darkness and light. When it is said that Hermes stole the oxen of Apollo, and after killing two of them nailed their skins on a rock, we have one of a class of myths described at length by Kuhn (*Entwickelungsstufen der Mythologie*). The slain animal is the sun, who is killed every evening; and the hide, *i.e.*, the sky of night, is either hung up on the tree of heaven (as is the Golden Fleece) or fastened with the star-headed nails. Again, when Io, the moon, is watched by the hundred-eyed Argus (Sanskrit *rajas*, "darkness"), the star-studded sky, Hermes slays Argus with a stone, the same which Cadmus and Jason use, viz., the rising sun. In both cases Hermes is the sun god as hidden during the night away among the souls of the dead; hence the Chthonian character so frequently attached to him. The rod with which he lulls men to sleep is the same sceptre that the ruler of the dead, Yama or Rhadamanthus, Minos or Hades, always bears (Kuhn in *Zft.*, iv. p. 193); he is also the sender of dreams; we find him worshipped among the Chthonian deities at Cnidus, and on vases accompanied by the Chthonian dog. We are now able to understand a fact which is perhaps the most interesting point connected with Hermes. Kuhn first pointed out the identity of the Greek Ἑρμείας with the Sanskrit Sârameyas, and though the connexion has been doubted by various writers, as Mannhardt (*Wald- und Feld-Kulte*, ii. pref.) and others, yet no valid objection has ever been offered on etymological grounds (see Benfey in *Abhandl. Gött. Ges.*, 1877). Amid the difficulties which still envelop the translation and the mythology of the Vedas, it is, however, even more difficult to discover the original character of the two Sârameyau and their mother Saramâ, than it is to determine the nature of Hermes. The two Sârameyau are mentioned twice in the *Rig Veda* (vii. 55; x. 14); they are two dogs, are said both to guard the way to the abode of the dead and refuse a passage to the impious, and also to act as the messengers of Yama, carrying away the souls when the time of death has arrived. Saramâ also seems to be regarded as the messenger or the dog of Indra; and Hermes appears regularly as the companion and helper of all the light-heroes on their adventures. One epithet of these dogs is Çarvara, spotted, which in its Greek form Cerberus (Benfey, *Vedica*, p. 149) is the name of the dog that guards the gate of the lower world. Now we find in Rome that two *lares praestites*, children of Mercury and Egeria, are said to guard dwellings and streets in the form of dogs; and in the German legend the dog who attends the wild huntsman Wuotan, *i.e.*, the sun hidden during the seven winter months, is closely related to the dwarfs or spirits of the dead, and is called by their name (Kuhn, *Westf. Sagen*, i. p. 69*c*). So Hermes, whom we have seen as king of the dead, is as ψυχοπομπός also the conductor of souls to their future home; we may therefore count the dog (or dogs) as ultimately identical in character with the king of the dead. Sonne (on Charis in Kuhn's *Zft.*, x.) has pointed out how these primitive conceptions commonly pass through the stage of animals before reaching that of gods; and in mythology we have the two stages preserved side by side as distinct beings. The Hindu Kubera, lord of the treasures of the lower world, who may be identified with Pluto or with Hermes, is styled "Lord of the hosts of the Sârameyas."

In this account there has been no room left for the idea of Hermes as connected with the wind. The sun, after he has set at night, is the same as the sun hidden during the dreary months of winter, who then rides abroad in the tempest. The wind is then easily conceived as his servant and messenger, and is often considered to carry away the souls of the dead (see HARPIES). From his connexion with the wind, Hermes is represented with winged shoes. But with Roscher (*Hermes der Windgott*) to see in Hermes simply the wind is to take a narrow view and to ignore the character of primitive Aryan thought.

In art, besides the Hermes already described, Hermes is in the archaic time represented as a man, with pointed beard, wearing a chlamys and the broad hat or cap (petasus); his symbols are the staff (*caduceus*) and the winged shoes (talaria). The ideal type of Hermes was probably perfected after the statue by Praxiteles in the Heraeum at Olympia. This statue, which was recently discovered by the German expedition, represents the god leaning with his left arm on a trunk, and supporting on it the infant Dionysus. The right arm, which is lost, probably held the caduceus. The form shows a perfect combination of agility and strength.

See the works on mythology or religion by Welcker, Gerhard, Rinck, Stuhr, Schwenck, O. Müller, Eckermann, H. D. Müller, Lauer, Schwartz, Max Müller, Preller, Hartung, Braun, Maury, &c.; also Lehrs, *Populäre Aufsätze*; Schömann, *Hesiod. Theog.*; Göttling in *Hermes* xxix.; Mehlis, *Grundidee des Hermes*; Myriantheus, *Açvins*; Haupt in *Ztschr. f. Alterth.*, 1842; Oestermann, *[illegible]*; H. D. Müller in *Philologus*, xiv.; Kuhn in Haupt's *Ztschr. f. D. Alterth.*, vi.; Von Hahn, *Sagwissensch. Studien*; Roscher, *Hermes*. As usual, the fullest list of ancient authorities is to be found in Jacobi, *Handwörterbuch der Mythologie*. (W. M. RA.)

HERMES, GEORG (1775–1831), a distinguished Catholic theologian, born on 22d April 1775, at Dreyerwald, in Westphalia, was educated at the gymnasium and university of Münster. His life presents no facts of importance. After completing his course of study at Münster, he acted for some time as lecturer at the gymnasium and then as professor at the university. In 1820 he was called, as professor of theology, to the university of Bonn, where he remained till his death on 26th May 1831. Hermes was peculiarly adapted for the life and work of the professoriate. He had great gifts as a lecturer and teacher, and gathered round him at Bonn a devoted band of adherents. His works were *Untersuchungen über die innere Wahrheit des Christenthums*, Münster, 1805, and *Einleitung in die Christkatholische Theologie*, of which the first part, a philosophical introduction, was published in 1819, the second part, on positive theology, in 1829. The *Einleitung* was never completed. His *Christkatholische Dogmatik* was published, from his lectures, after his death by two of his scholars, Achterfeld and Braun, 3 vols. 1831–4.

The *Einleitung* is a remarkable work, both in itself and in its effect upon Catholic theology in Germany. Few works of modern times have excited a more keen and bitter controversy. Hermes himself was very largely under the influence of the Kantian and Fichtean ideas, and though in the philosophical portion of his *Einleitung* he criticizes both these thinkers severely, rejects their doctrine of the moral law as the sole guarantee for the existence of God, and condemns their restricted view of the possibility and nature of revelation, enough remained of purely speculative material to render his system obnoxious to the Catholic Church. A very few years after his death, the contests between his followers and their opponents grew so embittered that reference of the dispute was made to the papal see. The judgment consequent upon a review of Hermes's writings, undertaken in Rome in 1833, was adverse, and on 25th September 1835 a papal bull condemned both parts of the *Einleitung* and the first volume of the *Dogmatik*. Two months later the remaining volumes of the *Dogmatik* were likewise condemned. The controversy did not cease with this condemnation; but not till 1845 was there any systematic attempt on the part of Catholic theology to examine and refute the Hermesian doctrines. In that year was published anonymously by F. X. Werner the most complete survey of the principles of the works of Hermes as contrasted with the orthodox catholic faith (*Der Hermesianismus*, 1845). In 1847 the condemnation of 1835 was confirmed by Pius IX. A sufficient account of Hermes and the dispute raised by him will be found in K. Werner, *Geschichte der Katholischen Theologie*, 1866, pp. 405 *sq.*

HERMES TRISMEGISTUS. The Egyptian Thoth, Tehuti, or Tet (see vol. vii. p. 718), who was identified by the Greeks more or less completely with their own Hermes, is described in the hieroglyphics by various epithets, among which occurs that of "the great great" or twice great, with an added hieroglyphic which is the superlative "great." To him as scribe of the gods, "lord of the divine words," "scribe of truth," was attributed the authorship of all the strictly sacred books generally called by Greek authors Hermetic. These, according to Clemens Alexandrinus, our sole ancient authority (*Strom.* vi. p. 268 *sq.*), were forty-two in number, and were subdivided into six divisions, of which the first, containing the ten books "of the prophets," dealt with laws, deities, and the education of priests; the second, consisting of the ten books of the "stolistes," or official whose duty it was to dress and ornament the statues of the gods, treated of sacrifices and offerings, prayers, hymns, festive processions; the third, "of the hierogrammatist," also in ten books, was a repertory of hieroglyphical, cosmographical, geographical, and topographical information; the four books "of the horoscopus" were devoted to astronomy and astrology; the two books "of the chanter" contained respectively a collection of songs in honour of the gods and a description of the royal life and its duties; while the sixth and last division, consisting of the six books "of the pastophor," was medical. Of this canon, which according to the generally received opinion of Bunsen must have been closed at latest in the time of the Psammetichi but probably earlier, numerous small fragments are to be found in the works of Stobæus and other ancient writers. The now well known *Book of the Dead*, according to Bunsen, originally had its place among the ten ceremonial books of the "stolistes," but this is denied by Lepsius; an ancient papyrus recently deciphered by Ebers is believed by that author to date from about the year 1500 B.C., and to have formed part of one of the books of the pastophor.

The epithet Trismegistus (ὁ τρισμέγιστος, or "superlatively" greatest), as applied to Hermes, is of comparatively late origin, and cannot be traced to any author earlier than the 2d Christian century. Most probably it arose out of the earlier forms μέγας καὶ μέγας or μέγιστος, derived by the Greeks from early Egyptian sources; but various other explanations of the appellation have been offered, such as that of the author of the *Chronicon Alexandrinum* (47 A.D.), who maintains that it was because Hermes, while maintaining the unity of God, had also asserted the existence of three supreme or greatest powers that he was called by the Egyptians Trismegistus.[1] This view, which is also adopted by Suidas, seems preferable at least to that met with in Nicolai's *History of Greek Literature*, according to which an apocryphal author named Hermes was called τρισμεγίστιος, simply in order to indicate that he had succeeded and outdone a certain Megistias of Smyrna in astrological, physiognomical, and alchemistic theories. The name of Hermes seems during the third and following centuries to have been regarded as a convenient pseudonym to place at the head of the numerous syncretistic writings in which it was sought to combine Neo-Platonic philosophy, Philonic Judaism, and cabbalistic theosophy, and so provide the world with some acceptable substitute for the Christianity which had even at that time begun to give indications of the ascendency it was destined afterwards to attain. Of these pseudepigraphic Hermetic writings some have come down to us in the original Greek; others survive in Latin or Arabic translations, but the majority appear to have perished. That which is best known and has been most frequently edited is the ποιμάνδρης *sive De Potestate et Sapientia Divina* (ποιμάνδρης being the Divine Intelligence ποιμὴν ἀνδρῶν), which consists of fifteen chapters treating of such subjects as the nature of God, the origin of the world, the creation and fall of man, and the divine illumination which is the sole means of his deliverance. The *Editio Princeps* appeared in Paris in 1554; and there has been a recent edition by Parthey (1854); the work has also been translated into German by Tiedemann (1781). Along with it are usually printed the certainly later ὅροι or *Definitions* of Asclepius, which have sometimes but erroneously been attributed to Apuleius. Other Hermetic writings which have been preserved, and which have been for the most part collected by Patricius in the *Nova de Universis Philosophia* (1593), are (in Greek) Ἰατρομαθηματικὰ πρὸς Ἄμμωνα Αἰγύπτιον, Περὶ κατακλίσεως νοσούντων περιγνωστικά, Ἐκ τῆς μαθηματικῆς ἐπιστήμης πρὸς Ἄμμωνα; (in Latin) *Aphorismi sive Centiloquium*, *Cyranides*; (in Arabic, but doubtless from a Greek original) an address to the human soul, which has been translated by Fleischer (*An die menschliche Seele*, 1870). The connexion of the name of Hermes with alchemy will explain what is meant by hermetic sealing, and will account for the use of the phrase "hermetic medicine" by Paracelsus, as also for the so-called "hermetic freemasonry" of the Middle Ages.

See Ursinus, *De Zoroastre, Hermete*, &c., Nuremberg, 1661; Lenglet Dufresnoy, *L'Histoire de la Philosophie Hermetique*, Paris, 1742; Baumgarten-Crusius, *De librorum hermeticorum origine atque indole*, Jena, 1827; Hilgers, *De Hermetis Trismegisti Pœmandro*, 1855; Menard, *Hermes Trismégiste: Traduction complète, precedee d'une etude sur l'origine des livres hermétiques*, 1866; Pietschmann, *Hermes Trismegistus, nach Ægyptischen, Griechischen, und Orientalischen Ueberlieferungen*, 1875.

HERMESIANAX, an elegiac poet of the Alexandrian school, was born at Colophon, and flourished in the time of Philip and Alexander, or a little later. He was a friend and admirer—probably also a pupil—of the grammarian and poet Philetas, whom he outlived. His chief work was a poem in three books, which he, following the example of his countrymen Mimnermus and Antimachus, inscribed with the name of his mistress Leontium (said by some to be the same as the mistress of Epicurus). Of this poem a fragment of about one hundred lines has been preserved by Athenæus (xiii. 597); and it may serve as a specimen of the style of the school. Erotic in character, and plaintive in tone, it enumerates instances, mythological and historical, of the irresistible power of love, and redeems the monotony of its ground plan by its picturesque language, and by the alternate force and tenderness of its treatment. Hermesianax was exceedingly popular in his own times, and was highly esteemed even in the Augustan period. Propertius follows his example in dedicating the first book of his *Elegies* to his mistress Cynthia.

Many scholars have laboured upon the text, but it is still in a very unsatisfactory condition. See Hermann, *Opuscula*, iv.; Schneidewin, *Delect. Poes. Eleg.*; Bergk, *De Hermesianactis Elegia*: the editions of Bailey (London, 1839), &c.

HERMOGENES, of Tarsus, Greek rhetorician, flourished in the reign of Marcus Aurelius. His precocious ability secured him a public appointment as teacher of his art while as yet he was only a boy; but at the age of twenty-five his faculties gave way, and he spent the long remainder of his life in a state of intellectual impotency. In the nine or ten years, however, of his activity he composed a whole series of treatises on matters rhetorical, which became popular text-books, and the subject of subsequent commentaries. Of his Τέχνη ῥητορική we still possess Περὶ τῶν στάσεων; Περὶ εὑρέσεων; Περὶ ἰδεῶν; Περὶ μεθόδου δεινότητος; and Προγυμνάσματα.

The last-mentioned was only known from Priscian's Latin translation till the publication by Heeren of the Greek original discovered at Turin (*Bibl. fur alte Lit. und Kunst*, Gott., 1791). Richard Volkmann, in *Animadversiones criticae in Hermogenis progymnasmata et alios rhetoricos locos* (Jauer, 1869), discusses the relation of the original to Priscian's translation, and treats them as sources of reciprocal emendation.

HERMON, the highest mountain in Syria (9150 feet above the Mediterranean), an outlier of the Antilebanon. The name חרמון, "separate," is perhaps due to its isolated position. The Sidonians called it Sirion, and the Amorites Shenir (Deut. iii. 9). It is probably the "high mountain" near Cæsarea Philippi where the Transfiguration occurred (Mark ix. 2). The modern name is *Jebel esh Sheikh*, or "chief mountain." It is also called *Jebel eth Thelj*, "snowy mountain." The ridge of Hermon, rising into a dome shaped summit, is 20 miles long, extending north-east and south-west. The formation is a hard dark-grey crystalline limestone belonging to the Neocomian period, and full of fossils. The spurs consist in some cases of white chalk covering the limestone, and on the south there are several basaltic outbreaks. The mountain in spring is covered with snow, but in autumn there is occasionally none left, even in the ravines. To the height of 500 feet it is clothed with oaks and brush, while luxuriant vineyards abound. Above the snow limit the mountain is bare and covered with fine limestone shingle. The summit is a plateau from which three rocky knolls rise up, that on the west being the lowest, that on the south-east the highest. On the south slope of the latter are remains of the small temple or sacellum described by St Jérome. A semicircular dwarf wall of good masonry runs round this peak and a trench excavated in the rock may perhaps indicate the site of an altar. On the plateau is a cave about 25 feet square, with the entrance on the east. A rock column supports the roof, and a building once stood above. The view from Hermon is very extensive, embracing all Lebanon and the plains east of Damascus, with Palestine as far as Carmel and Tabor. On a clear day Jaffa may also be seen. Other small temples are found on the sides of Hermon, of which twelve in all have been explored. They face the east, and are dated by architects about 200 A.D. The most remarkable are those of *Deir el 'Ashayir*, *Hebbariyeh*, *[illegible]*, and *Tell Thatha*. At the ruined town called Rukhleh on the northern slopes are remains of a temple, the stones of which have been built into a church. A large medallion 5 feet in diameter, with a head supposed to represent the sun god, is built into the wall. Several Greek inscriptions occur among these ruins. Foxes, wolves, and the Syrian bear are commonly found on Hermon, with various kinds of game. In the 12th century Psalm lxxxix. 12 was supposed to indicate the proximity of Hermon to Tabor. The conical hill immediately south of Tabor was thus named Little Hermon, and is still so called by some of the inhabitants of the district.

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[1] Ἑρμῆς ἔφρασε τρεῖς μεγίστας δυνάμεις εἶναι τὸ τοῦ ἀῤῥήτου καὶ δημιουργοῦ, ἃ καὶ ὄνομα μίαν θεότητα εἶπεν εἶναι . . . διὸ καὶ ἐκλήθη ὑπὸ τῶν Αἰγυπτίων Τρισμέγιστος Ἑρμῆς.

HERMOSILLO, a town of Mexico, state of Sonora, is situated at the entrance to a valley of remarkable fertility near the river Sonora at its confluence with the Horcasitas, 40 miles south-west of Ures. Some of the principal houses are built of stone, but most of the dwellings are of adobe. The town possesses two churches, a prison, and a mint. Its rise and early prosperity were due to the discovery of gold mines in Sonora, but it now depends wholly on the fertility of the surrounding country, of which the principal products are cotton, wheat, grapes, and a great variety of fruits. The town is the commercial centre of Sonora. It has cotton manufactories, flour mills, and brandy distilleries, and carries on a considerable foreign trade by means of the port of Guaymas, which is 100 miles distant. The population is about 14,000.

HERMSDORF, generally known as Niederhermsdorf, a town of Prussia, in the government district of Breslau and circle of Waldenburg. There are coal and iron mines and [illegible] in the vicinity, and in the town there is a large [illegible]. The population in 1875 was [illegible].

HERMUPOLIS. See SYRA.

HERNIA, a Latin term commonly derived from ἔρνος, a sprout, but the origin is doubtful, is the protrusion of any viscus from its normal position; for example, hernia cerebri is the name given to a protrusion of the brain substance, hernia pulmonis to a protrusion of a portion of the lung. The word may here be restricted to its most usual meaning, a protrusion of part of the contents of the abdomen from their normal position in the abdominal cavity, in common language a "rupture." A rupture may occur at any weak point in the abdominal wall. The common situations are the groin (inguinal hernia), the upper part of the thigh (femoral hernia), and the umbilicus or navel (umbilical hernia). The contents of a rupture may be any of the abdominal viscera; the more movable the viscus the more tendency there is to protrusion, and therefore we generally find that the small intestine and the omentum are most frequently displaced. The tumour may contain intestine alone (enterocele), omentum alone (epiplocele), or a combination of intestine and omentum (entero-epiplocele). The predisposing cause to rupture is any weakness of the abdominal wall due (1) to natural conformity, as in inguinal hernia, which descends along the inguinal canal, a canal in which the cord lies in the male and the round ligament in the female; or in femoral hernia, in which the hernia descends along the femoral canal along with and to the inner side of the femoral vessels; (2) to any cause which weakens the wall locally, as an abscess or wound; (3) to general laxity of the tissues, as in weakly people or after repeated pregnancies. This third cause only predisposes to hernia in so far as it may weaken an already weak part under the first and second heads. The exciting cause of hernia is generally some strain or over-exertion in any powerful effort, as lifting a heavy weight, jumping off a high wall, straining, as in difficult micturition or in consequence of constipation, or excessive coughing, as in chronic bronchitis. The pressure of the diaphragm above and the [illegible] abdominal wall in front acting on the abdominal viscera tends to cause their protrusion at the weakest point. Rupture is either congenital or acquired. A child may be born with a hernia in the inguinal or umbilical region, the result of an arrest of development in these parts; or the rupture may be acquired, first appearing perhaps in adult life, the result of one or other of the accidents referred to above. Ruptures are most frequent at the extremes of life. Men suffer more frequently than women, because they are more liable to these accidents, being frequently exposed to intermittent work, such as the lifting of heavy weights.

At first the rupture is small, and with more or less rapidity it gradually increases in size; it varies from the size of a small marble to that of a child's head or even larger. The swelling which appears is spoken of as consisting of three parts—the coverings, sac, and contents. (1) The "coverings" are composed of the different structures which form the abdominal wall at the part where the rupture occurs. In femoral hernia the coverings are formed of the structures at the upper part of the thigh. These structures are stretched and may be thinned; in some cases they are condensed and matted together, the result of pressure, or there is an increase in their thickness, the result of repeated attacks of inflammation. (2) The "sac" is composed of the peritoneum or membrane lining the abdominal cavity. In some very rare cases the sac is wanting. The neck of the sac is the term used to designate the narrowest portion where the protrusion leaves the sac [illegible] continuous with the general peritoneal cavity. Very frequently the neck of the sac is thickened, indurated, and adherent to surrounding parts, [illegible] the tendency to local inflammatory action [illegible], the pressure being greatest at this point. (3) The "contents" have already been described. There are three distinct conditions in which we may find the contents of a hernial tumour: it may be either reducible, irreducible, or strangulated. A "reducible" hernia is one in which the contents can be pressed back into the abdomen. In some cases this is done with ease, in others it is a matter of great difficulty. At any moment a reducible hernia may become "irreducible," that is to say, its contents cannot be pushed back into the abdominal cavity. This [illegible] occur in consequence of an attack of constipation, or slowly, the irreducibility being at first partial and gradually becoming total and more complete. Generally this is due to an increase in the size of the omentum, accompanied by inflammatory induration. A "strangulated" hernia is one in which the circulation of the blood through the hernial contents is interfered with. The interference is at first slight, but very rapidly tends to become more pronounced. At first there is congestion; this congestion may go on to inflammation; if unrelieved, the inflammation will end in mortification. The rapidity with which the change from simple congestion to mortification takes place will depend on the tightness of the constricting cause; as a rule the more rapidly a hernia forms, in other words, the less time the surrounding tissues have to accommodate themselves to the protruding swelling, the greater the rapidity of the changes in the condition of the contents. The constricting agent may be one or other of the structures which form the boundaries of the openings through which the hernia has travelled in its gradual course through the abdominal wall, or it may be in the neck of the sac, which has become thickened in consequence of inflammation.

Reducible Hernia.—The symptoms of reducible hernia show themselves in a soft compressible tumour (elastic when it contains intestine, doughy when it contains omentum, a combination of elasticity and doughiness when both are present), its size increasing in the erect, and diminishing in the horizontal posture, whence as a rule it gives little trouble during the night, and becomes more troublesome in the daytime, more especially towards evening. There is a more or less distinct impulse on coughing, and when the intestinal contents are pushed back into the abdomen a gurgling sensation is perceptible by the fingers. Such a tumour may be met with in any part of the abdominal wall, but the chief situations are—(a) the inguinal region, in which the neck of the tumour lies immediately above Poupart's ligament (a cord-like ligamentous structure which can be felt stretching from the anterior superior spinous process of the ilium to the spine of the pubis immediately above the genital organs), (b) the femoral region in the upper part of the thigh, in which the neck of the sac lies immediately below the inner end of Poupart's ligament; (c) the umbilical region, in which the tumour appears at the navel. As the inguinal hernia increases in size it tends to pass into the scrotum in the male, into the labium in the female, while the femoral hernia, appearing first below Poupart, tends gradually as it increases in size to pass upwards superficial to Poupart's ligament.

The treatment of reducible hernia consists in pushing back the contents of the tumour into the abdomen, and applying a truss or elastic bandage in order to prevent the contents from again escaping. The younger the patient the more chance there is of the truss acting as a curative agent, as the natural tendency to contraction of the channel through which the hernia protrudes is greater. The truss is frequently laid aside at night, because in the horizontal posture the tendency of the contents to descend is greatly lessened. The truss or bandage should, however, be worn day and night. If, after the hernia is once returned, it is never again allowed to come down, there is a probability of a cure taking place; but if it is allowed to come down occasionally, as it may do, even during the night, in consequence of a cough or from turning suddenly in bed, the parts are stretched, and the contracting process which may have been going on for weeks is undone.

It is unnecessary to describe the multitudinous varieties of trusses. When a truss is ordered the surgeon has to see that it fits accurately, the necessary amount of pressure being obtained by means of a steel spring, to which a pad is attached. The pad should be so arranged as to press, not into the opening through which the hernia has come, but rather on its sides, so as to facilitate its contraction and permanent closure. The main pressure should be in the neighbourhood of the neck of the sac; if the pad presses into the opening, the tendency is to keep the opening patent. The principle of the nipple-shaped pad, frequently ordered for umbilical hernia, is evil; a flat pad properly applied and held in position by an elastic bandage is the proper arrangement for restraining an umbilical hernia. No truss is to be applied until the hernia is completely reduced; it will only do harm by pressing on the contents of the unreduced hernia. In some herniæ, generally those of large size, it is found impossible to keep them up by means of a truss; in such cases an elastic bandage will sometimes effect the object, in others various operations have been recommended. They are spoken of as "the radical cure of hernia," in contradistinction to the so-called "palliative treatment by means of a truss." An attempt has been made above to show that a truss may radically cure a hernia. The principles involved in the operations described are (1) obliteration of the neck of the sac, (2) obliteration of the channel through which the hernia has descended, (3) obliteration of the sac itself, (4) plugging of the hernial [illegible] by [illegible] the [illegible]. The [illegible] [illegible] [illegible], [illegible] the [illegible] [illegible] [illegible] way of [illegible] the tendency to [illegible] peritoneum.

Irreducible Hernia.—Here there is a tumour in one or other of the situations already referred to, of long standing and generally of large size, in which the contents of the tumour, in whole or in part, cannot be pushed back into the abdomen. The irreducibility is due either to [illegible] which have taken place in the contents, or to adhesions or alterations. Such a tumour is a constant source of danger; its contents are liable, from their exposed situation, to injury from external violence; it has a constant tendency to increase in size; it may at any time become strangulated, or the contents may inflame, and strangulation may occur secondarily to the inflammation. It is accompanied by dragging sensations referred to the abdomen, colic, dyspepsia, and constipation, which may in its turn lead to obstruction, that is to say, a stoppage of the passage of the contents of that portion of the intestinal canal which lies in the hernial tumour. When an irreducible hernia becomes painful and tender, a local peritonitis has occurred, which resembles in many of its symptoms a case of strangulation.

The treatment of irreducible hernia may be palliative: a bag truss may be worn to prevent the swelling from getting larger, the bowels must be kept open, and all irregularities of diet avoided. A person with such a hernia is in constant danger, and more than palliation is called for. An attempt should be made to reduce the hernia—(1) by laying the patient on his back, raising his buttocks, administering purgatives, and starving him (persevering attention to these points may so reduce the size of the contents that the hernia may be returned); or (2) by means of an elastic bandage carefully applied so as to press continuously on the tumour, and gradually press it back into the abdominal cavity. By this simple means large irreducible herniæ, which have withstood all attempts at reduction, have been returned into the abdomen after elastic pressure has been carefully and continuously applied for a few days. (3) The surgeon may cut down on the hernia, under strict antiseptic precautions, open the sac, divide any omental adhesions, ligature and cut away indurated omentum, return the bowel, and then tie the neck of the sac. Such an operation is unjustifiable unless other means have been fairly tried and failed, and unless the hernia is giving rise to such symptoms that the usefulness of the patient is interfered with.

Strangulated Hernia.—In this the contents are constricted, and the flow of blood into the tumour and from the tumour is stopped. The symptoms are—nausea, vomiting first of bilious matter, after a time of fæcal matter, a twisting, burning pain generally referred to the umbilicus, intestinal obstruction, a quick wiry pulse, pain on pressure over the tumour and in the abdomen near the tumour, the abdomen tense and tympanitic, and no impulse on coughing, because the contents of the tumour are practically cut off from the general abdominal contents. The patient has an anxious expression. Sooner or later, from eight hours to eight days, if the strangulation is unrelieved, the tumour will become livid and emphysematous; mortification has occurred, and gangrene of the bowel at the neck of the sac will take place, followed by extravasation of the intestinal contents into the abdominal cavity; the patient becomes collapsed, and dies comatose.

The treatment of a strangulated hernia admits of no delay; delay is fatal. If the symptoms are not very acute, and if the case is seen early, attempts may be made by large enemata and by the application of cold to the tumour to reduce the congested condition and relieve the strangulation. But these attempts must not be persevered with for more than two or three hours. If the strangulation continues, then the patient should be told that his case is one which admits of no delay. Chloroform should be administered; another attempt to return the contents by pressure (termed "the taxis") should be made. If this has already been fairly tried, and if the symptoms indicate urgency, no prolonged attempts at taxis are justifiable, because the condition of the hernial contents may be such that they cannot bear the pressure. The taxis to be successful should be made in a direction opposite to the one in which the hernia has come down. The inguinal hernia should be pressed upwards, outwards, and backwards, the femoral hernia downwards, backwards, and upwards. The larger the hernia the greater is the chance of success. The slightest gurgle indicates that success is near. If taxis does not succeed then the surgeon must cut down on the tumour, carefully dividing the different coverings until he reaches the sac. The sac is then opened, the constriction divided, care being taken not to injure the bowel. The condition of the bowel is then examined, and if it is glistening, however black it may be, it is returned into the abdomen. If it has lost its glistening aspect, if it is like "wet parchment," then the case is very doubtful. If in doubt, relieve the constriction and leave the bowel in the sac. Never open the bowel, however bad it looks; it may recover; and if it does not burst for some hours afterwards, the chances are that adhesions may form at the neck of the sac and lessen the risk of intestine into the abdominal cavity—a fæcal fistula will be the result. The omentum, if healthy, may be returned; but if congested and altered, it must be ligatured and cut off. After the hernia is reduced, the wound is sewn up, and a pad and flannel bandage applied. A dose of opium should be given to prevent movement of the bowels. On the third day a dose of castor oil is administered if the bowels do not open naturally. A truss is applied after the wound is healed before the patient is allowed to get out of bed. Many complications which may occur cannot here be referred to. Any one suffering from hernia should take great care to obtain an accurately fitting truss, and should remember that, whenever any symptoms resembling in any degree those of strangulation occur, any delay in the treatment is not only dangerous but may prove fatal. A medical man should at once be communicated with. He in his turn has to remember that when a patient asks his advice, complaining of symptoms resembling strangulation, he must examine all the situations where hernia may occur, because the hernial tumour may be so small that it has escaped the notice of the patient. Any assertion on the patient's part that he does not suffer from hernia must receive no weight. The surgeon must satisfy himself by ocular inspection and manual examination. If an operation is necessary he may with confidence say that the operation is not in itself a dangerous one, while, on the other hand, he can assure the patient that any delay is most certainly excessively dangerous. (J. C.)

HERNÖSAND, chief town and seat of the administration of the lan of Wester Norrland on the east coast of Sweden, is built on the island of Hernö (connected with the mainland by bridges), about 3 miles south of the mouth of the Angerman river, and 230 miles north of Stockholm. It is the seat of a bishop and possesses a fine church, erected in 1842–46. There are engine works, timber-yards, saw-mills, and various manufactories in the town. The harbour is good. In 1878, 33 vessels, chiefly engaged in the timber trade, with a total burthen of 7698 tons, entered and cleared at the port. Tar is also exported, and there is an institution for pisciculture in the town. Hernösand was founded in 1584, and received its first town privileges from John III. in 1587. The population in 1876 was 4612.

HERO AND LEANDER. Hero, the beautiful priestess of Venus at Sestos, was there seen by Leander, a youth of Abydos, at the celebration of the festival of Venus and Adonis. He became deeply enamoured of her, and found that day an opportunity of declaring his passion, which she returned; and as her position rendered their marriage impossible, they agreed to carry on a clandestine intercourse. Nightly Hero placed a lamp in the top of the tower where she dwelt by the sea, and Leander, guided by it, swam the dangerous Hellespont. One stormy night the lamp was blown out, and Leander perished. On finding his body next morning on the shore, Hero flung herself into the waves.

Reference is made to this famous tale by Virgil (*Georg.*, iii. 258) and by Statius (*Theb.*, vi. 535). Ovid (*Her.*, xviii. and xix.) has composed two epistles, from Leander to Hero, and one from Hero to Leander. But the story is best known from the work of Musæus (see MUSÆUS), which has been repeatedly translated into modern European languages. The *Hero and Leander* of Marlowe and Chapman is an imitation and expansion of the work of Musæus.

HEROD was the name of a family of Idumæan origin, which displaced the Asmonæans as the rulers of Judæa. The founder of the dynasty, and its most notable representative in every way, was Herod the Great, who was king of the Jews for about thirty-seven years, from 40 to 4 B.C. Herod's father was Antipater, who during the troubles which broke out in the family of Alexander Jannæus, attached himself to Hyrcanus, the weak-minded son of Alexander. In this way Antipater, though an Idumæan, soon became the most powerful man in Judæa, and in the Alexandrian war gave such effectual help to Julius Cæsar that the dictator made him procurator of Judæa, Hyrcanus being high priest (47 B.C.). The same year, at the age of twenty-five, Herod was appointed governor of Galilee by his father. He soon gave proof of the remarkable energy of his character in rooting out the bandits who infested his province; but his summary measures gave a handle to the enemies of his house at Jerusalem, and he was summoned before the sanhedrin. There he appeared, not in the garb of an accused person, but gorgeously attired, and attended by a guard of soldiers. He found it expedient, however, to withdraw from Jerusalem without awaiting the sentence. He retired to Syria, where he met with a gracious reception from Sextus Cæsar, who appointed him governor of Cœle-Syria. Herod now marched with an army against Jerusalem, but at the persuasion of his father and brother was induced to depart without exacting vengeance on his enemies. After the death of Cæsar, the fortunes of Herod were affected by all the changes which befell the Roman state. When Cassius took the command in the East, and began to gather his strength for the final struggle which was decided at Philippi, Herod managed to win his favour by the readiness with which he raised his share of the heavy exactions imposed upon the East. About the same time his father was poisoned, and to Herod fell the task of avenging his death, as well as of supporting the interests of his house in Palestine. After Philippi he gained Antony over by large presents of money. He and his brother Phasael were appointed tetrarchs of Judæa. In 40 B.C. the Parthians appeared upon the scene, overran the whole of Syria, and placed on the throne of Judæa Antigonus, son of Aristobulus, and representative of the rival branch of the Asmonean house. Herod was completely overpowered; and, after placing his relatives in safety, so far as he could, he hastened to Rome to lay his case before Antony and Octavianus. He succeeded beyond his expectation, for, while he meant only to advocate the claims of Hyrcanus the Asmonean, the two heads of the state made him king of Judæa. Herod returned home without delay, and set about the task of winning the kingdom allotted to him. Owing chiefly to the slackness of the Roman generals who should have helped him, it was three years before he succeeded in taking Jerusalem (37 B.C.). Before that event he had married the beautiful Mariamne, a princess of the Asmonean house, a granddaughter both of Aristobulus and Hyrcanus. Herod's early measures were cruel; he put to death all the members of the sanhedrin except two, and spared no one that was likely to stand in his way. Aristobulus, the youthful brother of Mariamne, whom he had appointed high priest, he caused to be treacherously drowned because he was too popular with the patriotic party. On this occasion Alexandra, mother of Aristobulus, induced Cleopatra to take her part, and Herod had to appear before Antony to answer the charge of murdering the prince. Again Herod knew how to gain the Roman, and he returned home with confirmed power. During the war of Actium, Herod had the good fortune to be engaged in a war with the king of Arabia on Antony's behalf, and so escaped the risk of fighting against Octavianus. Yet he recognized the danger of his position as the friend of Antony, and faced it with his usual courage and foresight. Hastening to Rhodes (30 B.C.), he appeared in the presence of the conqueror, and avowing his loyalty to his friend Antony, proffered the same faithful service to Octavianus. Octavianus was gracious, and remained the constant friend and patron of Herod to the end. This was the last crisis of Herod's life; he was henceforward undisputed king of Judæa, and next to Agrippa the most trusted friend of Augustus. But while the friend of the great, and prosperous in all external relations, Nemesis pursued him in his family. When summoned to answer for himself before Antony, and again on his journey to Rhodes, he left the beautiful and beloved Mariamne in charge of one of his friends, but with the cruel injunction that she should be put to death should anything serious befall himself. On both occasions Mariamne discovered the secret, and instead of regarding the command as a proof of his jealous love, abhorred it as another instance of the cruelty which had not spared so many of her nearest relatives. A horrible tragedy ensued: Mariamne openly expressed her disgust; and Herod, furious with rage, jealousy, and rejected love, ordered her death. The violence of his feelings threw him into a dangerous malady, and even drove him to the verge of insanity. His mind never recovered its healthy tone, and in later years the avenger again overtook him. In the meantime his government was marked by the greatest magnificence and apparent success. His turbulent subjects were kept tolerably quiet in spite of heavy taxes. He managed to gratify his love for Greek and Roman life; and yet he avoided wounding too deeply the susceptibilities of the Jews. The magnificent buildings which he raised were the most brilliant products of his reign. He rebuilt Samaria, calling it Sebaste, from the Greek name for Augustus. He converted the small town of Strato's Tower into a magnificent seaport with an artificial harbour, under the name of Cæsarea. These and other towns which he built were furnished with temples, theatres, aqueducts, and all the other ornamental and useful appliances of Greek and Roman life. In the city of Jerusalem even he built a theatre, and an amphitheatre outside of it. A more patriotic work was the rebuilding of the temple (begun 20 B.C.), which had suffered greatly during the late troubles; it was on a very magnificent scale, and lasted nine years and a half, even then being unfinished. Equally necessary and equally significant of his relation to his subjects was the construction of strong fortresses in various parts of the country. The last years of Herod's life were darkened by the return of those family troubles which had previously overcast it. His two sons by Mariamne had been educated at Rome, and returned, 17 B.C., to Judæa. Their Asmonean descent, their youth, beauty, and accomplishments, and their too interesting history gained them the most enthusiastic popularity among the Jews. Their father himself was proud of them. But Pheroras and Salome, brother and sister of Herod, did all they could to sow jealousy and suspicion. Herod's mind was too painfully open to dark insinuations, and he recalled his eldest son Antipater to counterbalance the influence of the Asmonean princes. After the arrival of Antipater, who was a most unscrupulous plotter, there was no more peace or security at the court of Herod; things went from bad to worse, till after many years of the darkest intrigue and the bitterest domestic contention, the two sons of Mariamne were strangled at Sebaste. Soon after the clearest proof was discovered of a conspiracy which Antipater had formed with Pheroras against the life of Herod himself. The order for the death of Antipater was given by Herod from his death-bed. His health had long been failing; after the cruellest torments of both mind and body, he died 4 B.C. The birth of Christ took place in the same year as Herod's death, but this, as is well known, occurred four years before the date fixed as the beginning of the Christian era. The massacre of the little children at Bethlehem is not mentioned by Josephus among the horrors of Herod's last days. He was buried with great magnificence. His will, by which the greater part of his dominions was bequeathed to his sons by Malthace, a Samaritan, was confirmed by Augustus.

Herod's name is doubtless one of the most repulsive in history. He was a man of wonderful energy and sagacity. He saw clearly that Rome was the hinge on which everything turned, and that no policy could be successful which did not depend upon her leading men. His skill in understanding these men, in conciliating them, and making himself useful to them, was very great. Thus he made the successive masters of the world his willing friends, and out of all the crises of his fate emerged victorious. But his hands were red with the blood of his own household; when his position or his interests were touched no scruple could arrest him. All that can be said in his favour is that many of his cruel measures cost him unspeakable agony of mind, and that he was simply more expert than his rivals at the weapons which were in common use in the political life of the time.

The great source for the life of Herod is Josephus; but such writers as Strabo and Dion Cassius are of service in further illustrating it. Useful modern works are Hausrath, *Neutestamentliche Zeitgeschichte*; the work of the same name by Schürer; Ewald, *Geschichte des Volkes Israel*, vol. iv.; Keim, *Geschichte Jesu von Nazara*, vol. i.; and Milman's *History of the Jews*, vol. ii. (T. K.)

HEROD ANTIPAS, son of Herod the Great by the Samaritan Malthace, and full brother of Archelaus, received as his share of his father's dominions the provinces of Galilee and Peræa. Like his father, Antipas had a turn for architecture: he rebuilt and fortified the town of Sepphoris; he also fortified Betharamptha, and called it Julias after the wife of the emperor. Above all he founded the important town of Tiberias on the west shore of the Sea of Galilee, with institutions of a distinctly Greek character. Antipas is mentioned more than once in gospel history under the name of Herod. He it was who was called a "fox" by Christ. He is erroneously spoken of as a king in Mark vi. 14. It was to him that Jesus was sent by Pilate to be tried. But it is in connexion with his wife Herodias that he is best known, and it was through her that his misfortunes arose. He was married first of all to a daughter of Aretas, the Arabian king; but, making the acquaintance of Herodias, the wife of his brother Philip (not the tetrarch), during a visit to Rome, he was fascinated by her and arranged to marry her. Meantime his Arabian wife discovered the plan and escaped to her father, who made war on Herod, and completely defeated his army. John the Baptist condemned his marriage with Herodias, and in consequence was put to death in the way described in the gospels and in Josephus. When Herodias's brother Agrippa was appointed king by Caligula, she was determined to see her husband attain to an equal eminence, and persuaded him, though naturally of a quiet and unambitious temperament, to make the journey to Rome to crave a crown from the emperor. Agrippa, however, managed to influence Caligula against him. Antipas was deprived of his dominions, and banished to Lyons, Herodias voluntarily sharing his exile.

HEROD PHILIP, son of Herod the Great by Cleopatra of Jerusalem, received the tetrarchate of Ituræa and other districts to the N.E. of the Jordan. He is a different person from the first husband of Herodias, also called Philip by St Mark (vi. 17), and was married to Salome the daughter of Herodias. Philip is described as an excellent ruler, who loved peace, and was careful to maintain justice, and spent his time in his own territories. He was also a builder of cities, one of which was Cæsarea Philippi, and another was Bethsaida, which he called Julias. He died after a reign of thirty-seven years; and his dominions were incorporated in the province of Syria.

HERODIANS (Ἡρωδιανοί), a sect or party mentioned in Scripture as having on two occasions—once in Galilee, and again in Jerusalem—manifested an unfriendly disposition towards Jesus (Mark iii. 6; xii. 13; Matt. xxii. 6; *cf.* also Mark viii. 15). In each of these cases their name is coupled with that of the Pharisees. According to many interpreters the courtiers or soldiers of Herod Antipas ("Milites Herodis," Jerome; "Diener Herodis," Luther) are intended; but more probably the Herodians were a public political party, who distinguished themselves from the two great historical parties of post-exilian Judaism by the fact that they were and had been sincerely friendly to Herod the Great and to his dynasty (*cf.* such formations as "Cæsariani," "Pompeiani"). For the evidence which goes to show that neither the Pharisees nor the Sadducees as such could in consistency have been really thus friendly, reference may be made to Hausrath (especially his *Neu-Testamentliche Zeitgeschichte*, and article "Herodianer" in Schenkel's *Bibel-Lexicon*), and to Wellhausen (*Pharisäer u. Sadducäer*, 1873). It is possible that, to gain adherents, the Herodian party may have been in the habit of representing that the establishment of a Herodian dynasty would be favourable to the realization of the theocracy; and this in turn may suggest some explanation of Tertullian's (*De Præscr.*) palpably absurd allegation that the Herodians regarded Herod himself as the Messiah.

HERODIANUS, the author of a Greek history of the period extending from 180 to 238 A.D. Of his origin and condition in life very little is known. He was in Rome in 203, and seems to have held some public office. It has been conjectured that he was first "procurator Cæsaris" and afterwards "legatus" of the Sicilian provinces, and that, while fulfilling his official duties, he wrote at intervals the history which bears his name. It is entitled Ἡρωδιανοῦ τῆς μετὰ Μάρκον βασιλείας ἱστοριῶν βιβλία ὀκτώ, and it narrates the events of the fifty-eight years that intervened between the death of Marcus Aurelius and the proclamation of Gordianus III. The narrative is of special value for the reigns of the emperors subsequent to Alexander Severus, with whom the work of Dion Cassius ends. As an historian Herodianus has prominent merits and defects. His work has the value that attaches to a record written by one chronicling the events of his own times, gifted with respectable powers of observation, indubitable candour, and independence of view. But he prefers the interest of style to the interest of truth, and is thus led into exaggerations and errors. The inner life and thought of Rome, the formidable barbarian pressure on her borders, are alike unheeded, that he may blazon his pages with the dazzling vicissitudes of the purple. Though the somewhat sober declamations which he introduces are apt to become tedious, his story is on the whole clear, graceful, and vivacious. The frequent antitheses and studied tricks of phrase savour of the rhetorical schools. Imitations of Thucydides and Latinisms are frequent. Yet in the main his style retains an original cast, a genuine unborrowed beauty, and contrasts favourably with the thin, affected Atticism of the period. Extensive use has been made of Herodianus by later chroniclers. His history was first translated into Latin in the end of the 15th century, by the famous Angelo Poliziano.

HERODIANUS, ÆLIUS, a famous grammarian of antiquity, called by Priscian "maximus auctor artis grammaticæ." He was the son of the grammarian Apollonius, was born at Alexandria, and resided at Rome. He was patronized by the emperor Marcus Aurelius (161–180 A.D.), to whom he dedicated his great treatise on prosody. This was a work in twenty books, called Καθολικὴ Προσῳδία, which included also an account of the etymological part of grammar. An epitome of it has been preserved. Abstracts of a treatise on difficult words and peculiar forms, called Ἐπιμερισμοί, are also extant. Besides these, Herodianus wrote various other treatises; but of the large number of titles quoted, some are probably merely names for parts of larger works. Only one of them has come down to us entire,—a treatise on monosyllables (περὶ μονήρους λέξεως). Numerous quotations, however, and considerable fragments still exist.

Fabricius (*Bibl. Græc.* vi. 278 sqq.) [illegible] that are [illegible]. Lentz (*Herodiani* [illegible]) [illegible] all [illegible] at the present.

HERODOTUS, according to the best authorities, was born in or about the year 484 B.C. He was a native of Halicarnassus, a city which belonged originally to the Doric Hexapolis, situated towards the south-western corner of Asia Minor, but which from a date considerably anterior to the birth of Herodotus had been excluded from the confederacy, and was an isolated Greek town, dependent upon the Persians. Herodotus was thus born a Persian subject, and such he continued until he was thirty or five-and-thirty years of age. At the time of his birth, Halicarnassus was under the rule of a queen called Artemisia, who had been allowed by the Persians to succeed to the sovereignty of her husband, and was mistress, not only of Halicarnassus, but also of Cos, Nisyrus, and Calydna. The year of her death is unknown; but she left her crown to her son Pisindelis (born about 498 B.C.), who was succeeded upon the throne by his son Lygdamis about the time that Herodotus grew to manhood. The family of Herodotus belonged to the upper rank of the citizens. His father was named Lyxes, and his mother Rhœo, or Dryo. He had a brother Theodore, and an uncle or cousin called Panyasis, who was an epic poet, and a personage of so much importance that the tyrant Lygdamis, suspecting him of treasonable projects, put him to death. It is likely that Herodotus derived from this near relative that love of letters which led him at an early age to the careful study of the existing Greek literature, and determined him ultimately to engage in the composition of his great work. It is probable also that he shared his relative's political opinions, and was either exiled from Halicarnassus, or quitted it voluntarily, at the time of his execution.

Of the education of Herodotus no more can be said than that it was thoroughly Greek, and embraced no doubt the three subjects essential to a Greek liberal education—grammar, gymnastic training, and music. There is no reason to suppose that he went beyond the walls of his native city for instruction in this, the ordinary, curriculum or that he enjoyed any special advantages in respect of these early studies. They would be regarded as completed when he attained the age of eighteen, and took rank among the "ephebi" or "eirenes" of his native city. Under ordinary circumstances a Greek of this age began at once his duties as a citizen, and found in the excitement of political life sufficient employment for his growing energies. But when a city was ruled by a despot or tyrant, this outlet was wanting; no political life worthy of the name existed; and youths of spirit, more especially those of superior abilities, had to cast about for some other field in which to distinguish themselves. Herodotus may thus have had his thoughts turned to literature as furnishing a not unsatisfactory career, and may well have been encouraged in his choice by the example of Panyasis, who, whether his cousin or his uncle, was certainly his elder, and had already gained a reputation by his writings when Herodotus was still an infant. At any rate it is clear from the extant work of Herodotus that he must have devoted himself early to the literary life, and commenced that extensive course of reading which renders him one of the most instructive as well as one of the most charming of ancient writers. The poetical literature of Greece was in his time already large; the prose literature was more extensive than is generally supposed; yet Herodotus shows an intimate acquaintance with the whole of it. He has drunk at the Homeric cistern till his entire being is impregnated with the influence thence derived. The *Iliad* and the *Odyssey* are as familiar to him as Shakespeare to the most highly educated of modern Englishmen. He is acquainted with the poems of the epic cycle, the *Cypria*, the *Epigoni*, &c. He quotes or otherwise shows familiarity with the writings of Hesiod, Olen, Musæus, Bacis, Lysistratus, Archilochus of Paros, Alcæus, Sappho, Solon, Æsop, Aristeas of Proconnesus, Simonides of Ceos, Phrynichus, Æschylus, and Pindar. He quotes and criticizes Hecatæus, the best of the prose writers who had preceded him, and makes numerous allusions to other authors of the same class. It may be questioned whether there was any single work of importance in the whole range of extant Greek literature with the contents of which Herodotus had not made himself acquainted by the time that he undertook the composition of his "History."

It must not, however, be supposed that the great Halicarnassian was at any time a mere recluse student. There can be no reasonable doubt that from a very early age his inquiring disposition led him to engage in travels, both in Greece and in foreign countries, which must have been continued year after year for a considerable period, and which made him as familiar with men as with books. He traversed Asia Minor and European Greece in all directions, probably more than once; he visited all the most important islands of the Archipelago,—Rhodes, Cyprus, Delos, Paros, Thasos, Samothrace, Crete, Samos, Cythera, and Ægina. He undertook the long and perilous journey from Sardis to the Persian capital Susa, passed some considerable time at Babylon, and went a voyage to Colchis, and another along the western shores of the Black Sea as far as the estuary of the Dnieper; he travelled in Scythia and in Thrace, visited Zante and Magna Græcia, explored the antiquities of Tyre, coasted along the shores of Palestine, saw Gaza, and made a long stay in Egypt. At the most moderate estimate, his travels covered a space of thirty-one degrees of longitude, or 1700 miles, and twenty-four of latitude, or nearly the same distance. Nor was he content, like the modern tourist, with hasty glimpses of the countries which he visited. At all the more interesting sites he took up his abode for a time; he examined, he inquired, he made measurements, he accumulated materials. Having in his mind the scheme of his great work, he gave ample time to the elaboration of all its parts, and took care to obtain by personal observation a full knowledge of all the various countries which were to form the scene of his narrative.

The travels of Herodotus seem to have been chiefly accomplished between his twentieth and his thirty-seventh year (464–447 B.C.). It was probably in his early manhood that as a Persian subject he visited Susa and Babylon, taking advantage of the Persian system of posts which he describes in his fifth book. His residence in Egypt must, on the other hand, have been subsequent to 460 B.C., since he saw the skulls of the Persians slain by Inarus in that year. Skulls are rarely visible on a battlefield for more than two or three seasons after the fight, and we may therefore presume that it was during the reign of Inarus (460–454 B.C.), when the Athenians had great authority in Egypt, that he visited the country, making himself known as a learned Greek, and therefore receiving favour and attention on the part of the Egyptians, who were so much beholden to his countrymen. On his return from Egypt, as he proceeded along the Syrian shore, he seems to have landed at Tyre, and from thence to have gone to Thasos, which lay off the coast of Thrace. His Scythian travels are thought to have taken place prior to 450 B.C.

It is a question of some interest from what centre or centres these various expeditions were made. Up to the time of the execution of Panyasis, which is placed by chronologists in or about the year 457 B.C., there is every reason to believe that Halicarnassus was the historian's home; and thus we may assume that, for some seven or eight years, that city was the point from which he started and to which he returned. His travels in Asia Minor, in European Greece, and among the islands of the Ægean probably belong to this period, as does also his journey to Susa and Babylon. We are told that when he quitted Halicarnassus on account of the tyranny of Lygdamis, in or about the year 457 B.C., he took up his abode in Samos. That island was an important member of the Athenian confederacy, and in making it his home Herodotus would have put himself under the protection of Athens. The fact that Egypt was then largely under Athenian influence may have induced him to proceed, in 457 or 456 B.C., to that country. The complete knowledge that he has of the whole of Egypt indicates a stay there of some years, and it was perhaps not till 454 B.C. that he returned to his Samian home. The stories that he had heard in Egypt of Sesostris may then have stimulated him to make voyages from Samos to Colchis, Scythia, and Thrace. When he had seen these countries, he had made acquaintance with almost all the regions which were to be the scene of his projected history, and could apply himself to the task of its composition with the comfortable feeling that he possessed all the local knowledge requisite for graphic and telling description.

After Herodotus had resided for some seven or eight years in Samos, events occurred in his native city which induced him to return thither. The tyranny of Lygdamis had gone on from bad to worse, and at last the citizens rose in rebellion against him, and he was expelled. According to Suidas, Herodotus was himself an actor, and indeed the chief actor, in the enterprise; but no other author confirms this statement, which is intrinsically improbable. It is certain, however, that a revolt broke out, that Lygdamis was dethroned, and that Halicarnassus became a voluntary member of the Athenian confederacy, to which it continued thenceforth attached. Herodotus would now naturally return to his native city, and enter upon the enjoyment of those rights of free citizenship on which every Greek set a high value. He would also, if he had by this time composed his history, or any considerable portion of it, begin to make it known by recitation among his friends and acquaintance. There is reason to believe that these first attempts to push himself into notice were not received with much favour,—the prophet did not obtain honour in his own country,—his countrymen ridiculed the work which they had been expected to admire; and the disappointed author, chagrined at his failure, precipitately withdrew from his native town, and sought a refuge in Greece proper (about 447 B.C.).

A writer of late date (125–200 A.D.) and low credit, Lucian of Samosata, in one of his rhetorical pieces, declares that on quitting Halicarnassus Herodotus proceeded straight to Olympia, and finding the quadriennial festival in progress recited his work to the assembled multitudes, who were highly delighted with it, and freely expressed their admiration. The statement, however, is improbable, and is rejected by most critics, who point out with reason the unsuitability of the work for recitation before an assemblage of persons from all parts of Greece, and call attention to the suspicious circumstance that the story is first told 600 years after the time of its supposed occurrence. From earlier and better writers we learn that Athens was the place to which the disappointed author betook himself, and that he appealed from the verdict of his countrymen to Athenian taste and judgment. By recitations held in that city he made his work known to the best Grecian intellects, and won such approval that in the year 445 B.C., on the proposition of a certain Anytus, he was voted a sum of ten talents (£2400) by decree of the people. At one of the recitations Thucydides was present with his father, Olorus, and was so moved that he burst into tears, whereupon Herodotus remarked to the father—"Olorus, your son has a natural enthusiasm for letters."

Athens was at this time the centre of intellectual life, and could boast a galaxy of talent such as has rarely been gathered together either before or since. The stately Pericles, his clever rival Thucydides the son of Melesias, the fascinating Aspasia, the eloquent Antiphon, the scientific musician Damon, the divine Phidias, Protagoras the subtle disputant, Zeno the inventor of logic, the jovial yet bitter

Cratinus, the gay Crates, Euripides the master of pathos, Sophocles the most classic even of the ancients, formed a combination of which even Athens might be proud, and which must have charmed the literary aspirant. Accepted into this brilliant society, on familiar terms with all probably, as he certainly was with Olorus, Thucydides, and Sophocles, he cannot but have found his Attic sojourn delightful, and have been tempted, like many another foreigner, to make Athens his permanent home. It is to his credit that he did not yield to this temptation. At Athens he must have been a dilettante, an idler, without political rights or duties, a mere literary man. As such he would have soon ceased to be respected in a society where literature was not recognized as a separate profession, where a Socrates served in the infantry, and a Sophocles commanded fleets, and a Thucydides was general of an army, and an Antiphon was for a time at the head of the state. Men were not men according to Greek notions unless they were citizens; and Herodotus, aware of this, probably sharing in the feeling, was anxious, having lost his political status at Halicarnassus, to obtain such status elsewhere. At Athens the franchise, jealously guarded at this period, was not to be attained without great expense and difficulty. Accordingly, in the year 444 B.C., on the scheme of sending a colony to Thurii in Italy being broached by Pericles, Herodotus was among those who gave in their names; and in the spring of the following year he sailed from Athens to Italy with the other colonists, and became a citizen of the new town.

From this point of his career, when he had reached the age of forty, we lose sight of Herodotus almost wholly. He seems to have made but few journeys, one to Crotona, one to Metapontum, and one to Athens (about 430 B.C.) being all that his work indicates. No doubt he was employed mainly, as Pliny testifies, in retouching and elaborating his general history. He may also have composed at Thurii that special work on the history of Assyria to which he twice refers in his first book, and which is quoted by Aristotle. It has been supposed by many that he lived to a great age, and argued that "the never-to-be-mistaken fundamental tone of his performance is the quiet talkativeness of a highly cultivated, tolerant, intelligent, *old* man" (Dahlmann). But the indications derived from the later touches added to his work, which form the sole evidence on the subject, would rather lead to the conclusion that his life was not very prolonged. There is nothing in the nine books which may not have been written as early as 430 B.C.; there is no touch which, even probably, points to a later date than 424 B.C. As the author was evidently engaged in polishing up his work to the last, and even promises touches which he does not give, we may assume that he did not much outlive the date last mentioned, or in other words, that he died at about the age of sixty. The predominant voice of antiquity tells us that he died at Thurii, where his tomb was shown in later ages.

In estimating the great work of Herodotus, and his genius as its author, it is above all things necessary to conceive aright what that work was intended to be. It has been called "a universal history," "a history of the wars between the Greeks and the barbarians," and "a history of the struggle between Greece and Persia." But these titles are all of them too comprehensive. Herodotus, who omits wholly the histories of Phœnicia, Carthage, and Etruria, three of the most important among the states existing in his day, cannot have intended to compose a "universal history," the very idea of which belongs to a later age. He speaks in places as if his object was to record the wars between the Greeks and the barbarians; but as he omits the Trojan war, in which he fully believes, the expedition of the Teucrians and Mysians against Thrace and Thessaly, the wars connected with the Ionian colonization of Asia Minor, and others, it is evident that he does not really aim at embracing in his narrative all the wars between Greeks and barbarians with which he was acquainted. Nor does it even seem to have been his object to give an account of the entire struggle between Greece and Persia. That struggle was not terminated by the battle of Mycale and the capture of Sestos in 479 B.C. It continued for thirty years longer, to the peace of Callias. The fact that Herodotus ends his history where he does shows distinctly that his intention was, not to give an account of the entire long contest between the two countries, but to write the history of a particular war—the great Persian war of invasion. His aim was as definite as that of Thucydides, or Schiller, or Napier, or any other writer who has made his subject a particular war; only he determined to treat it in a certain way. Every partial history requires an "introduction;" Herodotus, untrammelled by examples, resolved to give his history a magnificent introduction. Thucydides is content with a single introductory book, forming little more than one-eighth of his work; Herodotus has six such books, forming two-thirds of the entire composition.

By this arrangement he is enabled to treat his subject in the *grand* way, which is so characteristic of him. Making it his main object in his "introduction" to set before his readers the previous history of the two nations who were the actors in the great war, he is able in tracing their history to bring into his narrative some account of almost all the nations of the known world, and has room to expatiate freely upon their geography, antiquities, manners and customs, and the like, thus giving his work the "universal" character which has been detected in it, and securing for it, without trenching upon unity, that variety, richness, and fulness which are a principal charm of the best histories, and of none more than his. In tracing the growth of Persia from a petty subject kingdom to a vast dominant empire, he has occasion to set out the histories of Lydia, Media, Assyria, Babylon, Egypt, Scythia, Thrace, and to describe the countries and the peoples inhabiting them, their natural productions, climate, geographical position, monuments, &c.; while, in noting the contemporaneous changes in Greece, he is led to tell of the various migrations of the Greek race, their colonies, commerce, progress in the arts, revolutions, internal struggles, wars with one another, legislation, religious tenets, and the like. The greatest variety of episodical matter is thus introduced; but the propriety of the occasion and the mode of introduction are such that no complaint can be made—the episodes never entangle, encumber, or even unpleasantly interrupt the main narrative.

The most important quality of a historian is trustworthiness; for a professed history is of no value unless we can place reliance upon its truth. It has been questioned, both in ancient and in modern times, whether the history of Herodotus possesses this essential requisite. Several ancient writers call his veracity in question, accusing him of the crime of conscious and intentional untruthfulness. Moderns generally acquit him of this charge; but his severer critics still urge that, from the inherent defects of his character, his credulity, his love of effect, and his loose and inaccurate habits of thought, he was unfitted for the historian's office, and has produced a work of but small historical value. It is impossible, within the limits of an article such as the present, to enter fully upon this controversy. Perhaps it may be sufficient to remark that the defects in question certainly exist, and detract to some extent from the authority of the work, more especially of those parts of it which deal with remoter periods, and were taken by Herodotus on trust from his informants, but that they only slightly affect the portions which treat of later times and form the special subject of his history. In confirmation of this view, it may be noted that the authority of Herodotus for the circumstances of the great Persian war, and for all local and other details which came under his immediate notice, is accepted by even the most sceptical of modern historians, and forms the basis of their narratives.

Among the merits of Herodotus as an historian, the most prominent are the diligence with which he has collected the materials for his history, the candour and impartiality with which he has placed his facts before the reader, the political dispassionateness which he displays in the judgments that he passes upon party leaders, the absence of undue national vanity, and the breadth of his conception of the historian's office, which makes his work a storehouse of diversified knowledge for which the student of antiquity can never be sufficiently grateful. On the other hand, he has no claim to rank as a critical historian; he has no conception of the philosophy of history, no insight into the real causes that underlie political changes, no power of penetrating below the surface, or even of grasping the real interconnexion of the events which he describes. He belongs distinctly to the romantic school; his forte is vivid and picturesque description, the lively presentation to the reader of scenes and actions, characters and states of society, not the subtle analysis of motives, or the power of detecting the undercurrents which sway events, or the generalizing faculty which draws lessons from history and makes the past illumine the darkness of the future.

But it is as a writer that the merits of Herodotus are most conspicuous and most unquestioned. "O that I were in a condition," says Lucian, "to resemble Herodotus, if only in some measure! I by no means say in all his gifts, but only in some single point; as, for instance, the beauty of his language, or its harmony, or the natural and peculiar grace of the Ionic dialect, or his fulness of thought, or by whatever name those thousand beauties are called which to the despair of his imitator are united in him." Cicero calls his style "copious and polished;" Quintilian, "sweet, pure, and flowing;" Longinus says he was "the most Homeric of historians;" Dionysius, his countryman, prefers him to Thucydides, and regards him as combining in an extraordinary degree the excellencies of sublimity, beauty, and the true historical method of composition. Moderns are almost equally complimentary. "The style of Herodotus," says one, "is universally allowed to be remarkable for its harmony and sweetness." "The charm of his style," argues another, "has so dazzled men as to make them blind to his defects." Various attempts have been made to analyse the nature of the charm which is so universally felt; but it may be doubted whether any of them are very successful, whether the aroma of the flower does not evaporate in the critic's alembic. All, however, seem to agree that among the qualities for which the style of Herodotus is to be admired are simplicity, freshness, naturalness, and harmony of rhythm. Master of a form of language peculiarly sweet and euphonical, and possessed of a delicate ear which instinctively suggested the most musical arrangement possible, he gives his sentences, without art or effort, the most agreeable flow, is never abrupt, never too diffuse, much less prolix or wearisome, and being himself simple, fresh, *naif* (if we may use the word), honest, and somewhat quaint, he delights us by combining with this melody of sound simple, clear, and fresh thoughts, perspicuously expressed, often accompanied by happy turns of phrase, and always manifestly the spontaneous growth of his own fresh and unsophisticated mind. Reminding us in some respects of the quaint mediæval writers, Froissart and Philippe de Comines, he greatly excels them, at once in the beauty of his language and the art with which he has combined his heterogeneous materials into a single perfect harmonious whole.

As might have been expected from its excellence, the history of Herodotus has been translated by many persons and into many languages. About 1450, at the time of the revival of learning, a Latin version was made and published by Laurentius Valla. This was revised in 1537 by Heresbach, and has accompanied the Greek text of Herodotus in many editions. The first complete translation into a modern language was the English one of Littlebury, published in 1737. This was followed in 1786 by the French translation of Larcher, a valuable work, accompanied by copious notes and essays. Beloe, the second English translator, based his work on that of Larcher. His first edition, in 1791, was confessedly very defective; the second, in 1806, still left much to be desired. A good German translation, but without note or comment, was brought out by Friedrich Lange at Berlin in 1811. Andrea Mustoxidi, a native of Corfu, published an Italian version in 1820. In 1822 Auguste Miot endeavoured to improve on Larcher; and in 1828-32 Dr Adolf Schöll brought out a German translation with copious notes (new ed., 1855), which has to some extent superseded the work of Lange. About the same time a new English version was made by Mr Isaac Taylor (London, 1829). Finally, in 1858-60, the history of Herodotus was translated by Canon Rawlinson, assisted in the copious notes and appendices accompanying the work by Sir Gardner Wilkinson and Sir Henry Rawlinson. More recently we have translations in German by Bahr (Stuttgart, 1867) and Stein (Oldenburg, 1875); in French by Giguet (1857) and Talbot (1864); and in Italian by Ricci (Turin, 1871-76), Grandi (Asti, 1872), and Bertini (Naples, 1871-2). A Swedish translation by F. Carlstadt was published at Stockholm in 1871.

The best recent editions of the Greek text of Herodotus are the following:—*Herodoti Historiæ*, ed. Schweighäuser, 5 vols. 8vo, Strasburg, 1816; *Herodoti Halicarnassei Historiarum libri IX.*, ed. Gaisford, Oxford, 1840; *Herodotus, with a Commentary*, by J. W. Blakesley, B.D., 2 vols. 8vo, London, 1854; *Herodoti Musæ*, ed. Bahr, 4 vols. 8vo, Leipsic, 1856-61, 2d ed.; *Herodoti Historiæ*, ed. Abicht, 2 vols. 8vo, Leipsic, 1869; and *Herodoti Historiæ*, ed. H. Stein, 2 vols., 1869-71. Among works of value illustrative of Herodotus may be mentioned Bouhier, *Recherches sur Hérodote*, Dijon, 1746; Rennell, *Geography of Herodotus*, London, 1800; Niebuhr, *Geography of Herodotus and Scythia*, Eng. trans., Oxford, 1830; Dahlmann, *Herodot, aus seinem Buche sein Leben*, Altona, 1823; Eltz, *Quæstiones Herodoteæ*, Leipsic, 1841; Kenrick, *Egypt of Herodotus*, London, 1841; Mure, *Literature of Greece*, vol. iv., London, 1852; Abicht, *Uebersicht über den Herodoteischen Dialect* (Leipsic, 1869, 3d ed. 1874), and *De codicum Herodoti fide ac auctoritate* (Naumburg, 1869); Melander, *De anacoluthis Herodoteis* (Lund, 1869); Matzat, "Ueber die Glaubenswurdigkeit der geograph. Angaben Herodots uber Asien," in *Hermes*, vi.; Budinger, *Zur egyptischen Forschung Herodots* (Vienna, 1873, reprinted from the *Sitzungsber.* of the Vienna Acad.); Merzdorf, *Quæstiones grammaticæ de dialecto Herodotea* (Leipsic, 1875); A. Kirchhoff, *Ueber die Entstehungszeit des Herodotischen Geschichtswerk* (Berlin, 1878); and Adolf Bauer, *Herodots Biographie* (Vienna, 1878). For notices of current literature see Bursian's *Jahresbericht*. Students of the original may also consult with advantage the lexicons of Æmilius Portus (Oxford, 1817) and of Schweighäuser (London, 1824). (G. R.)

HÉROLD, Louis Joseph Ferdinand (1791-1833), French musician, was born in Paris, January 28, 1791, the son of François Joseph Hérold, an accomplished pianist, who, however, did not at first wish his son to adopt the musical profession. It was indeed not till after his father's death that Hérold in 1806 entered the Paris conservatoire, where he studied under Catel and Méhul, one of the leading composers of the time, by whose teaching his pupil profited soon and permanently. In 1812 he gained the grand prix de Rome (a travelling scholarship awarded by the French Government to the best pupils of the conservatoire), and accordingly started for Italy, where he remained till 1815, and composed a symphony, a cantata, and several pieces of chamber music. It was also during his stay in Italy that Hérold for the first time ventured on the stage with the opera *La Gioventù di Enrico V.*, first performed at Naples in 1815 with moderate success. Returning to Paris he had the good fortune to be invited by Boieldieu to participate in the composition of an opera called *Charles de France*, performed in 1816, and soon followed by Hérold's first French opera, *Les Rosières* (1817), which was received very favourably. Of the numerous dramatic works which Hérold produced for the next fifteen years in rapid succession it is unnecessary to give a detailed account. Only the names of some of the more important may be mentioned here:—*La Clochette* (1817), *L'Auteur mort et vivant* (1820), *Marie* (1826), and the ballets *La Fille mal Gardée* (1828) and *La Belle au Bois Dormant* (1829). Hérold also wrote a vast quantity of pianoforte music of a more or less ephemeral kind, in spite of his time being much occupied by his duties as accompanist at the Italian opera in Paris. In 1831 he produced one of the two works which have given immortality to his name, the romantic opera *Zampa*, which has met with immense success not only in France but also in Germany, where it has kept the stage till the present day, and is considered Hérold's masterpiece. In France that eminence is justly awarded to the *Le Pré aux Clercs* (first performance December 15, 1832), in every way a representative work of the French school, in which French esprit and French chivalry find their most perfect embodiment. Grace, liveliness, and true dramatic spirit are Hérold's best qualities, and secure him a prominent place amongst the composers of *opéra comique*, in the more refined sense which has been lost by most composers of modern France. Hérold died January 19, 1833, of the lung disease from which he had suffered for many years, and the effects of which he accelerated by incessant work.

HERON, or Hero, a mathematician and natural philosopher of Alexandria, was the pupil of Ctesibius, and flourished probably about a century or a century and a half before Christ. His name has been preserved in the well-known experiment of Hero's fountain, in which, by means of condensed air, water is made to spring from a jet in a continuous stream. Several of Heron's writings are entirely lost, and of those that remain some have never been printed. His most valuable work is that on *Pneumatics*, in which are given his experiments on the elasticity of the air and of steam. His *Mechanics* and *Barulcus* treat of the subjects which would now be comprised in an elementary book on dynamics. At the end of his *Catapultica* or *Belopoeica*, which are probably the same, occurs Heron's solution of the ancient and much discussed problem to find two mean proportionals between two given straight lines. *Cheirobalistra*, *Carbestra*, *Camarica*, *Automata*, are the titles of some of his other physical works. His mathematical works (see Hultsch's *Heronis Alexandrini Geometricorum et Stereometricorum Reliquiae*, Berlin, 1864) are very fragmentary, and it is difficult to determine whether several of them are not to be attributed to later and anonymous writers. Heron seems to have been the first to show how the area of a triangle may be found from its three sides. See two papers by Vincent and Boncompagni in *Bullettino di bibliografia e di storia delle scienze matematiche e fisiche*, iv.

HERON, called the younger, to distinguish him from his namesake of Alexandria, was, like him, a mathematician and natural philosopher. By some he is supposed to have flourished in the first half of the 7th century A.D.; by others, with more probability, to have lived at Constantinople in the 10th century. He wrote a treatise on [illegible] and another on the [illegible] of [illegible]*lids*, which [illegible]. [illegible] mathematical writings assigned to him should perhaps be referred to Heron the elder (see Martin, *Recherches sur la vie et les ouvrages d'Héron d'Alexandrie*, [illegible], Paris, 1854).

HERON (French, *Héron*; Italian, *Aghirone*, *Airone*; [illegible]), [illegible] the representative of a [illegible] group, the *Ardeidae*, which, [illegible] has been for many years encumbered by a considerable number of alien forms, belonging truly to the Cranes, *Gruidae* (see vol. vi. p. 546), and Storks, *Ciconiidae*, whose structure and characteristics are wholly distinct, however much external resemblance some of them may possess to the Herons. Eliminating these intruders, it is difficult or even impossible to estimate with any accuracy the number of species of *Ardeidae* which exist. Professor Schlegel in 1863 enumerated 61, besides 5 of what he terms "conspecies," as contained in the collection at Leyden (*Mus. des Pays Bas*, Ardeae, 64 pp.),—on the other hand, G. R. Gray in 1871 (*Hand-list*, &c., iii. pp. 26–34) admitted above 90, while Dr Reichenow (*Journal für Ornithologie*, 1877, pp. 232–275) recognizes 67 as known, besides 15 "subspecies" and 3 varieties, arranging them in 3 genera, *Nycticorax*, *Botaurus*, and *Ardea*, with 17 subgenera. But it is difficult to separate the Family, with any satisfactory result, into genera, if structural characters have to be found for these groups, for in many cases they run almost insensibly into each other—though in common language it is easy to speak of Herons, Egrets, Bitterns, Night Herons, and Boatbills. With the exception of the last Professor Schlegel retains all in the genus *Ardea*, dividing it into *eight* sections, the names of which may perhaps be Englished—Great Herons, Small Herons, Egrets, Semi-egrets, Rail-like Herons, Little Bitterns, Bitterns, and Night Herons. It may be expedient here to adopt this arrangement, though the present writer would guard himself against being supposed to give it more than partial and provisional assent.

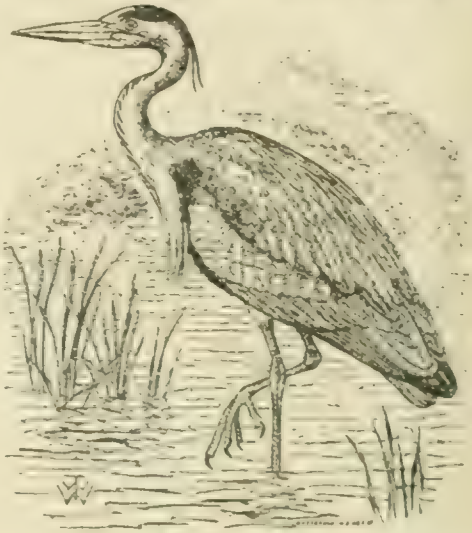

Fig. 1.—Heron.

The common Heron of Europe, *Ardea cinerea* of Linnaeus, is universally allowed to be the type of the Family, and it may also be regarded as that of Professor Schlegel's first section. The species inhabits [illegible] throughout the whole of Europe, Africa, and Asia, reaching Japan, many of the islands of the Indian Archipelago, and even Australia. Though by no means so numerous as formerly in Britain, it is still sufficiently common to render a description of it almost unnecessary,[1] and there must be few persons who have not seen it rising slowly from some river side or marshy flat, or passing overhead in its stately and heavy flight on its way to or from its daily haunts; while there are many who have been entertained by watching it as it seeks its food, consisting chiefly of fishes (especially eels and flounders) and amphibians—though young birds and small mammals are not amiss—wading warily in the shallows, swimming occasionally when out of its depth, or standing motionless to strike its prey with its formidable and sharp beak. When sufficiently numerous the Heron breeds in societies, known as Heronries, which of old time were protected both by law and custom in nearly all European countries, on account of the sport their tenants afforded to the falconer. Of late years, partly owing to the withdrawal of the protection they had enjoyed, and still more, it would seem, from agricultural improvement, which, by draining meres, fens, and marshes, has abolished the feeding places of a great population of Herons, many of the larger Heronries have broken up—the birds composing them dispersing to neighbouring localities and forming smaller settlements, most of which are hardly to be dignified by the name of Heronry, though commonly accounted such. Thus the number of so-called Heronries in the United Kingdom, and especially in England and Wales, has become far greater than formerly, but no one can doubt that the number of Herons has dwindled. Mr Harting, after being at great pains to collect statistics on the subject, gave, in 1872 (*Zoologist*, s.s. pp. 3261-3272; with additions and corrections, pp. 3404-3407), a list of those existing in the three kingdoms, more than 200 in number, of which a little over one half are in England and Wales, more than 50 in Scotland, and nearly 50 in Ireland. The sites chosen by the Heron for its nest vary greatly. It is generally built in the top of a lofty tree, but not unfrequently (and this seems to have been much more usual in former days) near or on the ground among rough vegetation, on an island in a lake, or again on a rocky cliff of the coast. It commonly consists of a huge mass of sticks, often the accumulation of years, lined with twigs, and in it are laid from four to six sea-green eggs. The young are clothed in soft flax-coloured down, and remain in the nest for a considerable time, therein differing remarkably from the "pipers" of the Crane, which are able to run almost as soon as they are hatched. The first feathers assumed by young Herons in a general way resemble those of the adult, but the fine leaden-grey back, the pure white breast, the black throat-streaks, and especially the long pendent plumes, which characterize only the very old birds, and are most beautiful in the cocks, are subsequently acquired. The Heron measures about 3 feet from the bill to the tail, and the expanse of its wings is sometimes not less than 6 feet, yet it weighs only between 3 and 4 lb.

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[1] [illegible]

Large as is the common Heron of Europe, it is exceeded in size by the Great Blue Heron of America, *Ardea herodias*, which generally resembles it in appearance and habits, and both are smaller than the *A. sumatrana* or *A. typhon* of India and the Malay Archipelago, while the *A. goliath*, of wide distribution in Africa and Asia, is the largest of all. The Purple Heron, *A. purpurea*, as a well-known European species having a great range over the Old World, also deserves mention here. Of the species included in Professor Schlegel's second section, little need now be said. They inhabit the tropical parts of Africa, Australasia, and America. The Egrets, forming his third group, require more notice, distinguished as they are by their pure white plumage, and, when in breeding-dress, by the beautiful dorsal tufts of decomposed feathers that ordinarily droop over the tail, and are so highly esteemed as ornaments by Oriental magnates. The largest species is *A. occidentalis*, only known apparently from Florida and Cuba; but one not much less, the Great Egret, *A. alba*, belongs to the Old World, breeding regularly in south-eastern Europe, and occasionally straying to Britain. A third, *A. egretta*, represents it in America, while much the same may be said of two smaller species, *A. garzetta*, the Little Egret of English authors, and *A. candidissima*; and a sixth, *A. intermedia*, is common in India, China, and Japan, besides occurring in Australia. The group of Semi-egrets, containing some nine or ten forms, among which the Buff-backed Heron, *A. bubulcus*, is the only species that is known to have occurred in Europe, is hardly to be distinguished from the last section except by their plumage being at certain seasons varied in some species with slaty blue and in others with rufous. The Rail-like Herons form Professor Schlegel's next section, but it can scarcely be satisfactorily differentiated, and the epithet is misleading, for its members have no Rail-like affinities, though the typical species, which inhabits the south of Europe, and occasionally finds its way to England, has long been known as *A. ralloides*.[1] Nearly all these birds are tropical or subtropical. Then there is the somewhat better defined group of Little Bitterns, containing about a dozen species—the smallest of the whole family. One of them, *A. minuta*, though very local in its distribution, is a native of the greater part of Europe, and has bred in England. It has a close counterpart in the *A. exilis* of North America, and is represented by three or four forms in other parts of the world, the *A. pusilla* of Australia especially differing very slightly from it. Ranged by Professor Schlegel with these birds, which are all remarkable for their skulking habits, but more resembling the true Herons in their nature, are the common Green Bittern of America, *A. virescens*, and its very near ally the African *A. atricapilla*, from which last it is almost impossible to distinguish the *A. javanica*, of wide range throughout Asia and its islands, while other species, less closely related, occur elsewhere as *A. flavicollis*,—one form of which, *A. gouldi*, inhabits Australia.

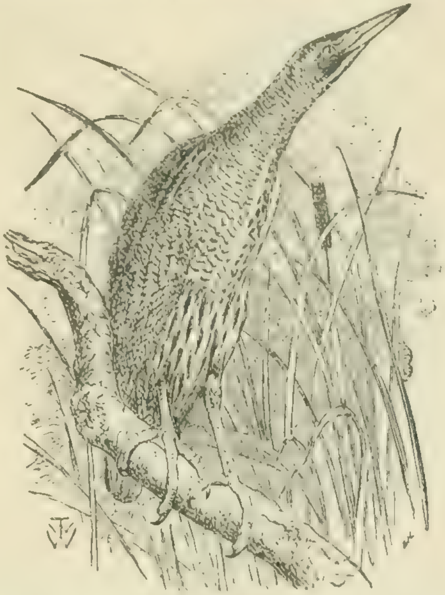
FIG. 2.—Bittern.

The true Bitterns, forming the genus *Botaurus* of most authors, seem to be fairly separable, but more perhaps on account of their wholly nocturnal habits and correspondingly adapted plumage than on strictly structural grounds, though some differences of proportion are observable. The common Bittern of Europe, *B. stellaris*, was formerly an abundant bird in many parts of Britain; but, since the reclamation of the bogs and fens it used to inhabit, it is become only an irregular visitant,—though not a winter passes without its appearing in some numbers, when its uncommon aspect, its large size, and beautifully pencilled plumage cause it to be regarded as a great prize by the lucky gun-bearer to whom it falls a victim. Its value as a delicacy for the table, once so highly esteemed, has long vanished. The old fable of this bird inserting its beak into a reed or plunging it into the ground, and so causing the booming sound with which its name will be always associated, is also exploded, and nowadays indeed so few people in Britain have ever heard its loud and awful voice, which seems to be uttered only in the breeding-season, and is therefore unknown in a country where it no longer breeds,[1] that incredulity as to its booming at all has in some quarters succeeded the old belief in this as in other reputed peculiarities of the species. The Bittern is found from Ireland to Japan, in India, and throughout the whole of Africa—suitable localities being, of course, understood. Australia and New Zealand have a kindred species, *B. poeciloptilus*, and North America a third, *B. mugitans* or *B. lentiginosus*. The former is said to bellow like a bull, but authorities differ as to the vocal powers of the latter,[2] which has several times wandered to Europe, and is distinguishable by its smaller size and uniform greyish-brown primaries, which want the tawny bars that characterize *B. stellaris*. Nine other species of Bitterns from various parts of the world are admitted by Professor Schlegel, but some of them should perhaps be excluded from the genus *Botaurus*.

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[1] It is the "Squacco-Heron" of modern British authors—the distinctive name, given "Sguacco" by Willughby and Ray from Aldrovandus, having been misspelt by Latham.

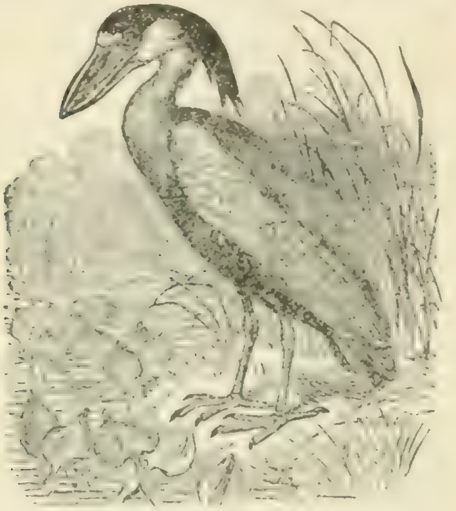

Fig. 2.—Boatbill.

Of the Night Herons the same author recognizes six species, all of which may be reasonably placed in the genus *Nycticorax*, characterized by a stouter beak and a few other peculiarities, among which the large eyes deserve notice. The best known is *N. griseus*, a bird widely spread over the Old World, and not unfrequently visiting England, where it would undoubtedly breed if permitted. Professor Schlegel united with it the common Night Heron of America, but this, though very closely allied, is generally deemed distinct, and is the *N. naevius* or *N. gardeni* of most writers. A clearly different American species, with a more southern habitat, is the *N. violaceus* or *N. cayennensis*, while others are found in South America, Australia, some of the Asiatic Islands, and in West Africa. The Galapagos have a peculiar species, *N. pauper*, and another, so far as is known, peculiar to Rodriguez, *N. megacephalus*, existed in that island at the time of its being first colonized, but is now extinct

The Boatbill, of which only one species is known, seems to be merely a Night Heron with an exaggerated bill,—so much widened as to suggest its English name,—but has always been allowed generic rank. This curious bird, the *Cancroma cochlearia* of most authors, is a native of tropical America, and what is known of its habits shews that they are essentially those of a *Nycticorax*.[3]

Bones of the common Heron and Bittern are not uncommon in the peat of the East-Anglian fens. Remains from Sansan and Langy in France have been referred by M. Alphonse Milne-Edwards to Herons under the names of *Ardea perplexa* and *A. formosa*; a tibia from the Miocene of Steinheim by Dr Fraas to an *A. similis*, while Professor Owen recognized a portion of a sternum from the London Clay as most nearly approaching this Family.

It remains to say that the Herons form part of Professor Huxley's section *Pelargomorphae*, belonging to his larger group *Desmognathae*, and to draw attention to the singular development of the patches of "powder-down" which in the family *Ardeidae* attain a magnitude hardly to be found elsewhere. Their use is utterly unknown. (A. N.)

HEROPHILUS. See ANATOMY, vol. i. p. 801-2.

HERRERA, FERNANDO DE (1534-1597), lyrical poet, born at Seville in 1534. Although an ecclesiastic, he addressed his verses to an Andalusian lady, said to have been the countess of Gelves, under different names; but his love was as Platonic as Petrarch's, and served only to lend additional beauty and tenderness to his poems. Herrera has been celebrated in a sonnet by Cervantes; and his poems were taken as models by the later poet, Lope de Vega. He died at Seville in 1597. Flourishing at a time when the Castilian language was not yet ripe for the higher lyrical efforts, Herrera endeavoured to remedy the defects of his native tongue by expelling from poetry the more vulgar and trivial words, by introducing words in their place from Greek, Latin, and Italian, and by employing unfamiliar inflexions and inverted constructions so as to approach more nearly the model of the classical tongues. His system, however, was theoretical and artificial, and not inspired by any genuine impulse of taste, so that in many instances where he strives to be elevated and correct, he succeeds only in being affected and formal.

Herrera [illegible] his critical views [illegible], in able notes to the works of [illegible], whose [illegible] in a volume of [illegible] 1582. [illegible] the [illegible] poet, and the [illegible] best of all. The [illegible] of these last are perhaps the two on the battle of Lepanto and on the overthrow of Sebastian of Portugal. The [illegible] been frequently printed. [illegible] published [illegible] poems of Herrera in 1619, and [illegible] [illegible] *The Battle of [illegible]*, *The [illegible]*, *The [illegible]* and *The [illegible]* [illegible] of Herrera, which [illegible] [illegible] [illegible] 1572, [illegible] [illegible] Thomas [illegible] to [illegible] down to our time.

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[1] The [illegible] of the Bittern breeding in England [illegible] [illegible] as far as is known, [illegible]

[2] [illegible]

[3] [illegible] greater [illegible]

HERRERA, Francisco (1576–1656), surnamed el Viejo (the old), historical and fresco painter, studied under Luis Fernandez in Seville, his native city, where he spent the most of his life. Although so rough and coarse in manners that neither scholar nor child could remain with him, the great talents of Herrera, and the promptitude with which he used them, brought him abundant commissions. He was also a skilled worker in bronze, an accomplishment that led to his being charged with coining base money. From this accusation, whether true or false, he sought sanctuary in the Jesuit college of San Hermenegildo, which he adorned with a fine picture of its patron saint. Philip IV., on his visit to Seville in 1624, having seen this picture, and learned the position of the artist, pardoned him at once, warning him, however, that such powers as his should not be degraded. In 1650 Herrera removed to Madrid, where he lived in great honour till his death in 1656. Herrera was the first to relinquish the timid manner of the old Spanish school of painting, and to initiate the free, vigorous touch and style which reached such perfection in Velazquez, who had been for a short time his pupil. His pictures are marked by an energy of design and freedom of execution quite in keeping with his bold, rough character. He is said to have used very long brushes in his painting; and it is also said that, when pupils failed, his servant used to dash the colours on the canvas with a broom under his directions, and that he worked them up into his designs before they dried. The drawing in his pictures is correct, and the colouring original and skilfully managed, so that the figures stand out in striking relief. What has been considered his best easel-work, the Last Judgment, in the church of San Bernardo at Seville, is an original and striking composition, showing in its treatment of the nude how ill founded the common belief was that Spanish painters, through ignorance of anatomy, understood only the draped figure. Perhaps his best fresco is that on the dome of the church of San Buenaventura; but many of his frescos have perished, some by the effects of the weather, and others by the artist's own carelessness in preparing his surfaces. He has, however, preserved several of his own designs in etchings. For his easel works Herrera often chose such humble subjects as fairs, carnivals, ale-houses, and the like.

See Stirling's *Annals of the Artists of Spain*, 3 vols., 1848.

HERRERA, Francisco (1622–1685), surnamed el Mozo (the young), historical and fresco painter, son of the subject of last notice, was also a native of Seville. Unable to endure his father's cruelty, the younger Herrera, seizing what money he could find, fled to Rome. There, instead of devoting himself to the antiquities and the works of the old Italian masters, he gave himself up to the study of architecture and perspective, with the view of becoming a fresco-painter. He did not altogether neglect easel-work, but became renowned for his pictures of still-life, flowers, and fruit, and from his skill in painting fish was called by the Italians *Lo Spagnuolo degli pesci*. In later life he painted portraits with great success. He returned to Seville on hearing of his father's death; and in 1660 was appointed sub-director of the new academy there under Murillo. His vanity, however, brooked the superiority of no one; and throwing up his appointment he went to Madrid. There he was employed to paint a San Hermenegildo for the barefooted Carmelites, and to decorate in fresco the roof of the choir of San Felipe el Real. The success of this last work procured for him a commission from Philip IV. to paint in fresco the roof of the Atocha church. He chose as his subject for this the Assumption of the Virgin. Soon afterwards he was rewarded with the title of painter to the king, and was appointed superintendent of the royal buildings. He died at Madrid in 1685. Herrera el Mozo was of a somewhat similar temperament to his father, and offended many people by his inordinate vanity and suspicious jealousy. His pictures are inferior to the older Herrera's both in design and in execution; but in some of them traces of the vigour of his father, who was his first teacher, are visible. He was by no means an unskilful colourist, and was especially master of the effects of chiaroscuro. As his best picture Sir Edmund Head in his *Handbook* names his San Francisco, in Seville Cathedral. An elder brother, known as Herrera el Rubio (the ruddy), who died very young, gave great promise as a painter.

See Stirling's *Annals of the Artists of Spain*, 3 vols., 1848.

HERRERA Y TORDESILLAS, Antonio de (1549–1625), Spanish historian, was born in 1549, at Cuellar, in the province of Segovia in Spain. His father, Roderigo de Tordesillas, and his mother, Agnes de Herrera, were both of good family. After studying for some time in his native country, Herrera proceeded to Italy, and there became secretary to Vespasian Gonzago, with whom, on his appointment as viceroy of Navarre, he returned to Spain. Gonzago, sensible of his secretary's abilities, commended him on his death-bed to Philip II. of Spain; and that monarch, no less discerning, appointed Herrera first historiographer of the Indies, and one of the historiographers of Castile. Placed thus in the enjoyment of an ample salary, Herrera devoted the rest of his life to the peaceful pursuit of literature, retaining his offices till the reign of Philip IV., by whom he was appointed secretary of state, very shortly, however, before his death, which took place at Madrid on March 29, 1625. Of Herrera's writings, the most valuable is his *Historia General de los Hechos de los Castellanos en las Islas y Tierra Firme del Mar Oceano* (Madrid, 1601–15, 4 vols. fol.), a work which relates the history of the Spanish-American colonies from 1492 to 1554. The author's official position gave him access to the state papers and to other authentic sources not attainable by other writers, while he did not scruple to borrow largely from other MSS., especially from that of Las Casas. He used his facilities carefully and judiciously; and the result is a work on the whole accurate and unprejudiced, and quite indispensable to the student either of the history of the early colonies, or of the institutions and customs of the aboriginal American peoples. Although it is written in the form of annals, mistakes are not wanting; and several glaring anachronisms have been pointed out by Quintana. "If," to quote Dr Robertson, "by attempting to relate the various occurrences in the New World in a strict chronological order, the arrangement of events in his work had not been rendered so perplexed, disconnected, and obscure that it is an unpleasant task to collect from different parts of his book and piece together the detached shreds of a story, he might justly have been ranked among the most eminent historians of his country."

Herrera's other works are the following:—*Historia de lo Succedido en Escocia é Inglaterra en quarenta y quatro años que vivió la reyna Maria Estuarda* (Madrid, 1589); *Cinco Libros de la Historia de Portugal, y Conquista de las Islas de los Açores*, 1582 y 1583 (ib., 1591); *Historia de lo Sucedido en Francia*, 1585–1594 (ib., 1598); *Historia General del Mundo del tiempo del Senor Rey Don Felipe II., desde* 1559 *hasta su muerte* (ib., 1601–12, 3 vols. fol.); *Tratado, Relacion, y Discurso historico de los movimientos de Aragon* (ib., 1612); *Comentarios de los Hechos de los Espanoles, Franceses, y Venecianos en Italia, &c., desde* 1281 *hasta* 1559 (ib., 1624, fol.).

HERRICK, Robert (1591–1674), English poet, was born in Cheapside, London, and baptized on the 24th of August 1591. He was the seventh child of Nicholas Herrick, goldsmith, of the city of London, who died in 1592, under suspicion of suicide. The children were brought up by their uncle, Sir William Herrick, one of the richest goldsmiths of the day, to whom in 1607 Robert was bound apprentice. In 1613 he proceeded to Cambridge; and it was no doubt between these dates that the young poet was introduced to that circle of wits which he was afterwards to adorn. He seems to have been present at the first performance of *The Alchemist* in 1610, and it was probably about this time that Ben Jonson adopted him as his poetical "son." He entered the university as fellow commoner of St John's College, and he remained there until, in 1613, upon taking his degree, he removed to Trinity Hall; in 1620 he became master of arts. From this date until 1629 we entirely lose sight of him; it has been variously conjectured that he spent these nine years preparing for the ministry at Cambridge, or in much looser pursuits in London. In the latter year his mother died, and, taking orders, he was presented to the rural living of Dean Prior, not far from Totnes in Devonshire. He entered upon this new career on October 2, 1629, being in his thirty-ninth year. At Dean Prior he resided quietly until 1648, when he was ejected by the Puritans. The solitude there oppressed him at first; the village was dull and remote, and he felt very bitterly that he was cut off from all literary and social associations; but soon the quiet existence in Devonshire soothed and delighted him. He was pleased with the rural and semi-pagan customs that survived in the village, and in some of his most charming verses he has immortalized the morris-dances, wakes, and quintains, the Christmas mummers and the Twelfth Night revellings, that diversified the quiet of Dean Prior. Herrick never married, but lived at the vicarage surrounded by a happy family of pets, and tended by an excellent old servant named Prudence Baldwin. His first appearance in print was in some verses he contributed to *A Description of the King and Queen of Fairies*, in 1635. In 1640 a volume of *Wit's Recreations* contained sixty-two small poems afterwards acknowledged by Herrick in the *Hesperides*, and one not reprinted until our own day. These partial appearances make it probable that he visited London from time to time. We have few hints of his life as a clergyman. Anthony Wood says that Herrick's sermons were fierid and witty, and that he was "beloved by the neighbouring gentry." A very aged woman, one Dorothy King, stated that the poet once threw his sermon at his congregation, cursing them for their inattention. The same old woman recollected his favourite pig, which he taught to drink out of a tankard. In 1648 he published his celebrated collection of lyrical poems, entitled *Hesperides, or the Works both Human and Divine of Robert Herrick*, only a few weeks, it would seem, after his ejection from his living by the Puritans. That he was reduced to great poverty in London has been stated, but Dr Grosart shows this to be very unlikely. In August 1662 Herrick returned to Dean Prior, supplanting his own supplanter, Dr John Syms. He died in his eighty-fourth year, and was buried at Dean Prior, October 15, 1674. A monument was erected to his memory in the parish church in 1857.

As a pastoral lyrist Herrick stands first among English poets. His genius is limited in scope, and comparatively unambitious, but in its own field it is unrivalled. His tiny poems—and of the thirteen hundred that he has left behind him not one is long—are like jewels of various value, heaped together in a casket. Some are of the purest water, radiant with light and colour, some were originally set in false metal that has tarnished, some were rude and repulsive from the first. Out of the unarranged, heterogeneous mass the student has to reject what is not worth reading, but, after he has cast aside all the rubbish, he is astounded at the amount of excellent and exquisite work that remains. Herrick has himself summed up, very correctly, the themes of his sylvan muse when he says—

> I sing of brooks, of blossoms, birds, and bowers,
> Of April, May, of June, and July flowers,
> I sing of May-poles, hock-carts, wassails, wakes,
> Of bridegrooms, brides, and of their bridal-cakes.

He saw the picturesqueness of English homely life as no one before him had seen it, and he described it in his verse with a certain purple glow of Arcadian romance over it, in tones of immortal vigour and freshness. His love poems are still more beautiful; the best of them have an ardour and tender sweetness which give them a place in the forefront of modern lyrical poetry, and remind us of what was best in Horace and in the poets of the Greek anthology.

After suffering complete extinction for more than a century, the fame of Herrick was revived by Mr Nichols, Sylvanus Urban, who introduced his poems to the readers of the *Gentleman's Magazine* of 1796 and 1797. Dr Drake followed in 1798 with considerable enthusiasm. By 1810 interest had so far revived in the forgotten poet that Dr Nott ventured to print a selection from his poems, which attracted the favourable notice of the *Quarterly Review*. In 1823 the *Hesperides* and the *Noble Numbers* were for the first time edited by Mr T. Maitland, afterwards Lord Dundrennan. Other editions followed in 1839, 1844, 1846, 1850, 1852, and 1859. A more complete collection, by Mr W. C. Hazlitt, was brought out in 1869. In 1876 followed Dr Grosart's exhaustive and authoritative edition in three vols., and in 1877, under the title of *Chrysomela*, a very elegant selection by Mr F. T. Palgrave, with a prefatory essay. There are therefore few English poets of the 17th century whose writings are now more accessible to every class of readers than those of Herrick.

HERRING (*Clupea harengus*, *Häring* in German, *Le Hareng* in French, *Sill* in Swedish), a fish belonging to the genus *Clupea*, of which more than sixty different species are known in various parts of the globe. The sprat, pilchard or sardine, and shad are species of the same genus. Of all sea-fishes *Clupeæ* are the most abundant; for although other genera may comprise a greater variety of species, they are far surpassed by *Clupea* with regard to the number of individuals. The majority of the species of *Clupea* are of greater or less utility to man; it is only a few tropical species that acquire, probably from their food, highly poisonous properties, so as to be dangerous to persons eating them. But no other species equals the Common Herring in importance as an article of food or commerce. It inhabits in incredible numbers the German Ocean, the northern parts of the Atlantic, and the seas north of Asia. The herring inhabiting the corresponding latitudes of the North Pacific is another species, but most closely allied to that of the eastern hemisphere. Formerly it was the general belief that the herring inhabits the open ocean close to the Arctic Circle, and that it migrates at certain seasons towards the northern coasts of Europe and America. This view has been proved to be erroneous, and we know now that this fish lives throughout the year in the vicinity of our shores, but at a greater depth, and at a greater distance from the coast, than at the time when it approaches land for the purpose of spawning.

Herrings are readily recognized and distinguished from the other species of *Clupea* by having an ovate patch of very small teeth on the vomer (that is, the centre of the palate). In the dorsal fin they have from 17 to 20 rays, and in the anal fin from 16 to 18; there are from 53 to 59 scales in the lateral line, and invariably 56 vertebræ in the vertebral column. They have a smooth gill cover, without those radiating ridges of bone which are so conspicuous in the pilchard and other *Clupeæ*. The sprat cannot be confounded with the herring, as it has no teeth on the vomer, and only 47 or 48 scales in the lateral line.

Herrings grow very rapidly; according to H. A. Meyer's observations, they attain a length of from 17 to 18 mm. during the first month after hatching, 34 to 36 mm. during the second, 45 to 50 mm during the third, 55 to 61 mm. during the fourth, and 65 to 72 mm. during the fifth. The size which they finally attain and their general condition depend chiefly on the abundance of food (which consists of crustaceans and other small marine animals), on the temperature of the water, on the season at which they have been hatched, &c. Their usual size is about 12 inches, but in some particularly suitable localities they grow to a length of 16 inches, and instances of specimens measuring 17 inches are on record. In the Baltic, where the water is gradually losing its saline constituents, thus becoming less adapted for the development of marine species, the herring continues to exist in large numbers, but as a dwarfed form, not growing either to the size or to the perfection of the North Sea herring. The herring of the American side of the Atlantic is specifically identical with that of Europe. A second species (*Clupea leachii*) has been supposed to exist on the British coast; but it comprises only individuals of a smaller size, the produce of an early or late spawn. Also the so-called "white-bait" is not a distinct species, but consists chiefly of the fry or the young of herrings, and is obtained "in perfection" at localities where these small fishes find an abundance of food, as in the estuary of the Thames. The important subject of herring-fishing has already been treated in the article Fisheries (see vol. ix. pp. 251, 257, &c.)

Several excellent accounts of the herring have been published, as by Valenciennes in the 20th vol. of the *Histoire naturelle des Poissons*, and more especially by Mr J. M. Mitchell, *The Herring, its Natural History and National Importance*, Edin., 1864. Older treatises are: P. Neucrantz, *De Harengo*, Lubeck, 1654; J. S. Dodd, *Essay towards a Natural History of the Herring*, Lond., 1752; J. Solas, *Essay towards a Natural History of Herrings*; Bock, *Versuch einer vollständigen Natur- und Handels-Geschichte des Härings*, Königsberg, 1769.

HERRNHUT, a town of Saxony, in the circle and 18 miles south-east of the town of Bautzen, and situated on the Löbau and Zittau Railway, is chiefly known as the principal seat of the Moravian or Bohemian Brotherhood, styled on the Continent Herrnhuter, a colony of whom, fleeing from persecution in their own country, settled at Herrnhut in 1722, on a site presented by Count Zinzendorf. The buildings include houses for the brethren, the sisters, and the widowed of both sexes. The town is remarkable for its regularity, cleanliness, and stillness. Linen, paper (to varieties of which Herrnhut gives its name), tobacco, and various minor articles are manufactured. The Hutberg commands a pleasant view. The population in 1875 was 1128. Berthelsdorf, a village about a mile distant, has been the seat of the directorate of the community since about 1789.

HERSCHEL, Caroline Lucretia (1750-1848), sister of Sir William Herschel, the eighth child and fifth daughter of her parents, was born at Hanover on the 16th March 1750. On account of the prejudices of her mother, who did not desire her to know more than was necessary for being useful in the family, she received in youth only the first elements of education. After the death of her father in 1767 she, in order to fit herself to earn her bread, obtained permission to learn millinery and dressmaking, but continued to assist her mother in the management of the household until the autumn of 1772, when she accompanied to England her brother William, who had established himself as a teacher of music in Bath. At once she became a valuable coöperator with her brother, both in his professional duties and in the astronomical researches to which he had already begun to devote all his spare time. She was the principal singer at his oratorio concerts, and acquired such a reputation as a vocalist that she was offered an engagement for the Birmingham festival, which, however, she declined. When her brother accepted the office of astronomer royal, she became his constant assistant in his observations, and also executed the laborious calculations which were connected with them. For these services she in 1787 received from the king a salary of £50 a year. Her chief amusement during her leisure hours was to sweep the heavens with a small Newtonian telescope planted on the lawn. Besides detecting by this means many of the small nebulæ included in Sir William Herschel's catalogue, she succeeded in discovering seven comets, in the discovery of five of which she could lay claim to priority, viz., those of 1786, 1788, 1791, 1793, and 1795. In 1797 she presented to the Royal Society a catalogue of 560 stars taken from Flamsteed's observations, and not included in the British catalogue, together with a collection of errata that should be noticed in the same volume. Though she returned to Hanover in 1822 she did not abandon her astronomical studies, and in 1828 she completed the reduction, to January 1800, of 2500 nebulæ discovered by her brother. In 1835 the Astronomical Society, to mark their sense of the benefits conferred on science by such a series of laborious exertions, unanimously resolved to present her with their gold medal, and also elected her an honorary member of the society. In 1846 she received a gold medal from the king of Prussia. She retained the use of her intellectual faculties, and also preserved her interest in science, to the close of a long life. Her death took place on 9th January, 1848. *The Memoir and Correspondence of Caroline Herschel*, by Mrs John Herschel, appeared at London in 1876.

HERSCHEL, Sir Frederick William (1738-1822), generally known as Sir William Herschel, one of the most illustrious of astronomers, was born at Hanover, November 15, 1738. His father was a musician employed as hautboy player in the Hanoverian guards. The family had migrated from Bohemia in the early part of the 17th century, on account of religious troubles, they themselves being Protestants. Herschel's earlier education was necessarily of a very limited character, chiefly owing to the troubles in which his country at that time was involved; but, being at all times an indomitable student, he, by his own exertions, more than repaired this deficiency of his youth. He became a very skilful musician, both theoretical and practical; while his attainments as a self-taught mathematician were fully adequate to the prosecution of those branches of astronomy which, by his labours and his genius, he so eminently advanced and adorned. Whatever he did he did methodically and thoroughly; and in this methodical thoroughness lay the secret of what Arago very properly terms his astonishing scientific success.

In 1755, at the age of seventeen, he joined the band of the Hanoverian guards, and with his detachment visited England, accompanied by his father and eldest brother; in the following year he returned to his native country, but two years later, impelled by the troubles that surrounded him, he finally quitted Hanover to seek his fortunes in England. As might have been expected, the earlier part of his career in his adopted country was attended with formidable difficulties and much privation. We find him engaged in several towns in the north of England as organist and teacher of music, but these were occupations not attended with any lucrative results. In 1766 the tide of his fortunes began to flow, inasmuch as he obtained the appointment of organist to the Octagon Chapel in Bath, at that time the resort of the wealth and fashion of the city, and of its numerous distinguished visitors.

The next five or six years of his life were spent in establishing his reputation as a musician, and he thereby eventually became the leading musical authority in the place, and the director of all the chief public musical entertainments. His circumstances having thus become easier, he revisited Hanover for the purpose of bringing back with him his sister Caroline, with the view of her rendering him such services as she could in his multifarious undertakings. She arrived in Bath with her brother in August 1772, being at that time in her twenty-third year. She thus describes her brother's life soon after her arrival:—"He used to retire to bed with a bason of milk or a glass of water, with Smith's *Harmonics* and Ferguson's

Astronomy, &c., and so went to sleep buried under his favourite authors; and his first thoughts on waking were how to obtain instruments for viewing those objects himself of which he had been reading." It is not without significance that we find him thus reading Smith's *Harmonics*; to that study loyalty to his profession would impel him; as a reward for his thoroughness this led him to Smith's *Optics*; and this, by a natural sequence, again led him to astronomy, for the purposes of which the chief optical instruments were devised. It was in this way that he was introduced to the writings of Ferguson and Keill, and subsequently to those of Lalande, whereby he was educating himself for an astronomer and for undying fame. In those days telescopes were very rare, very expensive, and not very efficient, for the Dollonds had not as yet perfected even their beautiful little achromatics of 2¾ inches aperture. So Herschel was obliged to content himself with hiring a small Gregorian reflector of about 2 inches aperture, which he had seen exposed for loan in a tradesman's shop. Not satisfied with this implement, he procured a small lens of about 18 feet focal length, and set his sister to work on a pasteboard tube of that length, so as to make him a telescope. A tube of this construction naturally bent, and it was useless for all purposes but for the determined eyes of William Herschel. This material was soon displaced for tin, and thus a sorry sort of vision was obtained of Jupiter and Saturn and the moon. He then sought for a reflector of much larger dimensions from artists in London. No such instrument, however, was for sale; and the terms demanded for the construction of a reflecting telescope of 5 or 6 feet focal length he regarded as too exorbitant even for the gratification of such desires as his own. So he was driven to the only alternative that remained; he must construct a large telescope for himself. His first step in this direction was to purchase the debris of an amateur's implements for grinding and polishing small mirrors; and thus, by slow degrees, and by indomitable perseverance, he in 1774 had, as he says, the satisfaction of viewing the heavens with a Newtonian telescope of 6 feet focal length constructed by his own hands. But he was not a man to be contented with viewing the heavens as a mere star-gazer; on the contrary, he had from the very first conceived the gigantic project and the hope of surveying the entire heavens, and, if possible, of ascertaining the plan of their general structure on a settled and systematic mode of procedure, if only he could but provide himself with adequate instrumental means. With this view he, his brother, and his sister toiled for many years at the grinding and polishing of hundreds of specula, always retaining the best, and recasting the others, until the best of the previous performances had been surpassed. This was the work of the daylight in those seasons of the year when the fashionable visitors of Bath had quitted the place, and had thus freed the family from professional duties. After 1774 every available hour of the night was devoted to the long-hoped-for scrutiny of the skies. In those days no machinery had been invented for the construction of telescopic mirrors; the man who had the hardihood to undertake the polishing doomed himself to walk leisurely and uniformly round an upright post for many hours, without removing his hands from the mirror, until his work was done. On these occasions Herschel received his food from the hands of his faithful sister. But his reward was nigh.

In May 1780 his first two papers containing some of the results of his astronomical observations during the last six years were communicated to the Royal Society through the influential introduction of Dr Watson. Herschel had made the acquaintance of this excellent man and skilful physician in a characteristic manner. In order to obtain a sight of the moon the astronomer had taken his telescope into the street opposite his house; the physician happening to pass at the time, and seeing his eye removed for a moment from the instrument, requested permission to take his place. The mutual courtesies and intelligent conversation which ensued soon ripened this casual acquaintance into a solid and enduring regard.

The subject of this first memoir was the varying lustre of several of the stars, and especially that of Mira in the constellation of Cetus. It had been long known to fade in brightness from nearly that of a star of the first magnitude down to invisibility in such telescopes as then existed. Herschel had examined it, and many other variable stars, for himself; it was not, however, a simple or isolated phenomenon that engaged his attention; but, regarding the stars as so many suns, he examined stellar phenomena as possibly leading him to some intelligent conception of what might be occurring in our own sun. The sun, he knew, rotated on its axis, and he knew that dark spots often exist on its photosphere; the questions that he put to himself were—Are there dark spots also on these variable stars? do the stars also rotate on their axes? or are they sometimes partially eclipsed by the intervention of some opaque and invisible bodies? And then he asked himself—What are these singular spots upon the sun? and have they any practical relation to us, the inhabitants of this planet? To these questions he applied his telescopes and his thoughts; and as light from time to time dawned upon his apprehension, he communicated the results to the Royal Society in no less than six memoirs, occupying very many pages in the *Philosophical Transactions*, and extending in date from 1780 to 1801. It was in the latter year that these remarkable papers culminated in the inquiry whether any relation could be traced in the recurrence of sun-spots, regarded as evidences of solar activity (allied to volcanic), and the varying seasons of our planet, as exhibited by the varying price of corn? Herschel's solution of the question was scarcely final, and the question has recently cropped up again, with more than a renewal of its former interest.

In the following year (1781) he communicated to the Royal Society the first of a series of papers containing the results of his telescopic inquiries in relation to the rotation of the planets and of their several satellites. The object which he had in view was not so much to ascertain the velocities or times of their rotation, as rather to discover whether those rotations are strictly uniform. From the result he expected to gather, by analogy, the probability of an alteration in the length of our own day. These inquiries occupy the greater part of seven memoirs extending from 1781 to 1797. In the course of these telescopic observations he lighted on the curious appearance of a white spot near to each of the poles of the planet Mars. On investigating the inclination of its axis to the plane of its orbit, and finding that it closely resembled that of our earth, he concluded that its changes of climate also would resemble our own, and that these white patches were probably polar snow. Modern investigations have confirmed his conclusion. He also discovered that, as far as his observations extended, the times of the rotations of the various satellites round their axes are in analogy with our own moon, viz., equal to the times of their revolution round their primaries. Here again we observe that his discoveries arise out of the complete and systematic and comprehensive nature of the investigation in which he is engaged. Nothing with such a man is accidental.

In the same year (1781) Herschel made a discovery which, as we shall see, soon completely altered the character of his professional life. In the course of his systematic examination of the heavens with a view to the discovery of the plan of their construction, he lighted on an object which at first he supposed to be a comet, but which, by its subse quent motions and appearance, turned out to be a new planet, moving outside of the orbit of Saturn. To this planet he in due time assigned the name of Georgium Sidus; but this name has by general consent been laid aside in favour of Uranus. It was discovered with a favourite 7-foot reflector having an aperture of $6\frac{1}{4}$ inches; subsequently, when he had provided himself with a much more powerful telescope, of 20 feet focal length, he discovered what he believed to be no less than six satellites. Modern observations have shorn this gloomy planet of four of these supposed attendants, but at the same time have added two others apparently not observed by Herschel. No less than seven memoirs on the subject were communicated by him to the Royal Society, extending from the date of the discovery in 1781 to 1815. There is a peculiarity worthy of notice in Herschel's mode of observation which led to the discovery of this planet. He had observed that the spurious diameters of stars are not much affected by increasing the magnifying powers, but that the case is different with other celestial objects; hence if anything in his telescopic field attracted his notice by peculiarity of appearance, he immediately varied the magnifying power in order to decide the nature of the object. Thus Uranus was discovered; and had a similar method been applied to Neptune, that planet would have been discovered at Cambridge some months before it was recognized at Berlin.

We now come to the commencement of Herschel's most important series of observations, culminating in what ought probably to be regarded as his most capital discovery. A material part of the task which he had set himself as the work of his astronomical life embraced the determination of the relative distances of the stars from our sun and from each other. Now, in the course of his scrutiny of the heavens, he had observed many stars in apparently very close contiguity, but often greatly differing in their relative brightness. He concluded that, on the average, the brighter star would be the nearer to us, and the smaller enormously more distant. He considered that an astronomer on the earth, in consequence of its immense orbital displacement of some 180 millions of miles every six months, would see such a pair of stars under different perspective aspects; and this variety of perspective aspect observed and measured would, he thought, lead to an approximate determination of their distance. With this view he mapped down the places and aspects of all the double stars that he met with, and communicated in 1782 and 1785 very extensive catalogues of the results. Indeed, the very last scientific memoir that he ever wrote, sent to the Royal Astronomical Society in the year 1822, at the time when he was its first president and already in the eighty-fourth year of his age, related to these investigations. In the first of these memoirs he throws out the hint that these apparently contiguous stars must, if constituted after the material laws of our solar system, circulate round each other through the effects of gravitation; but he significantly adds that the time had not yet arrived for settling the question. Thus the philosopher abides his time in patience and confidence, and a dozen years afterwards (1793) he remeasures the relative positions of many of these contiguous pairs, and we may conceive what his feelings must have been at finding the verification of his prediction. For he found that some of these stars had circulated round each other, after the manner required by the laws of gravitation. Thus Herschel had demonstrated the action of the same mechanical laws among the distant members of the starry firmament which bind together the harmonious motions of our solar system. This sublime discovery would of itself suffice to immortalize his memory in the respectful homage of all future races of intelligent men. If only Herschel had lived long enough to learn the approximate distances of some of these binary combinations, he would at once have been able to calculate their masses when compared with that of our own sun; and thus, knowing, as we now do, that these stars in their weights are strictly comparable with the weight of our own sun, he would have found another of his analogical conjectures realized.

In the year 1782, in consequence of his fame, Herschel was invited to Windsor by George III., and then accepted the offer made by the king to become his private astronomer, and henceforth devote himself wholly to a scientific career. The salary offered and accepted was £200 per annum, to which an addition of £50 per annum was subsequently made for the astronomical assistance of his faithful sister. Dr Watson, to whom alone the amount of this salary was mentioned, made the natural remark, "Never before was honour purchased by a monarch at so cheap a rate." In this way the great philosophical astronomer removed from Bath first to Datchet and soon afterwards permanently to Slough, within the easy access of his royal patron at Windsor.

The old pursuits at Bath were soon resumed at Slough, but with renewed vigour and without the old professional interruptions. The greater part, in fact, of the papers already referred to are dated from Datchet and Slough, for the magnificent astronomical speculations in which he was engaged, though for the most part conceived in the earlier portion of his philosophical career, required years of patient observation before they could be fully examined and realized.

It was at Slough in 1783 that he wrote his first memorable paper on the "Motion of the Solar System in Space,"—a sublime speculation, yet through his genius realized by considerations of the utmost simplicity. He returned to the same subject with fuller details in 1805. It was also after his removal to Slough that he published his first memoir containing his speculative ideas on the construction of the heavens, which from the first had been the chief aim of his toils both of mind and body. In a long series of remarkable papers, addressed as usual to the Royal Society, and extending from the year 1784 to 1818, when he was eighty years of age, he demonstrated the fact that our sun is a star situated not far from the bifurcation of the Milky Way, and that all the stars visible to us lie more or less in clusters scattered throughout a comparatively thin stratum, but in the other two dimensions stretching immeasurably further into space. At one time he imagined that his powerful instruments had pierced through this stellar stratum of the Milky Way, and that he had approximately determined the form of some of its boundaries. In the last of his memoirs he had convinced himself of his error, and he admitted that to his telescopes our stratum of stars is "fathomless." Over this stratum of stars and their planetary attendants, the whole being in ceaseless motion round some common centre of gravity as the resultant point of the combined gravitation, Herschel discovered on either side a canopy of discrete nebulous masses, from the condensation of at least a part of which the whole stellar universe had been formed,—a magnificent conception, pursued with a force of genius and put to the practical test of observation with an industry almost incredible. It was the work of a single mind, carried to its termination with no assistance beyond that of a loyal sister, almost as remarkable a personage as himself.

Hitherto we have said nothing about that grand reflecting telescope, of 40 feet focal length and 4 feet aperture, which is too often regarded as the chief effort of his genius and his perseverance. The full description of this celebrated instrument will be found in the 85th volume of the *Transactions* of the Royal Society. Gigantic as it really was, we are disposed to regard it as among the least of his great works. On the day that it was finished (August 28, 1789) Herschel saw at the first view, in a grandeur not witnessed before, the Saturnian system with all its six satellites, five of which had been discovered long before by Huygens or Cassini, while the sixth, latterly named Enceladus, he had, two years before, sighted by glimpses in his exquisite little telescope of 6¼ inches aperture, but now saw in unmistakable brightness with the towering giant he had just completed. On the 17th of September he discovered a seventh, which proved to be the nearest of all the satellites of Saturn. It has since that time received the name of Mimas. It is somewhat remarkable that, notwithstanding his long and repeated scrutinies of this planet, the eighth satellite, Hyperion, and the crape ring should have escaped him.

Herschel married the widow of Mr John Pitt, a wealthy London merchant, on May 8, 1788, by whom he had an only son, John Frederick William. The prince regent conferred a Hanoverian knighthood upon him in 1816. But a far more valued and less tardy distinction was the Copley medal assigned to him by his associates in the Royal Society in 1781.

He died at Slough on August 25, 1822, in the eighty-fourth year of his age, and was buried under the tower of St Laurence Church, Upton, within a few hundred yards of the old site of the 40-foot telescope. A mural tablet on the wall of the church bears a Latin inscription from the pen of the late Dr Goodall, provost of Eton College. A collected edition of his astronomical memoirs would speak of his genius in unmistakable language; but this has not yet been published. (C. P.)

HERSCHEL, SIR JOHN FREDERICK WILLIAM, BART. (1792–1871), the illustrious astronomer, the only son of Sir F. William Herschel, was born at Slough, Bucks, in the year 1792. His early home was a singular one, and eminently adapted to nurture into greatness any child born, as he was, with natural gifts capable of wide development. The examples about him were those of silent but ceaseless industry, busied about things which, at the first view, seemed to have no apparent connexion with the world outside the walls of his abode, but which, at a mature period of his life, he, with rare eloquence, taught his countrymen to appreciate as foremost among those influences which satisfy and exalt the nobler instincts of our nature.

His scholastic education commenced at Eton, but maternal fears or prejudices soon removed him to the house of a private tutor. Thence, at the early age of seventeen, he was sent to St John's College, Cambridge, and the form and method of the mathematical instruction he there received exercised a marked influence on the whole complexion of his scientific career. In due time the young student acquired the highest academical distinction of his year, graduating as senior wrangler. It was during his undergraduateship that he and two of his fellow students who subsequently attained to very high eminence in their respective careers of life, Dean Peacock and Mr Babbage, entered into a sort of moral compact that they would "do their best to leave the world wiser than they found it,"—a compact loyally and successfully carried out by all three to the end. As a commencement of this laudable attempt we find Herschel associated with these two friends in the production of a work on the differential calculus, and on cognate branches of mathematical science, which changed the whole style and aspect of mathematical learning in England, and brought it up to the level of the Continental methods. Two or three memoirs communicated to the Royal Society on some new applications of mathematical analysis at once placed him in the front rank of the cultivators of this branch of knowledge. Of these his father had the gratification of introducing the first, but the others were presented in his own right as a fellow.

His first intention had been to study for the bar, and with this view he left the university, and placed himself under the guidance of an eminent special pleader of that day. Probably this temporary choice of a profession arose from the extraordinary success which for some time had attended the efforts of so many eminent Cambridge mathematicians in legal pursuits. Be that as it may, an early acquaintance with Dr Wollaston in London soon changed the direction of his studies. In 1820, assisted by his father, he completed a mirror of 18 inches diameter and 20 feet focal length, for a reflecting telescope. This, subsequently improved by his own hands, became the instrument which enabled him to effect the astronomical observations which, more than any other of his great works, form the basis of his fame. In 1821–23 we find him associated with Mr South in the re-examination of his father's double stars, by the aid of an achromatic telescope and other appliances, the like of which for excellence and power had not hitherto been collected. For this work in 1826 he received the recognition of the Astronomical Society by the award of their gold medal; the French Institute also presented him with the Lalande medal for the same contribution to astronomical science. It ought also to be mentioned that in 1821 the Royal Society had presented him with the Copley medal for his mathematical contributions to their *Transactions*. From 1824 to 1827 he held the distinguished and responsible post of secretary to that society. In 1827 he was elected to the chair of the Astronomical Society, which office he also filled on two subsequent occasions. In the course of the discharge of his important offices in the last-named society he ennobled its literature by his memorable presidential addresses and obituary notices of deceased fellows, which, it is not too much to say, are, by their combination of eloquence and wisdom, the chief adornments of their printed memoirs. In 1831 the honour of knighthood was conferred on him by William IV., and two years later he again received the recognition of the Royal Society by the award of one of their medals for his memoir "On the Investigation of the Orbits of Revolving Double Stars." There is a significance in this award; the father had been the original discoverer of the extension of gravitation to the remotest boundaries of the visible universe, and the son had now put the crowning stone to this edifice of discovery by the invention of a graphical method whereby the eye could as it were see the two component stars of the binary system revolving before it, after the regularity of the Newtonian law.

Before the end of the year 1833, being then about forty years of age, Sir John Herschel had re-examined all his father's discoveries of double stars and nebulæ, and had added many similar bodies to his own list; this alone constituted a gigantic work even for the lifetime of any astronomer in that day. For it should be remembered that the astronomer was not as yet provided with those curious and valuable automatic contrivances for observing and for recording observations which at present most materially abridge the labour and increase the accuracy of astronomical work such as that in which Sir John had been engaged. And he had no assistant. Equatorial clocks for turning the telescope, electrical chronographs for recording the times of the phenomena observed, were at that date unknown.

His scientific life now entered another and very characteristic phase. The bent of his mind, as he subsequently was wont to declare, was towards chemistry and the phenomena of light, rather than towards astronomy. Indeed, very shortly after taking his academical degree at Cambridge, he proposed himself as a candidate for the vacant chair of chemistry in that university; but, as he said with some humour, the result of the election was that of the votes he had a glorious minority of one. In fact Herschel had become an astronomer from a sense of duty, just as his father had become one by fascination and fixed resolve; hence it was by filial loyalty to his father's memory that he was now impelled to undertake the completion of that work which at Slough had been so grandly commenced. William Herschel had explored the northern heavens; John Herschel determined to explore the heavens of the south, as well as re-explore the north. "I resolved," he said, "to attempt the completion of a survey of the whole surface of the heavens; and for this purpose to transport into the other hemisphere the same instrument which had been employed in this, so as to give a unity to the results of both portions of the survey, and to render them comparable with each other." In accordance with this resolution, he and his family embarked for the Cape on the 13th November 1833; they arrived in Table Bay on the 15th January 1834; and proceedings, he says, "were pushed forward with such effect that on the 22d of February I was enabled to gratify my curiosity by a view of κ Crucis, the nebula about η Argus, and some other remarkable objects in the 20-feet reflector, and on the night of the 4th of March to commence a regular course of sweeping."

To give an adequate description of the vast mass of labour completed during the next four busy years of his life at Feldhausen would require the transcription of a considerable portion of the *Cape Observations*, a volume which probably is not surpassed in varied interest or astronomical importance by any scientific work in existence; although it might perhaps be equalled by a judicious selection from Sir William's "Memoirs," now scattered in some thirty volumes of the *Philosophical Transactions*. It was published, at the sole expense of the late duke of Northumberland, but not till 1847, nine years after the author's return to England, for the very cogent reason assigned by himself:—"The whole of the observations, as well as the entire work of reducing, arranging, and preparing them for the press, have been executed by myself." There are 164 pages of catalogues of southern nebulæ and clusters of stars. There are then careful and elaborate drawings of the southern appearance of the great nebula in Orion, and of the region surrounding the remarkable star of Argo. The labour and the thought bestowed upon some of these objects are almost incredible; several months were well spent upon a minute spot in the heavens containing 1216 stars, but which an ordinary spangle, held at a distance of an arm's length, would eclipse. These catalogues and charts being completed, he proceeds to discuss their significance, which in the eyes of science possesses an absorbing interest. He confirms his father's hypothesis that these wonderful masses of glowing vapours are not irregularly scattered, and without apparent law, hither and thither in the visible heavens, but are collected in a sort of canopy, whose vertex is at the pole of that vast stratum of stars in which our solar system finds its position,—buried in it, as he supposes, at a depth not greater than that of the average distance from us of an eleventh magnitude star. Then follows his catalogue of the relative positions and magnitudes of the southern double stars. And he applies to one of them, γ Virginis, that beautiful graphical method invented by himself, whereby he determines the orbit of the two components round each other; and he had the satisfaction of witnessing with his own eyes the fulfilment of a prediction he had made some years before, viz., that the two stars would, in the course of their orbital movements, appear to close up into a single star, inseparable by any telescopic power. The double stars and their stately revolutions and lustrous colours dismissed, in the next chapter he proceeds to describe the observations which he had made on their varying and relative brightness. It has been already detailed how his father commenced his scientific career by similar observations on the varying magnitudes of many stars, and how his remarks culminated years afterwards in the question whether the variation of the lustre of our sun, by the presence or absence of sun spots, affected our harvests and the price of corn. The son carries his speculations backwards to a still more philosophical depth. The variation from time to time, he remarks, in the lustre of our sun, to the extent of half a magnitude, would account for those strange alternations of a semi-arctic and semi-tropical climate which geological researches have disclosed as having occurred in various regions of our globe.

Herschel returned to his English home in the spring of 1838. As was natural and honourable to all concerned, he was welcomed with an enthusiastic greeting. By the queen at her coronation he was created a baronet; and, what to him was better than all such rewards, other men caught the contagion of his example, and laboured in fields similar to his own, with an adequate portion of his success. In particular Mr Lassell transported a telescope as large as the celebrated Herschelian telescope to Malta, where with excellent results he "minded the heavens" for the space of four years. He was rewarded there, and at his own English residence near Liverpool, by the discovery of new satellites of Saturn and of Uranus, constituting what Sir John Herschel, animated by a fraternal sympathy, well called an epoch in astronomy. Mr De La Rue also, at Islington and at Cranford, followed zealously and successfully in the wake of the same infectious enthusiasm.

Herschel was a highly accomplished chemist. His discovery of the solvent power of hyposulphite of soda on the otherwise insoluble salts of silver, in 1819, exercised a most important influence on the practical applications of photography twenty years afterwards; and in 1839, the natal era of that valuable art, he, independently of Mr Fox Talbot, had discovered the means of taking and multiplying photographic pictures, and early in the spring of that year exhibited more than twenty photographic pictures to the Royal Society, including one of the old 40-foot telescope. He was the first person to introduce the now well-known terms *positive* and *negative* in photographic images, and to deposit upon glass a sensitized film for the reception of the picture. He also paved the way for Professor Stokes's important discovery of the change which luminous waves may suffer in their period of oscillation, by his addition of the lavender rays to the spectrum, and by his announcement of "epipolic dispersion," as exhibited by sulphate of quinine. Several other important and successful researches of his, connected with the undulatory theory of light, are scattered through the pages of his treatise on "Light" published in the *Encyclopædia Metropolitana*.

To the other varied accomplishments of his gifted mind we must add the graces of a deep poetic feeling. Perhaps no man can become a truly great mathematician or great philosopher, if unendowed with the versatile powers of the imagination. John Herschel possessed this endowment to a large extent; and he had reserved for himself as a solace and enjoyment in old age the translation of the *Iliad* into verse. He had at an earlier period of life translated in a similar manner Schiller's *Walk*. But the main work of his declining years was the collection of all his father's catalogues, combined with his own observations and those of other astronomers of nebulæ and double stars, each into a single volume. He lived to complete the former, and to present it to the Royal Society, who have published it in a separate form in the *Philosophical Transactions*. The latter work he had not fully completed at his death; but he bequeathed as much of it as was finished to the Astronomical Society. That society has printed a portion of it, which serves as an index to the observations of various astronomers on double stars up to the year 1866.

A complete list of his various contributions to learned societies will be found in the Royal Society's great catalogue, and from them may be gathered most of the records of his busy scientific life. Sir John Herschel met with an amount of public recognition which was unusual in the time of his illustrious father. Naturally he was a member of almost every important learned society in both hemispheres. For five years he held the office of master of the mint, the same appointment which, more than a century before, had been occupied by Sir Isaac Newton; his friends also offered to propose him as president of the Royal Society and again as a member of parliament for the university of Cambridge, but neither office was within the scope of his own desires.

In private life Sir John Herschel was a firm and most active friend; he had no jealousies, he avoided all scientific feuds; he readily extended a helping hand to those who consulted him in scientific difficulties; he never discouraged, and still less disparaged, men younger than or inferior to himself; he was pleased when his own work was appreciated, but that was never an object of his solicitude: it was said of him by a discriminating critic, and without extravagance, that "his was a life full of the serenity of the sage and the docile innocence of a child."

He died at Collingwood, his residence near Hawkhurst in Kent, May 11, 1871, in the seventy-ninth year of his age, and his remains are interred in Westminster Abbey close to the grave of Sir Isaac Newton.

Sir John Herschel, irrespectively of the labours connected with his [illegible] works, [illegible] which at least, the *Discourse on Natural Philosophy* [illegible], [illegible] interest [illegible] can [illegible] In 1849 [illegible] the *Outlines of Astronomy*, of which it is enough to [illegible] arising from the [illegible] which relate to progressive science, there is no [illegible] the subject of which it treats. His articles, "Meteorology," "Physical Geography," and "Telescope," contributed to the 8th edition of the *Encyclopaedia Britannica*, were afterwards published separately. There is also another very valuable little book, which originated from a [illegible] Herschel's [illegible] simplicity and truthfulness of mind. When he was at the Cape he more than once assisted in the attempts there made to diffuse a love of knowledge among men not engaged in literary pursuits. In one of his addresses he, with a kindly and far-seeing wisdom, told his audience that the [illegible] of a nation's [illegible] or a nation's fame did not depend upon a few [illegible] their lonely studies, [illegible] for their learning or their discoveries, but [illegible] rather lay in the diffusion of their knowledge among the masses of the population. Acting practically on this principle, he, on his return to England, published, in *Good Words* and elsewhere, a series of papers on interesting points of natural philosophy, which have since been collected in a volume called *Familiar Lectures on Scientific Subjects*. None but a deep-thinking philosopher could have written this book, none but [illegible] could have made it what it is, eminently intelligible. Another volume of his, not so widely known to the public as any of the above works, is his *Collected Addresses*, in which he is seen in his happiest and most interesting mood, walking, as it were, at liberty among sympathizing [illegible], in his own fields, and [illegible] at their limits. (C. P.)

HERSENT, Louis (1777–1860), French painter, was one of David's most distinguished pupils, and became one of the most noted painters of the Restoration. He was born at Paris on 10th March 1777, and obtained the Prix de Rome in 1797; in the Salon of 1802 appeared his Metamorphosis of Narcissus, and he continued to exhibit with rare interruptions up to 1831. His most considerable works under the empire were Achilles parting from Briseis, and Atala dying in the arms of Chactas (both engraved in Landon's *Annales du Musée*); an Incident in the Life of Fénelon, painted in 1810, found a place at Malmaison, and Passage of the Bridge at Landshut, which belongs to the same date, is now at Versailles. Hersent's typical works, however, belong to the period of the Restoration. Louis XVI. relieving the Afflicted (Versailles) and Daphnis and Chloe (engraved by Laugier and by Gelée) were both in the Salon of 1817; at that of 1819 the Abdication of Gustavus Vasa brought to Hersent a medal of honour, but the picture, purchased by the duke of Orleans, was destroyed at the Palais Royal in 1848, and the engraving by Henriquel Dupont is now its sole record. Ruth, produced in 1822, became the property of Louis XVIII., who from the moment that Hersent rallied to the Restoration zealously patronized him, made him officer of the Legion of Honour, and procured his election to the Institute, where he replaced Vincent (1822). He continued in favour under Charles X., for whom was executed Monks of Mount St Gothard, exhibited in 1824. In 1831 Hersent made his last appearance at the Salon with portraits of Louis Philippe, Marie-Amélie, and the duke of Montpensier; that of the king, though good, is not equal to the portrait of Spontini (Berlin), which is probably Hersent's *chef d'œuvre*. After this date Hersent ceased to exhibit at the yearly salons. Although in 1846 he sent an excellent likeness of Delphine Gay and one or two other works to the rooms of the Société d'Artistes, he could not be tempted from his usual reserve even by the international contest of 1855. Five years later, on 2d October 1860, he died. His work shows every artistic merit which can be attained by steadily directed intelligence and labour; his skilful arrangement, delicacy of line, and certainty in execution are points which have excited the admiration even of those who find him wanting in feeling, in interest, and in sense of colour. Louis XVI. relieving the Afflicted, the treatment of which indicates the approach of the realistic movement, is less theatrical than Daphnis and Chloe, which combines, in the true spirit of the Restoration, drawing-room graces with a pseudo-classic style; but both show the same dryness and hardness of manner which Hersent had acquired under the influence of the first empire, and from which he never was able to free himself.

HERSFELD, a town of Prussia, capital of a circle in the government district of Cassel, province of Hesse-Nassau, is pleasantly situated at the confluence of the Geisa and Haune with the Fulda, on the railway from Frankfort to Bebra, 10 miles N.N.E. of Fulda. The greater part of its old fortifications remain, but the ramparts and ditches have been laid out as promenades. The principal buildings are the ancient town-house; the parish church, completed in 1320, in the Gothic style, with a fine tower and a large bell; the ruins of the collegiate church in the Byzantine style, erected in the beginning of the 12th century on the site of the cathedral, but burnt down by the French during the Seven Years' War; and outside the town the ancient monastery with its surrounding grounds. Among the public institutions are a gymnasium, a higher town school, an orphanage, and a district infirmary. The town has important manufactures of cloth and leather, as well as dye works, worsted mills, and soap-boiling works. The population in 1875 was 6929.

Hersfeld owes its origin to a Benedictine abbey which, founded by Lullus, archbishop of Mainz, about 769, was richly endowed by Charlemagne, and [illegible] in the 12th century [illegible] prosperity. In [illegible] the town came under the protection of Hesse, and in 1525 it gave up its [illegible] to it. The abbey was secularized in 1648, but Hersfeld retained the capital of a principality until 18[illegible].

HERSTAL, or in its older form HERISTAL, a market town of Belgium, on the left bank of the Meuse, 3 or 4 miles north-east of Liége, and skirting the road which leads from that city to Maestricht. Its population, which in 1876 numbered 11,126, is mainly supported by its coal mines and iron industries. Herstal probably derives its name from being a "Heerstelle" or permanent camp of the Franks. It is well known as the birthplace and family seat of Pippin, the major-domo of the Austrasian kingdom, some few traces of whose castle are still pointed out above the town. And though it cannot maintain its claim to be the birthplace also of Charlemagne, it was undoubtedly a frequent place of residence for this greatest of the Carolingians; and in 870 it gave its name to the treaty by which Charles the Bald and Lewis the German decided the partition of Lotharingia. The lordship of Herstal passed to the house of Nassau in 1444; and in 1702, on the death of William III. of England, its possession was disputed between the house of Orange and the king of Prussia. The decision of the courts was given in 1714 in favour of Prussia, but the new possessors, finding the feelings of the people of Herstal against them, sold the lordship to Liége for 1000 thalers. Another Herford, distinguished as the Saxon, was the place where Charlemagne had his winter quarters in the year 797. It is now the village of Herstelle on the Weser, in the government of Minden.

Plate XV. HERTFORD, COUNTY OF, HERTFORDSHIRE, or HERTS, an inland county in the south-east of England, is situated between 51° 36' and 52° 5' N. lat. and 0° 15' E. and 0° 45' W. long. It is bounded on the N. by Cambridgeshire, N.W. by Bedfordshire, E. by Essex, S. by Middlesex, and S.W. by Buckinghamshire. The area comprises 391,141 acres or 611 square miles.

The aspect of the county is pleasant and picturesque, its surface being broken by gentle undulations which in some parts form a quick succession of hills and valleys. The highest summit is Kensworth Hill on the border of Bedfordshire, about 910 feet above sea level. Fine oak and other trees are grown in the hedges, and from being pruned closely they form high walls of living timber shading narrow winding lanes. The arable and pasture lands of the farms are intermingled with the parks and ornamental woods of the country seats which are scattered thickly throughout the county. These features, varied by its winding rivers, impart to it a peculiar beauty, while in luxuriance it is not surpassed by any county in England.

The principal rivers are the Lea, which, rising some miles beyond Luton in Bedfordshire and entering Hertfordshire at Hyde Hall, flows south east to Hatfield and then east by north to Hertford and Ware, whence it bends southward, and passing along the eastern boundary of the county falls into the Thames a little below London, having received in its course the Maran, the Beane, the Rib, and the Stort, which all flow southward in the north-eastern part of the county, the Stort for some distance forming the boundary between it and Essex; the Colne, which, flowing through the south-western part of the county, falls into the Thames at Brentford, having received in its course the Ver, the Bulborne, and the Gade; the Ivel, which, rising in the north-west of the county, soon passes into Bedfordshire. The New River, one of the water supplies of London, made by Sir Hugh Myddelton (1607-13), has its source in some springs near Ware, and runs parallel for many miles with the Lea. The Grand Junction Canal from London to Birmingham traverses the south-west corner of the county, passing by Watford and Berkhampstead. There are mineral springs in the parishes of Chipping Barnet, Northaw, and Watton.

Geologically the county consists of Cretaceous and Tertiary rocks, the greater part being Lower, Middle, and Upper Chalk, which in the south-eastern part of the county are covered by Tertiary deposits belonging to the London basin. Over a large part of the eastern side of the county there are superficial deposits of glacial origin, and on the western side there are traces of the Lower Tertiary beds having formerly extended over a much wider area, outliers of the beds being of not unfrequent occurrence, and the drift deposits on the chalk hills being largely composed of their debris. The vales traversed by the rivers and streams exhibit in the bottoms a rich sandy loam; the sloping sides are covered by loams of inferior quality; and the flat surface of the high ground is generally formed of a loam of reddish hue tending towards common clay, with which it is often confounded.

The climate is mild, dry, and remarkably salubrious. On this account the London physicians were accustomed to recommend the county for persons in weak health, and it was so much coveted by the noble and wealthy as a place of residence, that it was a common saying—"He who buys a home in Hertfordshire pays two years' purchase for the air."

According to the agricultural returns for 1879, the total area of arable land was [illegible], of which 11[illegible] acres were under [illegible], [illegible] rotation grasses, [illegible] permanent pasture, and 15,311 fallow. The corn most largely grown is wheat, [illegible] of Hertfordshire [illegible] wheat, which in 1879 occupied [illegible] acres. [illegible] very white, and [illegible] by that of any county in England. Wheat [illegible] from the fine quality of the wheat grown in that district. Of barley, which is largely used in the county for malting purposes, there were 19,1[illegible] acres in 1879, and of oats only 2[illegible]. Little or no rye is grown, and of peas and beans together there were in 1879 only a little over 11,[illegible] acres. Of green crops, turnips and Swedes occupied in 1879 an area of 21,[illegible] acres, while potatoes had only 2[illegible]. Vetches are largely grown for the London stables, extending to 8191 acres in 1879. The greater part of the permanent grass is made use of for hay. There are some very rich pastures on the banks of the river Stort, extending from Hertford to Hockerill on the borders of the river Lea, and also near Rickmansworth, where they are watered by the river Colne. The percentage of cultivated area in 1879 was 85·7 instead of 85·1 in 1870; of area under corn crops 37·2 instead of 38·5; under green crops 10·1 instead of 11·5; under rotation grasses 9·8 instead of 10·2; and of permanent pasture 21·9 instead of 22·0. The most common system of rotation is the five-course—turnips or fallow, barley, clover, wheat, oats. In the south-west part of the county large quantities of cherries and apples are grown for the London market. On the best soils nearest to London culinary vegetables are forced by the aid of rich manure, and more than one crop are sometimes obtained in a year.

Generally speaking, the quantity of stock kept is small. Not much attention is paid to the breeds of cattle, but among cows the Suffolk variety is the most common. The number of cattle in 1879 was only 31,754, or an average of 9·3 to every 100 acres under cultivation, the average for England being 11·9, and for the United Kingdom 21·0. Of these the number of cows in milk or in calf was 11,802. The number of horses in 1879 was 15,022, or an average of 4·4 to every 100 acres, the average for England being 4·5 and for the United Kingdom 4·1. The horses used for agricultural purposes are chiefly Suffolk punches. The number of sheep in 1879 was 171,143, or an average of 50·4 to every 100 acres under cultivation, the average for England being 75·3, and for the United Kingdom 68·0. The principal kinds are the Southdown and Wiltshire, and a cross between Cotswolds and Leicesters. Pigs in 1879 numbered 30,404, or an average of 8·9 to every 100 acres under cultivation, the average for England being 7·2, and that for the United Kingdom 6·7.

In Hertfordshire the number of resident proprietors is very large, which circumstance, as well as the proximity to London, has doubtless greatly aided the development of agricultural enterprise. The average extent of the farms is about 200 acres, and the modern improvements are everywhere adopted.

According to the return of owners of land for 1872-73, the soil was divided among 12,387 proprietors, holding land the gross annual rental of which was £1,163,192. Of the owners 77 per cent. held less than one acre, and the total annual value for the county was £2, 17s. 3½d. per acre. There were only eight proprietors who held upwards of 4000 acres, viz., Marquis of Salisbury, Hatfield, 13,389; Abel Smith, Watton, 10,212; Earl Cowper, Panshanger, 10,122; Earl of Verulam, Gorhambury, St Albans, 8625; Earl Brownlow, Ashridge Park, 8551; Lord Dacre, The Hoo, Welwyn, 7100; Charles C Hale, King's Walden, 6558; and Earl of Essex, Cashiobury Park, Watford, 6157. W. R. Baker, Bayfordbury, comes next with 3911 acres.

The staple trade of the county is in corn and malt, most of which is sent to the metropolis. There are numerous flour-mills, as well as breweries, tanneries, tile-works, and coach factories, but the principal manufactures are paper, silk, and straw plait.

Hertfordshire is so much intersected by railways that no place in any part of the county is more than 5 miles distant from a station. On the eastern border there is the Great Eastern, with branches to Hertford and Buntingford. The middle of the county is traversed by the Great Northern, with branches from Hatfield to Hertford, Luton, Dunstable, and St Albans, and from Hitchin to Royston, and thence to Cambridge. The Midland passes through St Albans, with branches to the Great Northern and London and North-Western. The London and North-Western traverses the south-western corner.

The county comprises 8 hundreds, and the municipal boroughs of Hertford and St Albans. The principal towns are the municipal and parliamentary borough of Hertford (municipal borough, 7169), the city of St Albans (8298), Hitchin (7630), Watford (7461), Bishop Stortford (6250), Hemel-Hempstead (5996), Ware (4917), Berkhampstead (4083), Tring (4045), Barnet (3720). For parliamentary representation the county is an undivided constituency, and returns three members, while one member is returned for the borough of Hertford. Hertfordshire is in the south-eastern circuit. There were formerly two courts of quarter sessions, one for the county and one for the liberty of St Albans, which liberty had the exclusive jurisdiction of the peace, but the county and the liberty are now amalgamated, though prisoners are tried both at Hertford and St Albans. The jail for the county is at the latter city. The county is divided into fifteen petty sessional divisions, and for some purposes into two divisions, those of Hertford and the liberty of St Albans. The boroughs of Hertford and St Albans have commissions of the peace. Ecclesiastically the county is in the diocese of St Albans, and contains 1[illegible] civil parishes, townships, or places, as well as parts of other parishes extending into adjoining counties. The total population in 1871 was 192,226, of whom 93,244 were males and 98,982 females. The population in 1801 was [illegible]. Since the first census in 1801 it has increased by [illegible], or 97 per cent.

History and Antiquities.—Previous to the Roman invasion the Celtic inhabitants of Hertfordshire, as of the other parts of South Britain, had been subdued by the Belgæ. In 54 B.C. Cassivellaunus, the chief of the Cassii, led an army to oppose Cæsar, but he was defeated, and his capital Verulam, near the present town of St Albans, taken. At Verulam and Berkhampstead traces of ancient British works may yet be seen, and it has been conjectured that British stations existed at Royston, Braughing, and various other places in the county. Numerous British coins have been found at Verulam. Three principal British roads or trackways crossed the county. Watling Street passed through its south-west corner, in a north-west direction by St Albans to Dunstable; Ermine Street entered the south-east corner at Little [illegible], whence it proceeded by Gouger's Oak and Broxbourne Bury to Ware, holding thence much the same course as the present road by Buntingford to Royston; Icknield Street, from Dunstable to Royston, crossed the north-west corner. There are numerous barrows at Royston, and along the range of chalk hills at the northern edge of the county. Hertfordshire was the scene of an important part of the struggle carried on against the Romans by Caractacus about 44 A.D.; and during the rebellion of Boadicea the Romans were defeated on the road from Verulam to Colchester, and Verulam itself was taken and devastated by the Britons. The shire was included within the Roman province of Flavia. Among the Roman stations within its limits were the capital *Verulamium*, which the Romans rebuilt and fortified, *Forum Dianæ*, not far from Dunstable, *Ad Fines*, supposed to have been near Braughing, where there are remains of a vallum with fosse, and probably others at Royston and Bishop Stortford. Watling Street and Ermine Street were causewayed as Roman roads, and other branch roads traversed the county in various directions. Roman antiquities have been found at Verulam, Braughing, Royston, Wilbury Hill (where there are remains of an ancient camp), Cheshunt, Hemel Hempstead, and Bishop Stortford. After the conquest of England by the Anglo-Saxons, Hertfordshire was included partly in Mercia and partly in Essex. It was the scene of frequent contests between the Saxons and the Danes. In 896 the Danes, having anchored their vessels in the Lea near the town of Ware, laid siege to Hertford, whereupon Alfred the Great, by diverting the stream into three channels, stranded their vessels and compelled them to retreat to the Severn. After the battle of Senlac in 1066, William the Conqueror, in order to force the earls to hurry [illegible] from London to their earldoms, crossed the Thames at Wallingford and marched into Hertfordshire, where at Berkhampstead an attempt was made by the abbot of St Albans to stop his course by cutting down the trees; and at a meeting of nobles held at the town he took an oath to rule according to the ancient laws and customs of the country. The subsequent events of historic importance connected with the county are the capture of Hertford castle by the revolted barons under the French dauphin, December 6, 1216; the battle between the royalists and the troops of the White Rose at St Albans, May 22, 1455, in which Henry VI. was wounded and taken prisoner; a second battle near St Albans, 17th February 1461, in which the earl of Warwick was defeated by Queen Margaret; the defeat near Barnet of the earl of Warwick by Edward IV., 14th April 1471; and the seizure by Cromwell of the high sheriff of the county as he was proceeding to St Albans for the purpose of proclaiming by order of the king that the Parliamentary commanders were rebels and traitors.

Among the objects of antiquarian interest may be mentioned the cave of Royston, discovered in 1742 [illegible]; Waltham Cross, [illegible] to mark the spot where rested the body of Eleanor, queen of Edward I., on its way to Westminster for interment; and the Great Bed of Ware, referred to in Shakespeare's *Twelfth Night*, for many years [illegible] at the Crown Inn of that town, and in September 1864 put up for auction at the Saracen's Head [illegible]. The principal [illegible] of Sopwell Benedictine nunnery, near St Albans, founded in 1140; the remains of the priory of Ware, dedicated to St Francis and [illegible] in Normandy; and the remains of the priory at Hitchin built by Edward II. for the White Carmelites. Among the more interesting churches may be mentioned those of Abbots Langley and Hemel-Hempstead, both of late Norman architecture; Baldock, a handsome Gothic building supposed to have been erected by the Knights Templars in the reign of Stephen; Royston, formerly connected with the priory of the canons regular; Hitchin, built in the 15th century on the site of an older structure, with a fine porch in the Perpendicular style and an altarpiece by Rubens; Hatfield, dating from the 13th century; Berkhampstead, chiefly in the Perpendicular style, with a tower of the 16th century. The ruins of secular buildings of importance are the massive remains of Berkhampstead castle, Hertford castle, Hatfield palace, the slight traces at Bishop Stortford, and the earthworks at Anstie. Of the numerous mansions of interest only a few can be mentioned:—the Rye House, erected in the reign of Henry VI., tenanted by Rumbold, one of the principal agents in the plot to assassinate Charles II.; Moor Park, Rickmansworth, at one time the property of St Albans abbey, granted by Henry VII. to John de Vere, earl of Oxford, for some time in the possession of Cardinal Wolsey and subsequently of the duke of Monmouth, who built the present mansion, which, however, after it was sold by the duchess of Monmouth to Mr Styles, was cased with Portland stone, and received various other additions at a cost of £150,000; Knebworth, the seat of the Lyttons, originally a Norman fortress, rebuilt in the time of Elizabeth in the Tudor style and restored in the present century; Hatfield House, the manor of which was granted to the abbey of St Etheldred at Ely by King Edgar, and with the palace was made over to Henry VIII., from whose reign it remained a royal residence until the time of James I., who exchanged it for the palace of Theobalds with Sir Robert Cecil, afterwards earl of Salisbury, by whom the present mansion in the Elizabethan style was erected, being founded in 1611; Panshanger House, now the principal seat of the Cowpers, a splendid mansion in the Gothic style erected at the beginning of the present century; Cashiobury House, the seat of the earls of Essex, supposed to derive its name from the old British tribe Cassii, and the manor of which was formerly held by the abbot of St Albans, rebuilt in the beginning of the present century from designs by Wyatt, somewhat resembling those of Windsor Castle; Gorhambury House, formerly the seat of the Bacons, and the residence of the great chancellor, but rebuilt by the Grimstons. Among the eminent persons connected with the county were Nicholas Breakspeare (Pope Adrian IV.), Francis Bacon, Sir John Mandeville, William Cowper, Charles Lamb, and Lord Lytton.

The old histories of Hertfordshire by Cox, Salmon, and Chauncey have been superseded by the splendid work of Clutterbuck, 3 vols. folio, 1815–27, and the [illegible] now in course of publication by John Edwin Cussans.

HERTFORD, a town of England, capital of the above county, is situated in a sheltered valley on the river Lea, and on the Great Northern and Great Eastern Railways, 26 miles north of London by rail. It is somewhat irregularly built, but is neat, clean, and well paved. The principal buildings are the shire house or town hall, erected on the site of the former edifice, and finished in 1771; the corn exchange, erected in 1858; the church of All Saints recently restored, a cruciform structure of the 14th century, with a square tower surmounted by a spire; the new church of St Andrews, occupying the site of the old one; the brick edifice which occupies the site of the ancient castle, and includes some portions of the old building; and the infirmary. The county jail has lately been sold under the provisions of the new Prisons Act. There are a large number of educational institutions, including the preparatory school for Christ's Hospital, London; Hale's grammar school for boys, the Cowper Testimonial school for boys, the Abel Smith Memorial school for girls, and the Green Coat school for boys and girls of poor parents who have never received alms. The town depends for its prosperity chiefly on agriculture. The trade is principally in wheat and wool, and a large quantity of malt is made for the London breweries. There are also breweries, iron foundries, and flour and oil mills. The population of the municipal borough in 1871 was 7169, and of the parliamentary borough 7894. The area of the municipal borough is 864 acres, and of the parliamentary borough 1123 acres.

The name Hertford is derived by [illegible] from [illegible], meaning red ford, but some prefer to regard it as a corruption of Hartford, meaning [illegible], and indeed it is spelt in this way by Saxon authorities and in some ancient charters. In 673 a council was convened at Hertford by Theodore, Archbishop of Canterbury, at which two

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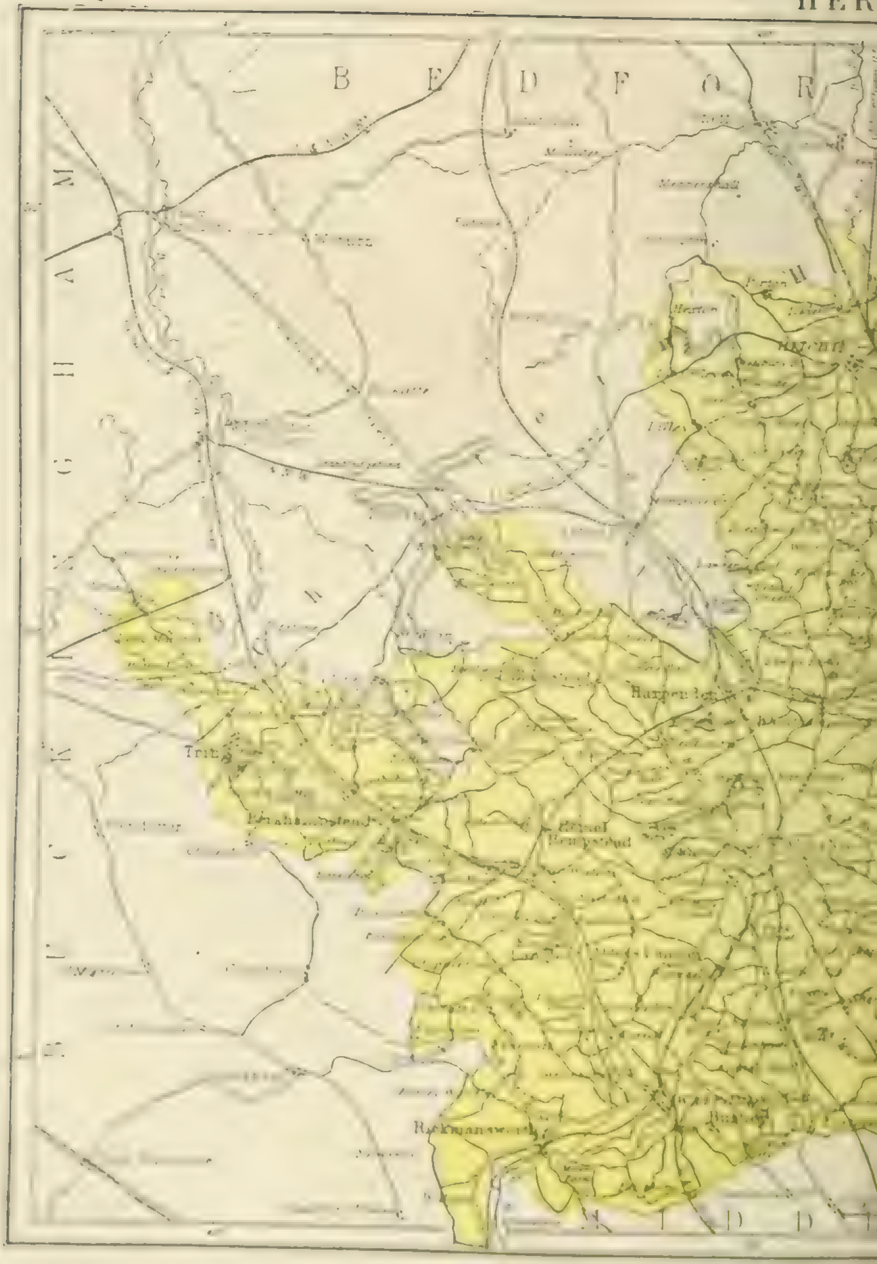
BEDFOR
BUCKINGHAM
Hitchin
Harpenden
Tring
Berkhampstead
Hemel Hempstead
Rickmansworth
Bushey
MIDD

ORD

PLATE XV

C A M B R I D G E
E S S E X
Ware
Sawbridgeworth
Stanstead
Hoddesdon
Harlow
Scale of Miles
Meridian of Greenwich

Saxon [illegible]. The castle was erected about 905 by [illegible] the Elder, [illegible] the town, which had [illegible] by the Danes. [illegible] and the [illegible] of the town [illegible] given by William the Conqueror to [illegible] de Valoignes. [illegible] it was [illegible] to the crown. In the reign of John it was captured by the [illegible] barons [illegible]. By Edward III. the castle was [illegible] the [illegible] prison of John II. king of France and David, king of Scotland. Hertford is [illegible] as a borough in Domesday. It received its first charter from Queen Mary in 1554, and this was renewed and modified by Elizabeth, and [illegible] and extended by James I. and Charles II. The borough sent two members to parliament from the reign of Edward I. to the time of Edward III., when the privilege was [illegible] until the reign of James I. Since the Reform Act of 1867 it has [illegible] only one member.

HERTZ, HENRIK (1798–1870), Danish poet, was born of Jewish parents in Copenhagen, August 25, 1798. At that date it was unusual for Jews to enjoy a professional situation, but young Hertz showed such marked literary bias that in 1817 he was sent to the university. His father having died in his infancy, and the family property having been destroyed in the bombardment of 1807, the boy was brought up by his relative, M. L. Nathanson, for many years editor of the principal Danish newspaper. Young Hertz was destined for the law, and passed his juridical examination in 1825. But his taste was all for polite literature, and in 1827 he came forward as a dramatic author by the publication of two plays, *Herr Burchardt and his Family* and *Love and Policy*; the latter enjoyed considerable success on the stage. In 1828 followed the comedy of *Flyttedagen*, which occupied itself with the humours of moving house on quarter-day. In 1830 he brought out what was a complete novelty in Danish literature, a drama in rhymed verse, *Amor's Strokes of Genius*. In the same year Hertz published anonymously *Gjengangerbreve*, or Letters from a Ghost, which he pretended were written by Baggesen, who had died in 1826, and which were full of satirical humour and fine critical insight. The success of this book was overwhelming; Copenhagen talked of nothing else for a whole season; but Hertz preserved his anonymity, and the secret was not known until many years later. In 1832 he published a didactic poem, *Nature and Art*, and *Four Poetical Epistles*. *A Day on the Island of Als* was his next comedy, followed in 1835 by *The Only Fault*. Hertz passed through Germany and Switzerland into Italy in 1833; he spent the winter there, and returned the following autumn through France to Denmark. In 1836 his comedy of *The Savings Book* enjoyed a great success. But it was not till 1837 that he developed his most important talent by writing the romantic drama of *Svend Dyring's House*, a beautiful and original piece, which still holds the stage. His historical tragedy *Valdemar Atterdag* was not so well received in 1839; but in 1845 he achieved an immense success with his lyrical drama *King René's Daughter*, which has been translated into almost every European language, and successfully acted all over the civilized world. To this succeeded the tragedy of *Ninon* in 1848, the romantic comedy of *Tonietta* in 1849, *A Sacrifice* in 1853, *The Youngest* in 1854. His lyrical poems appeared in successive collections, dated 1832, 1840, and 1844. From 1858 to 1859 he edited a very interesting literary journal entitled *Weekly Leaves*. He died in 1870. Hertz is one of the first of Danish lyrical poets. His poems are full of colour and passion, his versification has more witchcraft in it than any other poet's of his age, and his style is grace itself. He has all the sensuous fire of Keats without his proclivity to the antique. As a romantic dramatist he is scarcely less original. He has bequeathed to the Danish theatre, in *Svend Dyring's House* and *King René's Daughter*, two pieces which have survived the vicissitudes of forty years, and which are as popular as ever. He is a troubadour by instinct; he has little or nothing of Scandinavian local colouring, and succeeds best when he is describing the scenery or the emotions of the glowing south.

HERTZEN, ALEXANDER (1812–1870), was born at Moscow in 1812, a very short time before the occupation of that city by the French. His father, Ivan Yakovlef, after a personal interview with Napoleon, was allowed to leave, when the invaders arrived, as the bearer of a letter from the French to the Russian emperor. His family attended him to the Russian lines. Then the mother of the infant Alexander (a young German Protestant of Jewish extraction from Stuttgart, according to A. von Wurzbach), only seventeen years old, and quite unable to speak Russian, was forced to seek shelter for some time in a peasant's hut. A year later the family returned to Moscow, where Hertzen passed his youth, remaining there, after completing his studies at the university, till 1834, when he was arrested and tried on a charge of having assisted, with some other youths, at a festival during which verses by Sokolovsky, of a nature uncomplimentary to the emperor, were sung. The special commission appointed to try the youthful culprits found him guilty, and in 1835 he was banished to Viatka. There he remained till the visit to that city of the hereditary grand duke (afterwards Alexander II.), accompanied by the poet Joukofsky, led to his being allowed to quit Viatka for Vladimir, where he was appointed editor of the official gazette of that city. In 1840 he obtained a post in the ministry of the interior at St Petersburg; but in consequence of having spoken too frankly about a death due to a police officer's violence, he was sent to Novgorod, where he led an official life, with the title of "state councillor," till 1842. In 1846 his father died, leaving him by his will a very large property. Early in 1847 he left Russia, never to return. From Italy, on hearing of the revolution of 1848, he hastened to Paris, whence he afterwards went to Switzerland. In 1852 he quitted Geneva for London, where he settled for some years. In 1864 he returned to Geneva, and after some time went to Paris, where he died, January 21, 1870.

His literary career began in 1842 with the publication of an essay, in Russian, on *Dilettantism in Science*, under the pseudonym of "Iskander," the Turkish form of his Christian name,—convicts, even when pardoned, not being allowed in those days to publish under their own names. His second work, also in Russian, was his *Letters on the Study of Nature* (1845–6). In 1847 appeared his novel *Kto Vinovat?* (Whose Fault?), and about the same time were published in Russian periodicals the stories which were afterwards collected and printed in London in 1854, under the title of *Prervannuie Razskazui* (Interrupted Tales). In 1850 two works appeared, translated from the Russian manuscript, *Vom anderen Ufer* (From another Shore) and *Lettres de France et d'Italie*. In French appeared also his essay *Du Développement des idées révolutionnaires en Russie*, and his memoirs, which, after being printed in Russian, were translated under the title of *Le Monde russe et la Révolution* (3 vols. 1860–62), and were in part translated into English as *My Exile to Siberia* (2 vols., 1855). From a literary point of view his most important work is *Kto Vinovat?* a story describing how the domestic happiness of a young tutor, who marries the unacknowledged daughter of a Russian sensualist of the old type, dull, ignorant, and genial, is troubled by a Russian sensualist of the new school, intelligent, accomplished, and callous, without there being any possibility of saying who is most to be blamed for the tragic termination. But it was as a political writer that Hertzen gained the vast reputation which he at one time enjoyed. Having founded in London his "Free Russian Press," of the fortunes of which, during ten years, he gave an interesting account in a book published (in Russian) in 1853, he issued from it a great number of Russian works, all levelled against the system of government prevailing in Russia. Some of these were essays, such as his *Baptized Property*, an attack on serfdom; others were periodical publications, the *Polyarnaya Zvyezda* (or Polar Star), the *Kolokol* (or Bell), and the *Golosa iz Rossii* (or Voices from Russia). The *Kolokol* soon obtained an immense circulation, and exercised an extraordinary influence. For three years, it is true, the founders of the "Free Press" went on printing, "not only without selling a single copy, but scarcely being able to get a single copy introduced into Russia;" so that when at last a bookseller bought ten shillings' worth of *Baptized Property*, the half sovereign was set aside by the surprised editors in a special place of honour. But the death of the emperor Nicholas in 1855 produced an entire change. Hertzen's writings, and the journals he edited, were smuggled wholesale into Russia, and their words resounded throughout that country, as well as all over Europe. Their influence became overwhelming. Evil deeds long hidden, evil doers who had long prospered, were suddenly dragged into light and disgrace. His bold and vigorous language aptly expressed the thoughts which had long been secretly stirring Russian minds, and were now beginning to find a timid utterance at home. For some years his influence in Russia was a living force, the circulation of his writings was a vocation zealously pursued. Stories tell how on one occasion a merchant, who had bought several cases of sardines at Nijni-Novgorod, found that they contained forbidden print instead of fish, and at another time a supposititious copy of the *Kolokol* was printed for the emperor's special use, in which a telling attack upon a leading statesman, which had appeared in the genuine number, was omitted. At length the sweeping changes introduced by Alexander II. greatly diminished the need for and appreciation of Hertzen's assistance in the work of reform. The freedom he had demanded for the serfs was granted, the law-courts he had so long denounced were remodelled, trial by jury was established, liberty was to a great extent conceded to the press. It became clear that Hertzen's occupation was gone. When the Polish insurrection of 1863 broke out, and he pleaded the insurgents' cause, his reputation in Russia received its death-blow. From that time it was only with the revolutionary party that he was in full accord, and it is by that section of Russian Liberals alone that his opinions are now considered of authority. For the great reforms, however, which followed the Crimean War, Russia is much indebted to the outspoken utterances of Alexander Hertzen, and will be so in all probability for the constitutional changes which are likely to follow the repressive measures of 1879.

In 1873 a collection of his works in French was commenced in [illegible] [illegible] (W. R. S. R.)

HERULI, Æruli, or Eruli, a powerful and notable German tribe, who inhabited the northern shores of the Black Sea, but afterwards divided into various sections and wandered into different parts of Europe. They made their first appearance in history in the 3d century, as taking part with the Goths in their incursions against the eastern provinces of the Roman empire. In the 4th century they [illegible] the Gothic king Hermanric, but when Attila, king of the Huns, made his descent upon Gaul, they joined his standard. After the overthrow of the Huns, in which they suffered considerably, they established an [illegible] confederacy on the banks of the Danube, and under the leadership of Odoacer, assisted in 476 in the overthrow of the Western empire. Under their king Rudolf they in the beginning of the 6th century attempted the subjugation of the Longobardi, but were defeated and dispersed, some of them proceeding to Scandinavia, and others being allowed by the emperor Anastasius to settle on the south bank of the Danube. In the time of Justinian some of them embraced Christianity. A large portion of them afterwards joined the Gepidae in their wars against the Eastern empire; but others who remained afforded Justinian important assistance in his wars against the Vandals and East Goths, so that they frequently fought against one another. About the end of the 6th century they became submerged and lost in other nations, and disappeared from historical records. The Heruli were bold, hardy, and extremely pugnacious. For a considerable period they retained intact their strong individuality, and presented a firm resistance to the influences of surrounding civilizations. They put to death without mercy the sick and the aged, and are said even to have offered human sacrifices.

HERVEY, James (1714-1758), a popular religious writer of the 18th century, was born at Hardingstone, near Northampton, on February 26, 1714, and was educated at the grammar school of Northampton, whence in 1731 he passed to Lincoln College, Oxford. At the university he came under the influence of John Wesley and others of that school, and for some time manifested an inclination towards their theology; ultimately, however, while retaining his regard for the men and his sympathy with their religious aims, he adopted a thoroughly Calvinistic creed, and resolved to retain connexion with the Established Church. Having taken holy orders in 1737, he became curate to his father in the family livings of Weston Favell and Collingtree, to which he himself succeeded in 1752. There, under the disadvantage of very weak health, he laboured with great diligence in the discharge of his parochial duties, and also wrote numerous religious works, which, though of but slight literary or theological value, rapidly became highly popular, and in many English and Scottish houses, especially of the humbler class, took a place on the same shelf with the *Pilgrim's Progress* and the *Whole Duty of Man*. His earliest work, *Meditations and Contemplations*, containing "Meditations among the Tombs," "Reflexions on a Flower Garden," and a "Descant on Creation" (1746), and "Contemplation on the Night and Starry Heavens" (1747), said to have been modelled on Boyle's *Occasional Reflections on various Subjects*, within fourteen years passed through as many editions. *Theron and Aspasio, or a Series of Letters upon the most important and interesting Subjects*, which appeared in 1755, and was equally well received, called forth some adverse criticism even from Calvinists, on account of tendencies which were considered to lead to antinomianism, and was strongly objected to by Wesley in his *Preservative against unsettled Notions in Religion*. Besides carrying into England the theological disputes to which Fisher's *Marrow of Modern Divinity* had given rise in Scotland, it also led to what is known as the Sandemanian controversy as to the nature of saving faith. Hervey died on December 25, 1758. A "new and complete" edition of his *Works*, with a memoir, appeared in 1797. See also *Collection of the Letters of James Hervey, to which is prefixed an account of his Life and Death* (1760).

HERVEY, John Hervey, Lord (1696-1743), the "Narcissus," "Sporus," and "Lord Fanny" of Pope's satire, a nobleman of political and social distinction in the reign of George II., was son of John, first earl of Bristol, and was born on October 13, 1696. Educated and trained for public life at Westminster and Clare Hall, Cambridge, he became a favourite at the court of the prince and princess (afterwards George II. and Queen Caroline), to which Pope, Gay, Arbuthnot, Chesterfield, and others were attracted, and which was celebrated for the beauty and accomplishments of its ladies, such as Miss Bellenden, afterwards duchess of Argyll, Miss Howe, Miss Lepell, and Mrs Howard, whose names will live for ever in the poetry of Pope, Gay, and Swift, and in the lively and artless correspondence of that brilliant circle. Hervey was married to Miss Lepell in 1720. He was elected to the House of Commons as member for Bury (1725), and in 1730 received the appointment of vice-chamberlain to the king; in 1733 Sir Robert Walpole called him up to the House of Lords, where he proved a ready and effective speaker; and in 1740 he succeeded Lord Godolphin as lord privy seal, which office he held until the Walpole administration was driven from power in 1742. Notwithstanding miserable health he continued to take an active part in politics until his death, which occurred on August 8, 1743. He was survived by four sons, three of whom became successively earls of Bristol. Destitute of any commanding talents or solid principle, a sceptic in religion and a profligate in morals, Lord Hervey was yet far above the intellectual rank assigned him by his merciless satirist, Pope. He wrote and spoke vigorously on public questions, was studious and laborious, a fair scholar, and a writer of pleasing occasional verses. The origin of the hostility which led to the allusion in the *Dunciad* (iv. 104) in 1728, and afterwards to the attacks in the *Prologue* and *Epilogue to the Satires*, remains obscure. "It would be now idle," as Mr Croker remarks, "to seek for a cause of quarrel which the parties were, a hundred years ago, unable or unwilling to explain; but may it not be sufficiently accounted for by the jealousies almost inevitable between persons of such similar and therefore discordant tastes and tempers, living together in a circle of tittle-tattle, scandal, and pasquinades?" Political differences had probably something to do with it, Lord Hervey and Lady Mary Wortley Montague (who shared with him the poet's enmity) having at the accession of George II. adhered to Walpole, while Pope and his brother wits were chiefly associated with the opposition. Lord Hervey left behind him *Memoirs of the Reign of George the Second, from his Accession to the Death of Queen Caroline*, which were not published until 1848, when they appeared in two volumes, edited, with a biographical notice, by Mr Croker. The work throws much light on the interior of the court—its coarseness, dulness, and immorality; but it is as degrading to the author as it is to the English monarchy, for Lord Hervey appears rather in the light of a court parasite and malignant gossip than in that of a fair historian or an English gentleman.

HERZEGOVINA, an Illyrian province, ethnographically belonging to the Serbo-Croatian nationality, under the titular dominion of the Turkish sultan, but since 1878 administered by Austria-Hungary. The Turks included it in the vilayet of Bosnia. It is bounded N. and E. by Bosnia, S. by Montenegro, and W. by Dalmatia, only touching the Adriatic by the narrow enclaves of Klek and Suttorina. The province extends about 117 miles in a south-east direction between 17° 10′ and 20° 15′ E. long. By the treaty of Berlin the Herzegovinian districts of Niksich and Dormitor have been placed under the government of the prince of Montenegro.

Population.—The Austrians have not yet (1879) had time to complete trustworthy statistics as to the population and resources of the province, and those published in the days of Turkish administration must be received with great reserve. The best statistical accounts of Herzegovina are those collected for the Austrian Government by the staff-officers Majors Roskiewicz and Thoemmel, and their discrepancy is the best proof of the difficulties which have hitherto prevented an exact calculation.

According to Roskiewicz the population of Herzegovina amounted in 1868 to 230,000 souls. Thoemmel (in 1867) gives it as 207,970, of whom 101,348 were Pravoslavs or adherents of the Orthodox Greek Church, 56,000 Mahometans, 49,217 Roman Catholics, 1340 Gipsies, and 65 Jews. Dr Blau (late Prussian consul general at Seraievo) fixes the Herzegovinian population in 1872 approximately at 230,000, viz., 130,000 of the Orthodox Greek Church, 55,000 Mussulmans, 42,000 Roman Catholics, 2500 Gipsies, and 500 Jews. Klaich, however, the most recent Slavonic authority on the province (1878), reduces the total population to 185,421. During the troubles that ensued on the insurrection of 1875, about two-thirds of the Christian population fled beyond the Dalmatian and Montenegrin border, and the fearful mortality among these refugees has largely diminished the Herzegovinian population during the last three years.

With the exception of the Gipsies, the Jews, and a small sprinkling of Osmanli officials, the whole population is Slavonic, the Mahometans being for the most part renegade descendants of the feudal nobility that had formed itself here before the Turkish conquest. Much of the old Slavonic customs and family life still holds among the Herzegovinian Mussulmans, and here as in Bosnia polygamy is unknown. The Herzegovinians are tall, broad, and darker, and of greater personal bravery than the Bosnians; they are brachycephalic. In frame as well as character they approach very nearly to the Montenegrin type, and in the mountain districts they are divided, like the Montenegrins and Albanians, into clans or nahias, whose loyalty is reserved for their own waiwodes or military chiefs. Their temperament is pre-eminently poetic, in so much that the recent insurrection has already given rise to many epic lays, which are recited to the sound of the guzla or Serbian lyre by the national minstrels. The Serbo-Croatian language is spoken in its purest form in Herzegovina, and the Narenta valley has been called the Serbian Val d'Arno. The Orthodox Greek population is chiefly settled in the district east of the Narenta; to the west of that river the population is mostly Roman Catholic, and the Mahometans inhabit the larger towns. According to the *Schematismus* of the Franciscan P. Bakula, the population of the capital Mostar amounted in 1873 to 29,116, of whom 20,306 were Mahometans, 5008 Greeks, and 2821 Roman Catholics. Of the other towns, Ljubuski has, according to Klaich, a population of about 3000 souls, Stolatz 3500, Focha 10,000, Niksich (now under Montenegro) 4000, and Trebinje 3000.

Natural Features.—Herzegovina, which has been described as the Turkish Switzerland, is divided into a variety of mountain plateaus by the parallel ranges of the Dinaric Alps; and the whole country is bisected by the river Narenta, which cleaves its way through the mountains from the Bosnian frontier towards the Adriatic. The valley of the Narenta and its tributaries forms the main artery of the province. There is situated the capital Mostar; and a fine highroad, the only avenue of communication between Seraievo (Bosna Serai) and the Adriatic, follows the river bank from the Dalmatian frontier to the Bosnian. The "polyes" or mountain plateaus are the most characteristic feature of the country. The smaller towns and villages group themselves on their level and comparatively fertile surface, and the districts or cantons thus formed are walled round by a natural rampart of white limestone mountains. The "polyes" may be described as oases in what is otherwise a desert expanse of mountains. The surface of some, as notably the great Mostarsko Blato, is marshy, and in spring forms a lake; others are watered by streams which disappear in swallow-holes of the rock, and make their way by underground channels either to the sea or the Narenta. The most conspicuous example of these is the Trebinstica, which disappears in two swallow-holes in Popovopolje, and after making its way by a subterranean passage through a range of mountains, wells up in the mighty source of Ombla near Ragusa, and hurries in undiminished volume to the Adriatic. The climate of Herzegovina is cold in winter and oppressively hot (maximum 100° Fahr. in shade) in summer. The scirocco is a prevalent wind, as well as the bora, the fearful north-easter of Illyria, which, sweeping down the lateral valleys of the Dinaric Alps, overwhelms everything in its path. The snow-fall is slight, and, except on a few of the loftier peaks, the snow soon melts. In the valleys, as that of the Narenta, the flora approaches that of Dalmatia and Southern Italy, and olives, mulberries, figs, melons, pomegranates, grapes, rice, and maize flourish. The Dinaric Alps, which stretch across the province from N.W. to S.E., are as a rule barer and loftier than those of Bosnia. To the west of the Narenta, indeed, their flanks are in places covered with a forest growth of beech and pine, but north-east of that river they present for the most part a scene of lunar desolation. They are of the Tertiary formation common to the Mediterranean geological zone, but their limestone has a more dolomitic character than that of the Bosnian ranges. The group of mountains in the north-west bend of the Narenta, the Krabac, Lipeta, and Porim Planinas, attain altitudes varying from 4000 to 5000 feet; the dolomitic peaks of Orobac, Samotica, and Veliki Cap rise over 6000; Orien on the Dalmatian-Montenegrin frontier 6300; and Mount Dormitor, in the tract of Herzegovina now ceded to Montenegro, reaches a height of 8500 feet. The river Narenta is navigable for small steamers as far as Metkovitch, the Dalmatian frontier station, and for *trabaccoli* as far as Chaplina beyond Gabella, but the narrow and rocky bed of the stream beyond this point makes it doubtful whether the navigation can ever be extended as far as Mostar.

Produce and Industries.—In mineral wealth Herzegovina cannot compete with Bosnia. Lignite exists in considerable abundance in the Narenta valley near Mostar, at Konjica, and at Stolac. Mineral springs occur near Ljubuska; asphalt towards Metkovitch and Drazevo on the Dalmatian frontier. Rice is cultivated in the Trebisat valley and about Ljubuska. Mulberries are cultivated in the Narenta valley for silkworms, which were introduced here by the famous vizier Ali Pasha, but the culture is at present small. The wine of Konjica and Mostar resembles Dalmatian, and might be excellent, and the Trebinje tobacco is celebrated. Previous to the insurrection the chief wealth of the inhabitants consisted in cattle. Roskiewicz estimates the numbers as 100,000 horned cattle, 1,200,000 sheep and goats, and 190,000 swine, but there has been a terrible decrease during the three years of anarchy. Before the insurrection the annual value of the exports of the province, consisting principally of sheep's wool, hides, wax, wine, and tobacco, amounted to about 18,170,000 piastres (£163,500). The imports, principally cloth and woollen goods, were estimated at 17,5[illegible] piastres (£157,[illegible]

H[illegible] at St Savas [illegible] he derived from the tomb of the patron saint of Serbia in the monastery of [illegible]. From this time the Slav population of Illyria begins to know the dominions of [illegible] as the "Herzegovina" or duchy, a general term which [illegible], besides the [illegible] of Chelm, the two old Serbian [illegible] Trebinje and Popovo, also governed by the "Herzog." [illegible] Herzegovina [illegible] Dalmatia [illegible] Bosnia. The duke [illegible] Bosnian king [illegible] Herzegovina. The [illegible] Bosnia, [illegible] conquered Bosnia. The duke [illegible] Herzegovina, with some success, and though in 1464 the country was [illegible] the sultan's hands, it was not till 1483, twenty years after the final conquest and extinction of the Bosnian kingdom, that the Turks, [illegible] Stephen Cosaccia's son and successor Duke Vlatko. The whole country was now incorporated in the Sandjakate of Bosnia. At different times the Venetians succeeded in [illegible] parts of Herzegovina, and by the peace of Carlowitz in 1699 and that of Passarowitz in 1718 [illegible] of the Herzegovinian coast land, Castelnuovo, and Risano were [illegible] Venetian Dalmatia, and have thus descended to the Austrians. The only remaining strips of Herzegovinian sea-coast, the narrow enclaves of Klek and Suttorina, were left to the Turks by [illegible] of Venetian [illegible], supported by the good offices of England. The history of Herzegovina under the Turks is to a great extent a blank: the viziers of Herzegovina who resided at Mostar imitated by their quasi-independence of their Bosnian superiors the defiant attitude [illegible] by the duke of St Sava to his Bosnian sovereign. Feudalism under a Mahometan guise continued to survive here. The spahis, begs, or agas were merely mediæval lords who had apostatized to Islam. They kept their ancestral castles, their banners, their mediæval title deeds and patents of nobility. They exacted feudal service from their serfs and retainers. They indulged in the mediæval passion for hawking. One of these Mahometan nobles, Ali, aga of Stolac, did such good service for Sultan Mahmoud in his struggle with the Bosnian magnates that he was made vizier of Herzegovina, which was freed for a while from dependence on the Bosnian government. The reforms of Sultan Mahmoud did not by any means remove the grievances of the rayah population of Herzegovina. The serfs had now to satisfy the extortion of imperial tax-farmers and excisemen as well as the demands of their feudal lords. The begs and agas continued to exact their forced labour and a third of the produce; the central Government levied a tithe which at the date of the outbreak had become an eighth. Three kinds of cattle tax, the tax for exemption from military service levied on every infant in arms, forced labour on the roads, forced loan of horses, a heavy excise on grapes and tobacco, and a variety of lesser taxes combined to burden the Christian peasants; but what was more galling than the amount, was the manner in which these various taxes were extorted,—the iniquitous assessment of tax-farmers and excisemen, and the brutal license of the zaptiehs who were quartered on recalcitrant villagers. Meanwhile the profligate expenditure of the imperial voluptuary at Stamboul and the peculation of his ministers hurried on the crisis. The public bankruptcy of Turkey put the last straw on the rayah's back. On July 1, 1875, the villagers of Nevesinje, which gives its name to a mountain plateau east of Mostar, unable to bear the extortion of the tax-farmers, and goaded to madness by the outrages inflicted on them by the [illegible], rose against their oppressors. The [illegible] spread through Herzegovina and [illegible] Bosnia. The [illegible] Peko Pavlovitch, [illegible] held out for a year [illegible] of Mostar [illegible] the Turks lost [illegible]. In July 1876 the [illegible] joined in the [illegible] the Russo-Turkish war [illegible] by the treaty of [illegible] the government of Bosnia and Herzegovina was [illegible] while [illegible] and the country about [illegible] from Herzegovina and annexed to Montenegro. [illegible] 1878, the [illegible] the Herzegovinian [illegible] Mahometan [illegible] of Mostar [illegible] the Turkish [illegible] Mostar [illegible] August. By the end of September the [illegible] of Herzegovina was [illegible] of the [illegible] the government of the province has been [illegible] at Serajevo, controlled by the foreign office at Vienna. The sultan still remains sovereign *de jure*, but have the Austro-Hungarian administrators as yet been able to regulate the agrarian difficulty which lies at the root of all the evils that have afflicted the province.

Authorities.—Mauro Orbini, [illegible] (in his *Regno degli Slavi*, Pesaro, 1601); [illegible], *de Regno Bosniæ*, Leyden, 1627; [illegible], *Politische Geschichte des Königreichs Bosnien u. Rama*, Vienna, 1787; Farlato, *Illyricum Sacrum*, vol. iv.; Ami Boué, *La Turquie d'Europe*; Sir G. Wilkinson, *Dalmatia and Montenegro*, London, 1848; Roskiewicz, [illegible], Leipsic, 1861; [illegible], Vienna, 1867; Roskiewicz, [illegible] *u. Herzegovina*, Vienna, 1868; E. de Sainte-Marie, [illegible], Paris, 1875, and "Itinéraires en Herzégovine" in *Bull. de la Soc. de Géogr. de Paris*, 1876; Evans, *Through Bosnia and the Herzegovina*, London, 1876, and [illegible], London, 1878; Stillman, *Herzegovina and the Late Uprising*, London, 1877; De [illegible], [illegible] *u. d. Herzegowina*, Berlin, 1877; [illegible], [illegible], Agram, 1878; Haardt, *Die Occupations-Gebiete Bosnien u. die Herzegovina*, Vienna, 1878. *Correspondence respecting* [illegible], issued by the English Foreign Office, 1876, &c., and Reports of Consuls Holmes and Freeman. (A. J. E.)

HERZOGENBUSCH, or 's HERTOGENBOSCH. See BOIS-LE-DUC.

HESEKIEL, GEORGE LOUIS (1818-1874), German author and journalist, was born August 12, 1818, in Halle, where his father, a man of considerable distinction, was a preacher and inspector of schools. Hesekiel studied history and philosophy in Halle, Jena, and Berlin, and devoted himself in early life to journalism and literature. In 1848 he settled in Berlin, where he lived till his death, February 26, 1874, achieving a considerable reputation both as a writer of books and as editor of the *Neue Preussische Zeitung*. He attempted many different kinds of literary work, the most ambitious being perhaps his patriotic songs, of which he published a volume during the revolutionary excitement of 1848-49. Another collection—*Neue Preussenlieder*—appeared in 1864 after the Danish war, and there was a third in 1870—*Gegen die Franzosen, Preussische Kriegs- und Königslieder*. Among his novels may be mentioned *Vier Junker* (1864) and *Der Schultheiss vom Zeyst* (1875). By far the best known of his works is his life of Prince Bismarck—*Das Buch vom Fürsten Bismarck* (3d edition, enlarged, 1873). This biography, which has been translated into English by R. R. H. Mackenzie, is written from the point of view of an ardent admirer of the great chancellor. It is of no value as an estimate of his political importance, but it has acquired a certain popularity because of the mass of more or less interesting anecdotes which the author has brought together respecting both the public and the private life of his hero. It has lately, however, been rather thrust into the shade by the more piquant revelations of Herr Busch.

HESIOD, the father of didactic poetry in Greece, is placed by Herodotus after Homer, but not more than 400 years before his own epoch; and, though the settlement of the question must depend on the internal evidence of the Hesiodic poems, this testimony is corroborated by the Parian marble and the historian Ephorus. He probably flourished about nine centuries before Christ. His father had migrated from Cyme in Æolia to Bœotia, exchanging there a seafaring life for agriculture; and Hesiod and his brother, a scapegrace named Perses, were born at Ascra, near the base of Helicon and under the mountains which encircle Bœotia. Of this locality—whose claim to be his birthplace was disputed by the city Orchomenus on the score of possession of his relics—Hesiod's description differs from that of modern topographers in pronouncing the climate ungenial, with alternations of excessive heat and cold; but the poet's prejudice may have been influenced by the injustice of Bœotian law-courts, and it was at any rate here, as he fed his father's flocks beside Helicon, that he received his commission from the Muses to be their prophet and poet—a commission which he recognized by dedicating to them an eared tripod won by him in a contest of song at funeral games in Eubœa, and extant at Helicon in the age of Pausanias (*Theog.*, 20-34; Pausan., ix. 31, § 3). But to this call were linked, no doubt, literary antecedents in Æolia, as well as local associations of music and poetry in Hellas. His earliest poem, the famous *Works and Days*, embodies the experiences of his life afield, and, interwoven with episodes of fable, allegory, and personal history, forms a sort of Bœotian shepherd's calendar. The first portion is an ethical enforcement of honest labour and dissuasive of strife and idleness (1-383); the second consists of hints and rules as to husbandry (384-764); and the third is a religious calendar of the months, with remarks on the days most lucky or the contrary for rural or nautical employments. The connecting link of the whole poem is the author's advice to his brother, who appears to have bribed the corrupt judges to deprive Hesiod of his already scantier inheritance, and to whom, as he wasted his substance lounging in the agora, the poet more than once returned good for evil, though he tells him there will be a limit to this unmerited kindness. In the *Works and Days* the episodes which rise above an even didactic level are the "Creation and Equipment of Pandora," the "Five Ages of the World," and the much-admired "Description of Winter" (by some critics judged post-Hesiodic). It is in the *Works and Days* especially that we glean indications of Hesiod's rank and condition in life, that of a stay-at-home farmer of the lower class, whose sole experience of the sea was a single voyage of 40 yards across the Euripus, and an old-fashioned bachelor whose misogynic views and prejudice against matrimony have been conjecturally traced to his brother Perses having a wife as extravagant as himself.

The other poem attributed to Hesiod or his school which has come down in great part to modern times is *The Theogony*, a work of grander scope, inspired alike by older traditions and abundant local associations. It seems that no more congenial task could have suggested itself to the Ascræan shepherd than to work into system, as none had essayed to do before, the floating legends of the gods and goddesses and their offspring. This task Herodotus attributes to him, and he is quoted by Plato in his *Symposium* (p. 178 B) as the author of the *Theogony*. The first to question his claim to this distinction was Pausanias, the geographer (200 A.D.). The Alexandrian grammarians had no doubt on the subject; and indications of the hand that wrote the *Works and Days* may be found in the severe strictures on women, in the high esteem for the wealth-giver Plutus, and in coincidences of verbal expression. If, too, as commentators assert, the proper beginning of the *Works and Days* is at verse 11—

> Οὐκ ἄρα μοῦνον ἔην Ἐρίδων γένος, ἀλλ' ἐπὶ γαῖαν
> Εἰσὶ δύω,

it is hard to avoid the conclusion that the poet there corrects a statement made in his *Theogony* (225), where he had described Eris, the daughter of Night, as one and indivisible. One thing is clear, that, as Mr Grote puts it, it was the aim of Hesiod, or the member of his school who composed the *Theogony*, "to cast the divine functions into a systematic sequence,"—so welding into intelligible coherence the generations and genealogies of the deities of Hellas, whom Homer had dealt with in passing and scattered notices only. The *Theogony* consists of three divisions—(1) a cosmogony, or creation; (2) a theogony proper, recounting the history of the dynasties of Zeus and Cronus; and (3) a brief and abruptly terminated heroogony, or generation of heroes by immortal sires from mortal mothers; the starting-point not improbably of the Hesiodic poem, the *Eoiai*, or "Catalogues of Women," of which all but a few fragments are lost. Prefaced by an account of the Muses' visit to their bard, the *Theogony* proceeds, from the spontaneous generation of Erebus and Night from Chaos, to detail a cosmogonic order at first corresponding with the Mosaic. The first ruler of creation, Uranus, is disabled and dethroned by Cronus, and Cronus in turn by his sixth son by Rhea, Zeus; but the chronicling of Titans and Cyclopes, of Nereids and Oceanids, divine rivers and water-nymphs, defies even the briefest enumeration. The poet has interwoven several episodes of rare merit, such as the contest of Zeus and the Olympian gods with the Titans, or the description of the prison-house in which the vanquished Titans are confined, with the Giants for keepers and Day and Night for janitors (735 *sq.*). Notable also is the version of the legend of Pandora given in the *Theogony* as compared with that in the *Works and Days.* The *Theogony* omits the part played in the earlier poem by Epimetheus in accepting Pandora at Jove's hands in spite of the counsel of Prometheus, as well as the mention of the casket of evils from which in the *Works and Days* Pandora lifts the lid with such woeful results.

The only other approach to a poem of Hesiod is the so-called *Shield of Hercules*, a piece of patchwork with which interpolators have done their worst. The opening verses are attributed by a nameless grammarian to the fourth book of *Eoiai*. The theme of the piece is the expedition of Hercules and Iolaus against the robber Cycnus; but its main object apparently is to describe the shield of Hercules (141–317). C. O. Müller deems this description worthy of a place beside Homer's shield of Achilles in *Il.* xiii., and recognizes in it the genuine spirit of the Hesiodic school. Titles and fragments of other lost poems of Hesiod have come down to us: didactic, as the *Maxims of Chiron*; genealogic, as the *Ægimius*; and mythic, as the *Marriage of Ceyx* and the *Descent of Theseus to Hades.*

A strong characteristic of Hesiod's style is his sententious and proverbial philosophy (as in *Works and Days,* 24–5, 40, 218, 345, 371). There is naturally less of this in the *Theogony*, yet there too not a few sentiments take the form of the saw or adage. With the poet's history, apart from the evidence of his poems, we have little acquaintance. There is reason to suppose that in later life he removed from Ascra to Orchomenus, where, according to Pausanias, were his sepulchre and epitaph. Tradition has assigned a tragical ending to a life seemingly placid and unemotional; but the story that he met a violent death near the Locrian Œneon in the territory of Naupactus, by reason of an intrigue with a sister of his host, or a guilty knowledge of such intrigue, is probably valueless except as evidence of the hero-worship of Hesiod in Locris and Bœotia (*cf.* Friedel, *Die Sage vom Tode Hesiods*, Leipsic, 1879). The poet will be remembered as the first of didactic poets, the accredited systematizer of Greek mythology, and the rough but not unpoetical sketcher of the lines on which Virgil wrought out his exquisitely finished *Georgics.*

Among the older editions of the Hesiodic poems may be mentioned those printed at Venice in 1495 and 1537, and those of Heinsius (Leyd. 1603), Schrevelius (Leyd. 1650), Graevius (Amst. 1667), Robinson (Oxf. 1737); and among those of recent date, Loesner (Leip. 1778), Lehrs (Paris, 1840, new ed. 1868), Schoemann (Berl. 1869), Koechly and Kinkel (Leip. 1870), Flach (Berl. 1878). The *Works and Days* has been edited separately by Spohn (Leip. 1819), Vollbehr (Kiel, 1844), Lennep (Amst. 1847); and the *Theogony* by F. A. Wolf (Halle, 1783), Lennep (Amst. 1843), Schoemann (Berl. 1868), and Flach (Berl. 1873). The *Fragments* were collected by Marckscheffel (Leip. 1840). The many disputed questions connected with the poems of Hesiod have given rise to a vast critical and polemical literature. In regard to the language of the poems the student may consult W. Christ, "[illegible] zur Lehre vom Hexameter," in [illegible], iii.; Dr H. Flach, *Das dialektische Digamma des Hesiodos* (Berl. 1876); Rzach, *Der Dialekt des Hesiodos* (Leip. 1876). The composition and system of the *Theogony* have been investigated by Koch (Breslau, 1842), Gerhard (Berl. 1856), Welcker (Elberf. 1865), Lettschuh (Würzburg, 1867), Schoemann (Berl. 1868), Flach (Leip. 1874), Fritzsche ([illegible], 1873); and special studies on the *Works and Days* have been contributed by Twesten (Kiel, 1815), Ranke (Götting. 1838), Steitz (Leip. 1869), [illegible] (Münster, 1872), and [illegible] (Par. 1874). Works of more general criticism are Creuzer and Hermann, *Briefe über Homer und Hesiod* (Heidelb. 1817); Thiersch, *Ueber die Gedichte des Hesiodus* (Munich, 1813); J. P. Mahaffy, "Studies in Greek Literature" in *Hermathena*, iv. The MSS. are discussed by Flach, *Die beiden ältesten Handschriften des Hesiod* (Leip. 1877); Kinkel, [illegible] (Heidelb. 1866); [illegible], "Über eine neue Hesiod-Handschrift" in *Sitzungsber.* of Vienna Academy, 1879. There are English translations of the Hesiodic poems by Cooke (Lond. 1728), Elton (Lond. 1815), and Banks (Lond. 1856); German translations by J. H. Voss (Heidelb. 1806), and Uschner (Berl. 1865); French translations by Leconte de Lisle (Par. 1869) and Patin (Par. 1872-3); and Italian by Chiodi (Cosenza, 1867) and Pozzolo (Milan, 1873). (J. DA.)

HESPERIDES, maidens whose number is variously given as three, four, or seven, who guarded the golden apples which Earth gave Hera at her marriage to Zeus. They live far away in the west at the borders of Ocean, in other words at that point of heaven where the sun sets. Hence the sun (according to Mimnermus) sails in the golden bowl that Hephæstus made from the abode of the Hesperides to the land where he rises again. According to other accounts they dwell among the Hyperboreans, who live in quietness and calm, *i.e.*, they dwell in heaven among the souls of them that have died on earth. The golden apples grow on a tree which is guarded by an ever-watchful dragon. The sun is often in German and Lithuanian legends described as the apple that hangs on the tree of the nightly heaven, like the fleece of the sun-ram that was sacrificed and skinned, and the dragon, the envious power, keeps the light back from men till some beneficent power takes it from him. Heracles is the hero who brings back the golden apples to mankind again. Like Perseus, he first applies to the Nymphs, who help him to learn where the garden is. Arrived there he slays the dragon and carries the apples to Argos; and finally, like Perseus, he gives them to Athene. The Hesperides are, like the Sirens, beautiful singers, λιγύφωνοι. They are said to be the daughters of Atlas; or, according to other accounts, they are the children of Erebus and Night, or Phorcys and Ceto, and are thus sisters of the Grææ, who also receive into their care the setting sun. Hesperides are introduced into the Argonautic legend, but it is doubtful if this is really antique, or only a poetic embellishment of the wanderings of the Argonauts.

HESS. Amongst numerous German artists of this name, the following particularly deserve attention.

HEINRICH MARIA HESS—Von Hess, after he received a patent of personal nobility—was born at Düsseldorf in 1798, and brought up to the profession of art by his father, the engraver Karl Ernst Christoph Hess. Karl Hess had already acquired a name when in 1806 the elector of Bavaria, having been raised to a kingship by Napoleon, transferred the Düsseldorf academy and gallery to Munich. Karl Hess accompanied the academy to its new home, and there continued the education of his children. In time Heinrich Hess became sufficiently master of his art to attract the attention of King Maximilian. He was sent with a stipend to Rome, where a copy which he made of Raphael's Entombment, and the study of great examples of monumental design, probably caused him to become a painter of ecclesiastical subjects on a large scale. In 1828 he was made professor of painting and director of all the art collections at Munich. He decorated the [illegible], the Glyptothek, and the Allerheiligencapelle at Munich with frescos; and his cartoons were selected for glass windows in the cathedrals of Cologne and Ratisbon. Then came the great cycle of frescos in the basilica of St Boniface at Munich, and the monumental picture of the Virgin and Child enthroned between the four doctors, and receiving the homage of the four patrons of the Munich churches (now in the Pinakothek). His last work, the Lord's Supper, was found unfinished in his atelier after his death in 1863. Before testing his strength as a composer Heinrich Hess tried genre, an example of which is the Pilgrims entering Rome, now in the Munich Gallery. He also executed portraits, and twice had sittings from Thorwaldsen (Pinakothek and Schack collections). But his fame will rest on the frescos representing scenes from the Old and New Testaments in the Allerheiligencapelle, and the episodes from the life of St Boniface and other German apostles in the basilica of Munich. Here he holds rank second to none but Overbeck in monumental painting, being always true to nature though mindful of the traditions of Christian art, earnest and simple in feeling, yet lifelike and powerful in expression. Through him and his pupils the sentiment of religious art has been preserved and extended in the Munich school, and will not easily die out.

PETER HESS—afterwards Von Hess—was born at Düsseldorf in 1792, and accompanied his younger brother Heinrich Maria to Munich in 1806. Being of an age to receive vivid impressions, he felt the stirring impulses of the time, and became a painter of skirmishes and battles. In 1813–15 he was allowed to join the staff of General Wrede, who commanded the Bavarians in the military operations which led to the abdication of Napoleon; and there he gained novel experiences of war and a taste for extensive travel. In the course of years he successively visited Austria, Switzerland, and Italy. On Prince Otho's election to the Greek throne King Louis sent Peter Hess to Athens to gather materials for pictures of the war of liberation. The sketches which he then made were placed, forty in number, in the Pinakothek, after being copied in wax on a large scale (and little to the edification of German feeling) by Nilson, in the northern arcades of the Hofgarten at Munich. King Otho's entrance into Nauplia was the subject of a large and crowded canvas now in the Pinakothek, which Hess executed in person. From these, and from battle-pieces on a scale of great size in the Royal Palace, as well as from military episodes executed for the czar Nicholas, and the battle of Waterloo now in the Munich Gallery, we gather that Hess was a clever painter of horses. His conception of subject was lifelike, and his drawing invariably correct, but his style is not so congenial to modern taste as that of the painters of touch. He finished almost too carefully with thin medium and pointed tools; and on that account he lacked to a certain extent the boldness of Horace Vernet, to whom he was not unaptly compared. He died suddenly, full of honours, at Munich, in April 1871. Several of his genre pictures, horse hunts, and brigand scenes may be found in the gallery of Munich.

KARL HESS, the third son of Karl Christoph Hess, born at Düsseldorf in 1801, was also taught by his father, who hoped that he would obtain distinction as an engraver. Karl, however, after engraving one plate after Adrian Ostade, turned to painting under the guidance of Wagenbauer of Munich, and then studied under his elder brother Peter. But historical composition proved to be as contrary to his taste as engraving, and he gave himself exclusively at last to illustrations of peasant life in the hill country of Bavaria. He became clever alike in representing the people, the animals, and the landscape of the Alps, and with constant means of reference to nature in the neighbourhood of Reichenhall, where he at last resided, he never produced anything that was not impressed with the true stamp of a kindly realism. Some of his pictures in the museum of Munich will serve as examples of his manner. He died at Reichenhall on the 16th of November 1874.

HESSE, or HESSIA (in German *Hessen*), an old country of Germany, situated on both banks of the Rhine and Main, north and south of Frankfort, has had different boundaries at different times. Its greatest length was about 95 miles, while its breadth has varied considerably. Several detached portions of territory were also included in Hesse.

The earliest recorded inhabitants of the district were the Chatti, whose chief settlement Mattium, probably near Gudensberg, was destroyed by Germanicus in 15 A.D. The Chatti, merged in the Franks, migrated westward, and their place in Hesse was taken by the Saxons. Among these, when conquered by the German kings, several "gaus" or earldoms were founded, some of whose possessors after the death of Charlemagne rose to great power. Two families—those of Werner and of Giso, count of Gudensberg—became latterly the most important. In 1130 the heiress of the Gisos married the landgrave of Thuringia, who thus became the overlord of Hesse. In 1247 the Thuringian male line became extinct, and Hesse, along with the other possessions of the landgrave, was involved in a prolonged war of succession. In 1263 Sophia, duchess of Brabant and niece of the last landgrave, received by treaty the landgraviate of Hesse, as it was from that time called, and two years later resigned it in favour of her son, Henry the Child, the ancestor of the present house of Hesse. Till the death of Philip the Magnanimous in 1567, Hesse continued to be regarded as one state, though sometimes shared by two rulers; but at that date Philip's four sons divided the landgraviate into Hesse-Cassel, Hesse-Marburg, Hesse-Rheinfels, and Hesse Darmstadt. Of these the second and third lapsed by inheritance in 1583 and 1604 to the others, which became the chief lines. The small landgraviate of Hesse-Homburg was formed in 1596 of part of Hesse-Darmstadt. Hesse-Darmstadt, since the annexation of the other two to Prussia in 1866, has been the only independent part of Hesse left, and generally receives the common name.

Hesse-Nassau is a province of Prussia, formed in 1866 from parts of Hesse-Cassel and the dukedom of Nassau. Hesse-Philippsthal was a collateral line of the house of Hesse-Cassel, founded in 1630, and extinct in 1820. Hess-Barchfeld, Hesse-Butzbach, Hesse-Rothenburg, Hesse-Rumpenheim, and Hesse-Wanfried were collateral lines of little importance.

For further information see Teuthorn, *Ausführliche Geschichte des Hessen*, 1777-80; Wenck, *Hessische Landesgeschichte*, 1783 and 1803; Pfister, *Ueber den Chattischen und Hessischen Stamm und die älteste Geschichte des Chattischen Stammes*, 1868; Hoffmeister, *Historisch-genealogisches Handbuch über alle Linien des Regentenhauses Hessen*, 1874; Rommel, *Geschichte von Hessen*, 1820-58, 10 vols.; Heppe, *Hessische Kirchengeschichte*, 1876.

HESSE-CASSEL, in German KURHESSEN, *i.e.*, Electoral Hesse, now forming the government district of Cassel in the Prussian province of Nassau, was till 1866 a landgraviate and electorate of Germany, consisting of several detached masses of territory, to the N.E. of Frankfort-on-the-Main. It contained a superficial area of 3699 square miles, and its population in 1864 was 745,063.

The line of Hesse-Cassel was founded by William IV., surnamed the Wise, eldest son of Philip the Magnanimous. On his father's death in 1567 he received one half of Hesse, with Cassel as its capital; and this formed the landgraviate of Hesse-Cassel. Additions were made to it by inheritance from his brother's possessions, while, as compensation for losses sustained in the Thirty Years' War, a large part of the countship of Schaumburg and other territory was acquired towards the middle of the 17th century. Charles I., who ascended the throne in 1670, was the first ruler who adopted the system of hiring his soldiers out to foreign powers as mercenaries, as a means of improving the national finances. Frederick I., the next landgrave, had become by marriage king of Sweden, and on his death was succeeded in the landgraviate by his brother William VIII., who fought as an ally of England during the Seven Years' War. From his successor Frederick II., who had become a Roman Catholic, 22,000 Hessian troops were hired by

England for about £3,191,000, to assist in the war against the North American colonies. The reign of the next [illegible], William IX., was an important epoch in the history of Hesse-Cassel. Ascending the throne in 1785, he took part in the war against France a few years later, but in 1795 peace was arranged by the treaty of Basel. For the loss in 1801 of his possessions on the left bank of the Rhine he was in 1803 compensated by some of the former French territory around Mainz, and at the same time was raised to the dignity of Elector as Elector William I. In 1806 he made a treaty of neutrality with Napoleon, but after the battle of Jena the latter [illegible] the elector's [illegible] the country, and [illegible]. Hesse-Cassel was then added to Jerome Bonaparte's new kingdom of Westphalia; but after the battle of Leipzig in 1813 the French [illegible] and the elector restored. By the Vienna Congress [illegible] he [illegible] in vain to be recognized as [illegible] on the [illegible] of his [illegible]. On his [illegible], William promised to grant a [illegible]; but [illegible] the [illegible], he [illegible] the [illegible]. His son, William II., who succeeded him in 1821, pursued the same line of policy, and [illegible] to the [illegible]. The [illegible] was [illegible] by the [illegible] with the [illegible] of [illegible], and the elector, after [illegible] in 1831, withdrew to Frankfort, where he died in 1847. The [illegible], [illegible] Frederick William I., [illegible] the [illegible] of 1848, made many promises to the people, and carried some of them into effect, but in the [illegible] of 1850, which spread over all Germany, started at the [illegible] of things. He attempted to levy the usual taxes without obtaining the consent of his [illegible], [illegible] that he was forced to retire to Wilhelmsbad, along with his very unpopular minister, H[illegible]. He [illegible] then [illegible] at Frankfort [illegible], and Austrian and Bavarian troops entered Hesse-Cassel to [illegible]. Prussia, in return, immediately [illegible] the northern part of the country, and [illegible] was [illegible] by arrangement. The elector, however, scarcely changed his policy, and the next sixteen years were occupied with disputes between the chambers and the Government. In 1866 Hesse-Cassel joined Austria against Prussia. Prussian troops immediately overran the country, and on the treaty with Austria, the electorate was annexed to the Prussian kingdom. The elector was carried a prisoner to Stettin, and was only released on [illegible] his claims to the throne of Hesse-Cassel. He died in 1875.

See W[illegible], *K[illegible] F[illegible]kriegen*, 1850; Roth, *G[illegible] Hessen-Kassel*, 1856; Gr[illegible], *Der Verfassungskampf in Kurhessen*, 1871; and works under Hesse.

HESSE-DARMSTADT, Grand-Duchy of, the actual Hesse of the present day, is a state of Germany situated on the Rhine and Main, between Prussia on the north and Baden on the south. It consists of two large and several small detached portions of territory. The more northerly of the large portions forms the province of Oberhessen, and is completely surrounded by Prussia. The other, divided by the Rhine into the provinces of Starkenburg and Rheinhessen, is bounded on the N. by Hesse-Nassau, on the W. by the Rhine Palatinate and Rhenish Prussia, on the S. by Baden, and on the E. by Baden and Bavaria. The extent of the duchy is about [illegible] square miles. Oberhessen is mountainous, having the Vogelsberg in the east with Taufstein ([illegible] feet) as the highest summit in the country, and the Hausberg, a branch of the Taunus, in the north-west. In the south-east of Starkenburg is the Odenwald. Rheinhessen is occupied by fertile hills. The chief rivers are the Rhine, Main, Neckar, Lahn, and Nidda, with their tributaries. There are no lakes, but mineral springs are found in all the provinces. The climate is pleasant and mild in the low valleys and plains, but severe in the highlands, especially in Oberhessen. Besides the usual domestic animals, deer of various kinds, wild [illegible], [illegible], and otters are found. Agriculture, including the breeding of horses and cattle, is actively encouraged by Government, and is the principal industry of the people. [illegible] and [illegible] are also produced, the [illegible] being produced almost exclusively in Rheinhessen. The [illegible] potatoes, [illegible], flax, tobacco, and fruit are also cultivated. The manufactures embrace leather (enamelled and coloured), tobacco, cigars, shoes, furniture, pocket-books and similar goods, chemicals, matches, machinery, and various textile fabrics. Mining is carried on chiefly in Oberhessen. Iron, copper, manganese, graphite, lignite, salt, marble, and clay are the principal minerals, which are worked for home consumption. In 1878 there were produced in Hesse 45,39[illegible] tons of lignite, 91,724 tons of iron ore, and 13,200 tons of salt, representing in value about £62,100. Trade is tolerably important in Hesse. The following numbers of persons engaged in the various industries are taken from the industrial census of 1875:—Horticulturists, 292; fishermen, 65; miners, 1556; workers in stone, clay, glass, 4715; in metals, 8266; in machines, instruments, &c., 7202; in chemical industries, 2153; in lighting materials, soap, resins, &c., 11[illegible]; in textile industries 8274; in paper and leather, 7600; in wood, 11,142; in food and drink, 1[illegible],923; in dress and washing, 21,629; in building, 1291; in polygraphic industries, 1291; in artistic industries, 412; in mercantile business, 17,593; in conveyance, 2273; in lodging and boarding, 6016—total, 134,3[illegible]. The people are well educated; of the recruits in 1878-79 only ·21 per cent. were unable either to read or write. There is a university at Giessen, and the schools, ordinary, technical, and theological, throughout the country are very numerous. The Protestant religion predominates, though the Roman Catholic faith is also recognized by the state. Darmstadt is the capital; Offenbach is the chief manufacturing town; Mainz has perhaps the most active trade. The other chief towns are Alsfeld, Lauterbach, Friedberg, Bingen, Bensheim, and Worms. The population in 1875 was 884,218. The government since 1820 has been a constitutional hereditary monarchy, assisted by two chambers, modified in 1856—the one of life members, mostly from among the nobility, the other of popular representatives, elected indirectly. The chambers must meet at least once every three years. The ministry of three is responsible to the nation. Hesse is represented in the imperial federal council by 3 votes, and in the reichstag by 9. The annual revenue for the finance-period 1876-78 was £872,375, and the expenditure £872,481. The estimated annual revenue for the period 1879-82 is £1,011,762, and the estimated expenditure £857,124. The public debt in 1879 was £2,041,397, chiefly incurred for railways. For additional statistics see Germany.

George I., youngest son of Philip the Magnanimous, received on his father's death in 1567 the upper countship of Katzenelnbogen, and, choosing Darmstadt as his residence, became the founder of the Hesse-Darmstadt line. Additions to the territory were made both in his reign and [illegible] Louis V. The [illegible], [illegible] was at first divided, suffered severely from war and its attendant famine and plagues. The Thirty Years' War, a war of [illegible] with Hesse-Cassel, and the Seven Years' War [illegible] at its [illegible]. Louis X., who succeeded his father in 1790, [illegible] France, he [illegible] in 1803 [illegible] a treaty of neutrality. [illegible] on the left bank of the Rhine, [illegible] a very rich [illegible]. In 1806 he was [illegible] Napoleon [illegible] against [illegible]. In 1806 [illegible] of the Confederation of the Rhine [illegible] Louis I. of Hesse. After the battle of Leipzig in 1813, when Napoleon was defeated, [illegible] Vienna Congress [illegible], but [illegible] of Hesse-[illegible] which [illegible] had been [illegible] was [illegible] country [illegible] the people, and [illegible] to frame a constitution [illegible] to the ruler and the ruled. Louis II succeeded his father in 18[illegible]. His policy in [illegible] the popular [illegible]. His son Louis III., who [illegible] in 1848, alarmed by the events in Paris of that year, and by [illegible] in his own country, gave way a little, but about the autumn of 1850 [illegible] to [illegible]. Since that time, although [illegible] has been changed, the liberal party in the state has been [illegible]. In 1866 Hesse-Darmstadt [illegible] Austria [illegible], with the result that it had to give up [illegible] provinces, [illegible] Hesse-Homburg [illegible]. In 1867 it entered the North German Confederation, [illegible] in 1870 the German Confederation [illegible]. Louis IV. [illegible] in 1877.

A list of works on Hesse is to be found in Walther's *Literarisches Handbuch für Geschichte und Landeskunde von Hessen*, 1841. See also Steiner, *Geschichte des Grossherzogthums Hessen*, [illegible], 1833-4; [illegible], *[illegible]*, 1849-52; [illegible], *Geschichte des Grossherzogthums Hessen*, 1857; [illegible], *Das Grossherzogthum Hessen in [illegible]*, 1875; [illegible], *Übersicht der geologischen Verhält[illegible]* [illegible] *Hessen*, 1872; and works under Hesse.

HESSE HOMBURG, a former landgraviate of Germany, consisted of two parts, the province of Homburg-vor-der-Höhe, on the right bank of the Rhine, and the lordship of Meisenheim (added in 1815), on the left bank, to the north of Frankfort-on-the-Main. It comprehended an area of 106 square miles; and its population in 1864 was 27,374. Homburg now forms part of the Prussian government district of Wiesbaden, and Meisenheim of the government district of Coblentz.

Hesse Homburg was formed into a separate landgraviate in 1596, by Frederick I., son of George I. of Hesse-Darmstadt. By his two sons it was divided into the parts Hesse-Homburg and Hesse-Homburg-Bingenheim; but the latter returned by inheritance to the original line in 1681. In the reign of Frederick V. (1751-1820) Hesse-Homburg was in 1806 incorporated with Hesse-Darmstadt, but that state was obliged by the Vienna congress to recognize the independence of Hesse-Homburg, which at the same time was increased by the district of Meisenheim. Frederick V. became a member of the German Confederation in 1817. After his death, his five sons successively filled the throne. The last, Ferdinand Henry Frederick, granted a liberal constitution to his people, but in the reaction of 1852 cancelled it. On his death on March 24, 1866, the landgraviate reverted by inheritance to the grand-duke of Hesse-Darmstadt; but in September of the same year that ruler was forced to cede it to Prussia, in consequence of having supported Austria in the Seven Weeks' War.

HESSIAN FLY, a name originally given in the United States in 1776 during the War of Independence to a small fly very destructive to wheat, supposed to have been brought over in straw by the Hessian troops employed on the British side. It is a species of *Cecidomyia*, described under the name *C. destructor* by the American entomologist Say, and belonging to the Dipterous family *Cecidomyiidæ*, the numerous members of which produce galls, distortions, and other injuries in the plants they attack. It was often thought that this insect occurred in England; but the indigenous English wheat-midge, also very destructive, is an allied species, *Diplosis tritici*. A species found in Hungary and Germany, where it has committed great damage, has been supposed to be the true Hessian fly, which has also been recorded from Minorca and Naples; Cohn notices its ravages in Silesia, and Künstler in Austria; and Kaltenbach (who identifies *C. secalina*, Loew, with it) says it is more or less common in Germany, and that it originally came from Europe. Nevertheless, many good authorities have considered that the destructive European fly is not identical with the North American insect, though closely allied to it, and of similar habits. In the United States this minute midge has been a dreadful scourge at times, even to the extent of causing local famine. The female lays 20 or 30 eggs in a crease of the leaf of the young plant, and the larvæ when hatched work their way between the leaf and the stalk, till they come to a joint, a little below the surface, where they remain, head down, sucking the sap, and turn to pupæ enclosed in a covering; this is known as the "flax-seed" condition. The injury occasioned is not detected until the plant grows higher. There are two broods every year, one reaching the fly state in May, the other in August or early in September; as the fly only lives a few weeks, wheat that is sown so late as not to come up until the second brood has disappeared escapes harm. The usual result of the attack is that small aborted ears only are formed, the few grains of which shrivel and will scarcely ripen, the straw also being of inferior quality. The perfect insect is smaller than the common gnat, which it somewhat resembles, and from which its size and more simple antennæ distinguish it. The larvæ are spindle-shaped and reddish-white, with the intestinal canal showing through the skin when full grown; they are about one-seventh of an inch long, and are provided with small hooks near the head; at this stage they group themselves in regular rings round the stem attacked. A very minute natural parasite, *Semiotellus destructor*, belonging to the division *Pteromalides* of the Hymenopterous family *Chalcididæ* is, luckily for agriculturists, usually so plentiful as to be able to keep down the fly, on the larvæ and pupæ of which its own larvæ feed.

Besides the original account by Say (in the *Journal of the Academy of Natural Science*, Philadelphia, 1817), his countryman, Dr Asa Fitch, has published a history of this insect in the *Transactions of the New York State Agricultural Society*, 1846; and in England the celebrated entomologist Kirby gave an account of it in the *Magazine of Natural History*, 1829. It is figured in the *American Naturalist*, vol. ii. p. 153. A map showing its distribution will be found in Hayden's Report of the United States Geological and Geographical Survey for 1875.

HESSUS, Helius Eobanus (1488–1540), a distinguished German humanist of the 16th century, was born January 6, 1488, at Bockendorf near Frankenberg in Hesse. His family name is not known: the baptismal name Eoban he owed to a local saint; Hessus merely indicates the land of his origin; while the prenomen Helius was assumed by himself partly with reference to the sun-god, patron of poets, and partly also, it is said, with reference to the fact that he had been born on a Sunday. His early education was received in the monastery of Haina, where his father held a menial position, and afterwards at Frankenberg; in 1503 he entered the university of Erfurt, where in 1505 Crotus Rubianus and Ulrich von Hutten became his fellow-students and his firm friends. Though devoting himself enthusiastically to the composition of Latin verse, in which he soon became an acknowledged master, he was far from neglecting the other studies of the place, and shortly after his graduation he held for a short time the post of rector of the St Severus school. Compelled by disturbances to leave Erfurt in 1510, he for five years led a somewhat wandering life, in the course of which he passed some time in Leipsic as a student of law; in 1515 he returned to his former post at Erfurt, and in 1516 became professor of belles lettres. He was now prominently associated with Reuchlin, Peutinger, Mutianus, as well as with Crotus Rubianus and Hutten; and from the first he fully identified himself with the cause of Luther and the Reformation. In 1526 he went as teacher of rhetoric and poetry to Nuremberg, but in 1534 returned to Erfurt, whence in 1536 he was called to the chair of poetry and history in Marburg. There he died October 5, 1540.

Hessus was generally regarded by his contemporaries both in Germany and elsewhere as the foremost Latin poet of the age; "if Erasmus was the modern Cicero, Eoban was Virgil and Ovid." His most popular works were a translation into Latin distichs of the Psalms, which passed through more than forty editions, and Latin hexameter translations of Theocritus and of the *Iliad*. He also published *Sylvæ*, a collection of idylls, epigrams, and occasional pieces, and a series of Christian *Heroidæ*, in imitation of Ovid. His *Epistolæ* were edited by his friend Joachim Camerarius, who also published his Life (1553). See the monographs of Herz (*H. E. Hessus, ein Lebens- u. Dichterleben aus der Reformationszeit*, 1860), Schwertzell (*H. E. Hessus, ein Lebensbild aus der Reformationszeit*, 1874), and Krause (*H. E. Hessus, sein Leben u. seine Werke*, 1879); also Strauss, *Ulrich von Hutten* (1858; 2d ed. 1871; Engl. transl. 1874).

HESTIA, a Greek goddess, who is probably the latest in origin of the greater deities. She seems to belong to a particular stage in the advance of civilization, and to embody the religious sanction that confirmed the social system then reached. When we compare her worship with that of Agni, the nearest parallel in the Vedic period, we see that the Greeks made this advance after they had separated from the Aryan conquerors of India. Agni is invoked in the *Rig Veda* as the brother, friend, and helper of men, as dwelling with them and mediating between them and the gods. But beyond this Hestia is the hearth-fire as the centre of an association, wider or narrower, which meets in common at the hearth. She is not mentioned in Homer; in the *Odyssey* sometimes one swears by Zeus, the table and the hearth, *i.e.*, by Zeus as the god of the family both in its external relation of hospitality and its internal unity round its own hearth. Hence we have the Zeus ἑστιώτας, ἑστιοῦχος, ἐφέστιος. The former of these two ideas is too delicate and fine ever to become more than a mere aspect of Zeus, but the second gradually formed itself into a distinct worship, in which the already existing worship of the fire was merged. The fact that Hestia is not mentioned in Homer shows that her worship was not so universally acknowledged at the time which these poems reveal to us. Perhaps we may see in the connexion of the Latin Jupiter and Vesta at Lavinium a relic of the original connexion of the two; and the fact that the worship of this same goddess under the same name (they are only two forms of the feminine of the passive participle of the root *vas*, burn) is found in Latium and Greece affords strong evidence of a specially close connexion between the two races. We find therefore in Hestia relics of the old pre-Greek worship; she is the altar-fire, presiding over all sacrifices, and sharing in the honours of all the gods. The opening sacrifice was offered to Hestia, to her at the sacrificial meal the first and the last libations were poured. The fire of Hestia was always kept burning, or if by any mischance it were extinguished, only sacred fire made by friction, or got direct from the sun, might be used to rekindle it (see Kuhn, *Herabkunft*). But beyond this she is the goddess of the family union, the personification of the idea of home (see Welcker, *Gr. Gött.*, ii. 691), the protectress along with Zeus of the suppliants who fled for refuge to the hearth. To her therefore is ascribed the art of house-building. Hestia and Hermes are often united as the representatives of home and private life on the one hand, and of all business and outdoor life on the other. The city union, moreover, is just the family union on a large scale; it has its centre in the prytaneum, where the common hearth-fire round which the magistrates meet is always burning, and where the sacred rites that sanctify the concord of city life are performed. From this fire, as the representative of the life of the city, was taken the fire wherewith that on the hearth of a new colony was kindled. As patroness of the deliberations held in the prytaneum, Hestia is surnamed *Βουλαία*. Even larger unions than the city had their central fire: in Tegea was the Hestia of the Arcadians; and it is probable that the Achaeans had theirs at Ægium. In the later mystic philosophy Hestia becomes the hearth of the universe, the eternal fire at the centre of the world.

As Hestia had her home in the prytaneum, special temples to her rarely occur. There was one in Hermione, where the only symbol of the goddess was a fire always burning on the hearth. We also hear of her image at Olympia. Her statue stood in the prytaneum at Athens beside that of Peace. Though many statues of the Roman Vesta are preserved, many perhaps based on the Greek conception of Hestia, yet no purely Greek representation of the goddess has come down to us.

HESYCHASTS (ἡσυχασταί or ἡσυχάζοντες), also called ὀμφαλόψυχοι, Umbilicani, and sometimes referred to as Euchites, Massalians, or Palamites, a quietistic sect which arose among the monks of the Greek Church, and especially of Mount Athos, during the later period of the Byzantine empire, and owing to various adventitious circumstances came into great prominence politically and ecclesiastically for a few years about the middle of the 14th century. Their opinion and practice will be best represented in the words of one of their early teachers (quoted by Gibbon, *Decline and Fall*, c. 63):—"When thou art alone in thy cell shut thy door, and seat thyself in a corner; raise thy mind above all things vain and transitory; recline thy beard and chin on thy breast; turn thine eyes and thy thought towards the middle of thy belly, the region of the navel; and search the place of the heart, the seat of the soul. At first all will be dark and comfortless; but if thou persevere day and night, thou wilt feel an ineffable joy; and no sooner has the soul discovered the place of the heart than it is involved in a mystic and ethereal light." About the year 1337 this Hesychasm, the affinity of which with certain well-known forms of Oriental mysticism is obvious, attracted the attention of the learned and versatile Barlaam, a Calabrian monk, who at that time held the office of abbot in the Basilian monastery of St Saviour's in Constantinople, and who had visited the fraternities of Mount Athos on a tour of inspection. Amid much that he disapproved, what he specially took exception to as heretical and blasphemous was the doctrine entertained as to the nature of this divine light, the fruition of which was the supposed reward of Hesychastic contemplation. It was maintained to be the pure and perfect essence of God Himself, that eternal light which had been manifested to the disciples on Mount Tabor at the transfiguration. This Barlaam held to be polytheistic, inasmuch as it postulated two eternal substances, a visible and an invisible God. On the Hesychastic side the controversy was taken up by Gregory Palamas, afterwards archbishop of Thessalonica, who laboured to establish a distinction between eternal οὐσία and eternal ἐνέργεια. In 1341 the dispute came before a synod held at Constantinople; the decision, which no doubt was to a large extent determined by the excessive veneration in which the writings of the pseudo-Dionysius were held in the Eastern Church, was adverse to Barlaam, who in consequence returned to Calabria, and afterwards became bishop of Hierace in the Latin communion. Three other synods in relation to the same subject were subsequently held; and at the last of these, held in 1351 under the presidency of the emperor John Cantacuzenus, the uncreated light of Mount Tabor was established as an article of faith for the Greeks, who ever since have been ready to recognize it as an additional ground of separation from the Roman Church. The contemporary historians Cantacuzenus and Nicephorus Gregoras have both dealt very copiously with this subject, which is also more or less discussed in all the church histories. See Engelhardt's article on the Arsenians and Hesychasts in Illgen's *Zeitschr. f. Hist. Theol.*, viii. 48, and the account of the Hesychasts in Herzog's *Encyklopädie*. It may be mentioned that in the time of Justinian the word Hesychast was applied to monks in general simply as descriptive of the quiet and contemplative character of their pursuits.

HESYCHIUS was a grammarian of Alexandria, as we learn from a letter prefixed to his great work. From the fact that he was apparently unknown to Hesychius the Milesian and other writers of the time of Justinian, M. Schmidt considers that he must have flourished later than 500 A.D. On the other hand he cannot have been later than 642 A.D., when the school of Alexandria was scattered by the Saracen conquest. Many bad Greek words occurring in his book show that he belonged to this late period. Welcker (*Rh. Mus.*, xi. 204) places him in the latter part of the 4th century. Belonging to the school of Alexandria, he was probably a pagan, and the explanations of words from Gregory Nazianzen and other Christian writers (*glossæ sacræ*) are interpolations of a later time. He has left a Greek dictionary, containing a copious list of peculiar words, forms, and phrases, with an explanation of their meaning, and often with a reference to the author who used them or to the district of Greece where they were current. Hence the book is of great value to the student of the Greek dialects; while in the restoration of the text of the classical authors generally, and particularly of such writers as Æschylus and Theocritus, who used many unusual words, its value can hardly be exaggerated. The explanations given of many epithets and phrases reveal to us numberless facts about religion and social life, which are of the highest importance in the study of antiquities. In a prefatory letter addressed to his friend Eudocius (who is probably the Eudocius Scholasticus mentioned in the [illegible] and elsewhere), Hesychius mentions that his work is based on the lexicon of Diogenianus, but that he has also used similar works by Aristarchus, Apion, Heliodorus, &c. (about whom see M. Schmidt's edition, vol. iv.). The text is very corrupt, and the order of the words has often been disturbed. There is no doubt that many interpolations, besides the Christian glosses, have been made.

HETTSTADT, or HETTSTEDT, a town of Prussian Saxony, in the circle of Mansfeld, and the government district of Merseburg, is situated on both banks of the Wipper, about 23 miles N.W. of Halle. It is the seat of a commission of justice, and has manufactures of machinery, pianofortes, and artificial manure. The population in 1875 was 5988. In the neighbourhood are mines of argentiferous copper, and the surrounding district and villages are occupied with smelting and similar works. Silver and sulphuric acid are the other chief products; nickel and gold are also found in small quantities. Hettstadt is mentioned as early as 1016; in 1220 it possessed a castle; and in 1380 it received the privileges of a town. When the countship of Mansfeld was sequestrated, Hettstadt came into the possession of the Saxons, from whom it passed to the Prussians in 1815.

HEUGLIN, THEODOR VON (1824-1876), an eminent African and Arctic traveller, was born 20th March 1824 at Hirschlanden near Leonberg in Wurtemberg, and died at Stuttgart, 5th November 1876. His father was a Protestant pastor, and he was originally trained to be a mining engineer, but his own early ambition was to contribute to scientific progress by his personal explorations, and he prepared himself for his task by careful and multifarious discipline, studying the natural sciences, and more particularly zoology, acquiring the more serviceable of the modern languages, strengthening his physique by gymnastic exercises, and learning to use with equal skill his pencil and his gun. Supplied with funds by his mother's liberality, Heuglin went to Egypt in 1851, and till 1865 the north-eastern regions of Africa were the main scene of his labours. In 1852 he accompanied Dr Reitz, the Austrian consul at Khartum, in his fatal journey to Abyssinia; in 1853, having been appointed Dr Reitz's successor in the consulate, he visited Kordofan and the lower course of the White Nile; and in 1857, on his return after about two years' absence in Europe, he was commissioned by the grand duke Ferdinand Maximilian of Austria to explore the countries along the west coast of the Red Sea. From the latter part of 1858 to the latter part of 1860 he was again in Europe; but in 1861 he was placed at the head of the Vogel search expedition, which included Munzinger, Steudner, Kinzelbach, &c., and was expected to make its way to Wadai. Having reached Mai scheeha, however, the explorers broke up into three parties, Heuglin turning along with Steudner and Schubert in the direction of Adoa, Gondar, and the Galla lands. At Khartum they joined Miss Tinne's party, and proceeded to Lake Rey and the Kosanga river, but Steudner died on 10th April 1863, and Heuglin was compelled by sickness to retrace his steps. He returned to Europe in 1865. In 1870 and 1871 he made a valuable series of explorations in Spitzbergen and Novaya Zemlya, but 1875 found him again in North-East Africa, in the country of the Beni Amer and Habab. An invitation from the khedive took him abroad again in 1876, but receiving no definite appointment he returned to Europe. Later in the same year he was engaged in preparing for an exploration of the island of Socotra, when he was suddenly carried off by inflammation of the lungs. He was buried beside Mauch, the African traveller, and a statue has been erected over his grave.

His principal works are *Systematische Uebersicht der Vögel Nordost-Afrika's*, 1855; *Reisen in Nordost-Afrika*, 1852-1853 (Gotha, 1857); *Syst. Uebersicht der Säugethiere Nordost-Afrika's* (Vienna, 1867); *Reise nach Abessinien, den Galla-Ländern*, &c., 1861-62 (Jena, 1868); *Reise in das Gebiet des Weissen Nil*, 1862-1864 (Leipsic, 1869); *Reisen nach dem Nordpolarmeer*, 1870-71 (Brunswick, 1872-74); *Ornithologie von Nordost-Afrika's* (Cassel, 1869-75); *Reise in Nordost-Afrika* (Brunswick, 1877, 2 vols.). It is principally by his zoological, and more especially his ornithological, labours that Heuglin has taken rank as an independent authority. A list of the more important of his numerous contributions to Petermann's *Mittheilungen* will be found in that serial for 1877 at the close of the necrological notice.

HEUSCH, WILLEM or GUILLIAM DE, a landscape painter in the 17th century at Utrecht. The dates of this artist's birth and death are unknown. Nothing certain is recorded of him except that he presided over the guild of Utrecht, whilst Cornelis Poelemburg, Jan Both, and Jan Weenix formed the council of that body, in 1649. According to the majority of historians, Heusch was born in 1638, and was taught by Jan Both. But each of these statements seems open to doubt; and although it is obvious that the style of Heusch is identical with that of Both, it may be that the two masters during their travels in Italy fell under the influence of Claude Lorraine, whose "Arcadian" art they imitated. Heusch certainly painted the same effects of evening in wide expanses of country varied by rock formations and lofty thin-leaved arborescence as Both. There is little to distinguish one master from the other, except that of the two Both is perhaps the more delicate colourist. The guild of Utrecht in the middle of the 17th century was composed of artists who clung faithfully to each other. Poelemburg, who painted figures for Jan Both, did the same duty for Heusch. Sometimes Heusch sketched landscapes for the battlepieces of Molenaer. The most important examples of Heusch are in the galleries of the Hague and Rotterdam, in the Belvedere at Vienna, the Städel at Frankfort, and the Louvre. His pictures are signed with the full name, beginning with a monogram combining a G (for Guilliam), D, and H. Heusch's etchings, of which thirteen are known, are also in the character of those of Both. After Guilliam there also flourished at Utrecht his nephew, Jacob de Heusch, who signs like his uncle, substituting an initial J for the initial G. He was born at Utrecht in 1657, learnt drawing from his uncle, and travelled early to Rome, where he acquired friends and patrons for whom he executed pictures after his return. He settled for a time at Berlin, but finally retired to Utrecht, where he died in 1701. Jacob was an "Arcadian," like his relative, and an imitator of Both, and he chiefly painted Italian harbour views. But his pictures are now scarce. Two of his canvases, the Ponte Rotto at Rome, in the Brunswick Gallery, and a lake harbour with shipping in the Lichtenstein collection at Vienna, are dated 1683. A harbour with a tower and distant mountains, in the Belvedere at Vienna, was executed in 1699. Other examples may be found in English private galleries, in the Hermitage of St Petersburg, and the museums of Rouen and Montpellier.

HEVELIUS, HEVEL, HEWEL, HEWELKE, or HOVELKE, JOHANN (1611-1687), astronomer, was born at Dantzic on January 28, 1611, and died there on January 28, 1687 (see ASTRONOMY, vol. ii. p. 754).

HEXHAM, a market-town of England, county of Northumberland, is situated on the south bank of the river Tyne, crossed there by a handsome stone bridge of nine arches, 20 miles west from Newcastle and 36 east from Carlisle, and on the line of railway connecting those towns. It is somewhat irregularly built, and consists chiefly of several narrow streets diverging from the market place, a spacious square. Its defects in architecture and arrangement are, however, compensated for by its pleasant situation and the imposing remains of the old priory church. This church, begun by Wilfrid in 674, and completed by Acca, his successor, remained uninjured till 875, when every part of the monastery but the stone work was destroyed by the Danes. It was built of stones used in an earlier work, and many of them bear Roman inscriptions. Originally in dimensions and splendour it was unsurpassed on this side of the Alps, and doubtless had no small influence on ecclesiastical architecture in various parts of England. The building as renovated in the 12th century consisted of nave and transepts, choir and aisles, and a massive central tower; but the nave was burned by the Scots in 1296, and has never been rebuilt. The style is Early English with Transition details. The crypt, discovered in 1726, is a fine example of Saxon architecture, of which there appear also to be some traces in the choir. Among the interesting old monuments which have been collected in the transept is a sculptured stone slab of Oswulf, king of Northumbria, of the date 788. To the west of the church there are still some remains of the conventual buildings. Near the market-place there are two old castellated towers. A vessel containing about 8000 Saxon coins was discovered in the churchyard in 1832. The "Seal," formerly the park of the monks, is now used as a promenade, and from an eminence within its bounds a fine view is obtained. Hexham possesses a new town-hall and corn exchange, erected in 1866 in the Italian style, and a large board school. A hydropathic establishment has recently been opened. Leather gloves are the principal manufacture of the town; and it has tanneries, wool-staplers' yards, a brewery, and an iron and brass foundry. In the neighbourhood there are extensive market gardens and nurseries. The population of the township in 1871 was 5331, and of the parish 6437.

Hexham is supposed by some to have been the Axelodunum of the Romans, but although in all probability it was a Roman station, the similarity in the names is too slight to establish the identity. By the Saxons it was called Hextoldesham and Hagustald from two of the neighbouring streams. Wilfrid, who founded the monastery and church in 673, received from Queen Etheldreda a grant of the town and a large surrounding tract of country. In 681 the southern portion of Bernicia was formed into the diocese of Hexham, which comprised the county of Durham and the greater part of Northumberland. In 821 Hexham was united to the diocese of Lindisfarne, after which it formed part of Durham, then of York until 1837, when it was restored to Durham. In 875 the town was plundered by the Danes and the monastery destroyed. In 1138 the monastery was plundered by the Scots, and in 1296 they again attacked the town and destroyed the nave of the conventual church. In the reign of Henry VIII the last prior of Hexham was in 1537 hanged at the gate of the monastery for being concerned in the insurrection called the Pilgrimage of Grace.

See the old *History of the Church of Hexham* by Prior Richard; *Raine's Hexham and Hexham Church* in *Archæologia Æliana*, new series, vol. v.; Wright's *History of Hexham*, 1823; *The Priory of Hexham, its Chroniclers, Endowments, and Annals*, edited for the Surtees Society by James Raine, 1864-65; Hewitt's *A Handbook to Hexham and its Antiquities*, Hexham, 1869.

HEYDEN, JAN VAN DER, was born at Gorcum in 1637, and died at Amsterdam on the 12th of September 1712. He was an architectural landscape painter, a contemporary of Hobbema and Jacob Ruysdael, with the advantage, which they lacked, of a certain professional versatility; for, whilst they painted admirable pictures and starved, he varied the practice of art with the study of mechanics, improved the fire engine, and died superintendent of the lighting and director of the firemen's company at Amsterdam. Till 1672 he painted in partnership with Adrian van der Velde. After Adrian's death, and probably because of the loss which that event entailed upon him, he accepted the offices to which allusion has just been made. At no period of artistic activity had the system of division of labour been more fully or more constantly applied to art than it was in Holland towards the close of the 17th century. Van der Heyden, who was perfect as an architectural draughtsman in so far as he painted the outside of buildings and thoroughly mastered linear perspective, seldom turned his hand to the delineation of anything but brick houses and churches in streets and squares, or rows along canals, or "moated granges," common in his native country. He was a travelled man, had seen the Hague, Ghent, and Brussels, and had ascended the Rhine past Xanten to Cologne, where he copied over and over again the tower and crane of the great cathedral. But he cared nothing for hill or vale, or stream or wood. He could reproduce the rows of bricks in a square of Dutch houses sparkling in the sun, or stunted trees and lines of dwellings varied by steeples, all in light or thrown into passing shadow by moving cloud. He had the art of painting microscopically without loss of breadth or keeping. But he could draw neither man nor beast, nor ships nor carts; and this was his disadvantage. His good genius under these circumstances was Adrian van der Velde, who enlivened his compositions with spirited figures; and the joint labour of both is a delicate, minute, transparent work, radiant with glow and atmosphere, and most pleasant to look at. Almost all Van der Heyden's pieces are inscribed with his name alone, as if Van der Velde had been but a sleeping partner in his work. Like Heusch, he formed the first letters of his name into a monogrammatic interlacement. Very few of his pictures are dated. One, a street in a Dutch town, of 1666, is in the Hope collection in London. Two of 1667, a bridge on a canal, lined with houses casting their reflexions into the water, and the town house at Amsterdam, are in the galleries of the Hague and Florence. Another view of the dam and town hall at Amsterdam, dated 1668, is in the Louvre. A church and houses in the museum of Dresden is inscribed 1673. In all there are seventy or more of Van der Heyden's works fairly accessible to the public, those which are least so being chiefly in English private collections. Eight capital examples are in the Hermitage at St Petersburg, two of which are views in Cologne. Four are in the London National Gallery, four at Amsterdam and Dresden. Munich and Cassel have two apiece, and two very fine ones are in Buckingham Palace. The rest are in public and private galleries in Vienna, Paris, Frankfort, and Carlsruhe.

HEYDUKE. See HAIDUKS.

HEYLIN, PETER (1600-1662), an historical and polemical writer, born at Burford, Oxfordshire, 29th November 1600, was the second son of Henry Heylin, gentleman, who belonged to an old Montgomeryshire family. Being of a studious turn of mind, Heylin was entered at Hart Hall, Oxford, in 1613; was of Magdalen College, 1615; B.A., July 1617; M.A., 1620; B.D., 1629; D.D., 1633. In July

1618 he began to read college lectures on cosmography (*i.e.*, geography) with such acceptance that his associates made him fellow of Magdalen. The lectures, under the title of *Microcosmus*, were published in 1621; and many editions of this useful book, each somewhat enlarged, subsequently appeared, until scarcely any scholar's library was without a copy. In 1625 he published his observations on a journey to France. This book—which was frequently reprinted—Southey termed "one of our liveliest books of travel in its lighter parts, and one of the wisest and most replete with information that was ever written by a young man." After obtaining the patronage of Laud, whose life he wrote, Heylin was made chaplain to Charles I. His legendary and learned *History of St George of Cappadocia* procured for him the rectory of Hemmingford, Hunts; his hearty attachment to the High-Anglican party brought many other preferments; and his analysis of Prynne's *Histriomastix* was rewarded by the rectory of Islip. He was also made a prebendary of Westminster (9th November 1631), treasurer to the chapter (1637), and subsequently sub-dean. Here he was the bitter opponent of the rule of Bishop Williams, the commendatory dean. With great ardour Heylin entered into the religious controversies which preceded the war, being equally hostile to the Puritan element within and without the church. He was consequently singled out for punishment by the committees of the Long Parliament, who deprived him of benefices worth £800, and heavily fined him. An amusing anecdote he tells affords proof of his unpopularity in London, and at the same time shows how his *Cosmography* was appreciated. As he passed along the street a fellow "shouldered" him with the remark, "Geography is better than Divinity." For seven years, he says, his name was in almost every libel. He retired to his Hampshire parsonage of Alresford until Waller's army disturbed him. Robbed there of his library, valued at £1000, and his property, he went to Oxford, where from 1st June 1643 he edited *Mercurius Aulicus*, a vivacious but virulent news-sheet which greatly annoyed the Parliamentarians. His *Extraneus Vapulans*, written against L'Estrange (who wittily retorted that a prelate should be "no striker"), refers to his sufferings and hardships. The necessary quiet for his literary pursuits was ultimately found at Lacy's Court, Abingdon, whence were dated several books and pamphlets against those of his own communion whose opinions were not as unyielding as his, as also against the Presbyterians and others, controversies in which Ussher, Fuller, Baxter, and Harrington were concerned. His works, all more or less marred by political or theological rancour, were upwards of fifty in number; and they comprise histories of Episcopacy, of the Reformation, and of the Presbyterians, with a useful *Help to English History*. Some verses of merit also came from his active pen; and his poetical memorial of Bishop Waynflete was published by the Caxton Society in 1851. Heylin was a diligent writer and investigator, a good ecclesiastical lawyer, and had his learning always at command. His principles, to which he was honestly attached, were defended with ability; but his efforts to uphold the church passed unrecognized at the Restoration. His sight began to fail him; yet he rejoiced that his "old bad eyes" had seen the king's return. Upon that event he preached a jubilant sermon in Westminster Abbey to a great audience, 29th May 1661. He died on 8th May in the following year, and was buried two days after under his sub-dean's seat.

Lives of Heylin were written by Dr John Barnard, his son-in-law, and by George Vernon. Barnard's work was very carefully reprinted, with notes, in the *History of the Reformation*, published, 1849, by the Ecclesiastical History Society.

HEYNE, Christian Gottlob (1729–1812), one of the most distinguished critics and archæologists of the modern school of which Ernesti and Gesner were the founders, was born on the 25th of September 1729, in a suburb of the city of Chemnitz in Saxony, where his father, who had been compelled by some religious persecutions to abandon his native country of Silesia, earned a precarious support for his family by exercising the trade of a weaver. It was only by the liberality of his godfathers that Heyne was enabled to obtain his primary instruction in the elementary school of Chemnitz, and afterwards to prosecute his classical studies in the gymnasium of that city. In 1748 he entered the university of Leipsic, with the professed intention of studying for the legal profession. There he was so scantily supported by those on whose assistance he relied that he was frequently in want even of the common necessaries of life, and was sometimes indebted for food to the generosity of a maid-servant in the house where he lodged. In this situation, without even the hope of future distinction, he continued to struggle on against every difficulty and disappointment in the acquisition of knowledge. For six months he is said to have allowed only two nights in the week to sleep, and he was at the same time forced to endure his godfather's reproaches for negligence in the prosecution of his studies. His distress had almost amounted to despair, when he procured the situation of tutor in the family of a French merchant resident in Leipsic. He was thus enabled to continue his studies, though with much interruption,—the emoluments of his appointment being sufficient to support him in what was at least comparative comfort. Under Ernesti he was initiated into the criticism of the classical authors; from the prelections of the celebrated Bach he acquired a competent knowledge of Roman jurisprudence; and by Christius, who lectured on archæology, his attention was strongly directed to the works of ancient art. Even after he had finished his studies at the university, he was exposed for many years to all the accumulated distresses of poverty and neglect. The first situation he was able to procure was that of copyist in the library of Count von Brühl in Dresden, with a salary of somewhat less than twenty pounds sterling, which he obtained in the year 1753. From the necessity of adding something to this scanty pittance, he was forced to employ himself in the drudgery of translation; and, besides some French novels, he rendered into German the Greek romance of Chariton. He published his first edition of *Tibullus* in 1755, and in 1756 his *Epictetus*. In the latter year the Seven Years' War broke out; Dresden was entered, and the Saxon archives seized; the Brühl ministry fell; and Heyne was once more in a state of absolute destitution. In 1757 he was offered a tutorship in the household of Frau von Schönberg, and there he first became acquainted with Teresa Weiss, whom he subsequently married. In January 1759 he accompanied his pupil to the university of Wittenberg, at which more than a year was spent in the study of philosophy and German history, but from which he was driven in 1760 by the Prussian cannon. The bombardment of Dresden (to which city he had meanwhile returned) on July 18, 1760, destroyed not only his humble lodging but also all his worldly possessions, which included amongst other valuable papers an almost finished edition of Lucian based on a valuable codex of the Dresden Library. In the summer of 1761 he married, although still without any fixed means of support; and for some time he found it necessary wholly to suspend his literary pursuits that he might devote himself to the duties of the office of land-steward, to which he had been charitably appointed in the household of the Baron von Löben in Lusatia. He was enabled, however, to return to Dresden in the end of 1762, where he was commissioned by Lippert to prepare the Latin text of the third volume of his *Dactyliotheca*. At length, in the commencement of the year 1763, Heyne's merit met with its reward, and a new and illustrious career was opened to him. On the death of Johann Matthias Gesner at Göttingen in 1761, the appointment to the vacant chair had been first offered to Ernesti, who, however, declined leaving the university of Leipsic, but proposed Ruhnken of Leyden or Saxe of Utrecht for the appointment. Ruhnken likewise refused it, but having been strongly impressed with the taste and learning displayed by the editor of Tibullus and Epictetus, he advised Münchhausen, the Hanoverian minister and principal curator of the university of Göttingen, to bestow the professorship on Heyne, whose merit, though known to few, he was confident would do honour to the choice. The minister had the good sense to acquiesce in the recommendation of this great scholar, and Heyne, after some delay, became professor of eloquence in Göttingen. Though his appointments were at first few and his emoluments inconsiderable, these were gradually augmented in proportion as his usefulness was proved, and his growing celebrity rendered it an object with the other Governments of Germany to secure the services of so distinguished a scholar. He refused the most advantageous and honourable overtures from Cassel, Berlin, and Dresden. As professor, principal librarian, member of the Royal Society, and chief editor of the *Gelehrte Anzeigen*, and still more by his publications, he greatly contributed to raise the university of Göttingen to the distinguished rank it still holds among the seminaries of Europe. After a long and useful career, graced with all the distinctions which in Germany are conferred on literary eminence, he died, full of years and honour, on the 14th of July 1812.

Besides Tibullus (1755; 4th ed. by Wunderlich in 1817) and the *Enchiridion* of Epictetus (1756; 2d ed. 1776), he edited Virgil (1767-75; new ed. by Wagner, 1830-41), Pindar (1773; 3d ed. 1817), the *Bibliotheca Græca* of Apollodorus (1782; 2d ed. 1803), and the *Iliad* (1802),—all illustrated with copious commentaries. His *Opuscula Academica*, in six vols. (1785-1812), contain a series of more than a hundred academical dissertations, of which the most valuable are those respecting the colonies of Greece and the antiquities of Etruscan art and history. He left also a great number of papers on almost every subject of erudition, more especially on ancient mythology, among the *Commentationes Societatis Regiæ Gottingensis*. His *Antiquarische Aufsätze*, in two vols., comprise a valuable collection of essays connected with the history of ancient art. His contributions to the *Göttinger Gelehrte Anzeigen* are said by Heeren to have been between 7000 and 8000 in number. In the earlier part of his life he translated, or rather wrote anew, a great part of the *Universal History*. See Heeren, *Heyne's Biographie* (1813), which forms the basis of the interesting essay by Carlyle, originally published in the *Foreign Review* (1828), and now reprinted in his *Miscellanies*, vol. ii.

HEYWOOD, a manufacturing town of Lancashire, is situated on the Roch, and on the Lancashire and Yorkshire Railway, 3 miles east of Bury and the same distance south-west of Rochdale. It possesses several handsome churches and chapels, among which may be mentioned St Luke's church, erected in 1860, with a tall spire and a peal of bells. The other principal buildings are the national school, the mechanics' institute, the new Conservative club house, and the market hall. A new park—the Queen's Park—purchased and laid out at the cost of £11,000 with money which devolved to Her Majesty in right of her duchy and county palatine of Lancaster, was publicly opened on the 2d of August 1879. Heywood Hall in the neighbourhood of the town was at one time the residence of Peter Heywood, who contributed to the discovery of the Gunpowder Plot. Heywood owes its rapid rise to the enterprise of the Peels, its first manufactory having been introduced by the father of the first Sir Robert Peel. It is an important seat of the cotton manufacture, in connexion with which it has upwards of fifty factories, and there are in addition power-loom factories, iron foundries, boiler works, and railway waggon works. Coal is wrought extensively in the neighbourhood. The population in 1871 was 21,248.

HEYWOOD, John (*c.* 1500-1565), sometimes styled "the Epigrammatist," was born, it is not known in what year, at North Mims near St Albans. He was educated at Oxford, and afterwards made the acquaintance of Sir Thomas More, who introduced him at court. His skill in music and his inexhaustible fund of ready wit made him a special favourite of Henry VIII., and afterwards of his daughter Mary. On the accession of Elizabeth, Heywood, who was a zealous Catholic, retired to Malines in Belgium, where he died in 1565. A collection of his works was published in 1562.

His longest single composition is the allegorical work, written in the octave stanza, entitled *The Spider and the Fly* (1556), in which the flies are the Roman Catholics and the spiders the Protestants, while Queen Mary is represented by the housemaid with her broom (the sword), executing the commands of her master (Christ) and her mistress (the church). It has been justly characterized by Warton as dull, tedious, and trifling. Of greater literary interest are the Interludes (*A Play between Johan the Husband, Tyb the Wife, and Sir Johan the Priest*; *A merry Play between the Pardoner and the Friar, the Curate and Neighbour Prat*; *The play called the four P's, a new and very merry Interlude of a Palmer, a Pardoner, a Potycary, and a Pedlar*; *A Play of Gentleness and Nobility*; *A Play of Love*; *A Play of the Weather*) which form a connecting link between the old moralities and the modern drama, and were extremely popular in their day. They generally represent some ludicrous incident of a homely kind in a style of the broadest farce, but in their way display considerable skill and talent. Other works of Heywood are a comic poem in long verse entitled *A Dialogue containing in effect the number of all the Proverbs in the English tongue compact in a matter concerning two marriages*; and three collections of *Epigrams*.

HEYWOOD, Thomas, a voluminous dramatist and miscellaneous author of the 16th and 17th centuries, was born in Lincolnshire and was educated at Cambridge, where he became a fellow of Peterhouse. The dates of his birth and death are alike unknown, and the few facts of his life that are preserved have been gleaned chiefly from his own writings. He is mentioned in the MS. book of Henslowe as having written a book or play for the Lord Admiral's Company in October 1596; and from the same source we learn that in 1598 he was regularly engaged as a player and a sharer in that company. In the preface to *The English Traveller*, written in 1633, he describes himself as having had "an entire hand or at least a main-finger in two hundred and twenty plays." Of this number, which probably afterwards was considerably exceeded (for we find him still writing in 1640, and indeed his last published piece did not appear until 1655), only three and twenty survive; but they amply attest that had he chosen to concentrate his powers, he might easily have ranked with the Massingers, Fords, and others of his great contemporaries. "Heywood," says Charles Lamb, "is a sort of prose Shakespeare; his scenes are to the full as natural and affecting." His facility and variety are almost without a parallel, his fancy was inexhaustible, and his invention never at a loss; but he delighted to excess in what he called "merry accidents, intermixed with apt and witty jests," or in other words, in the broadest and coarsest farce. His best pieces, such as *A Woman Killed with Kindness*, *Fortune by Land and Sea*, *The English Traveller*, and *The Fair Maid of the West*, lie chiefly in the department of what has been called the domestic drama.

Besides his dramatic works, which were partly reprinted by the "Shakespeare Society," and were published in a complete edition of six vols. with notes and illustrations in 1874, he was the author of *Troia Britannica, or Great Britain's Troy* (1609), a poem in seventeen cantos "intermixed with many pleasant poetical tales" and "concluding with an universal chronicle from the creation until the present time"; *An Apology for Actors*, containing three brief treatises (1612); *Γυναικεῖον, or Nine Books of various History concerning Women* (1624); *England's Elizabeth, her Life and Troubles during her minority from the Cradle to the Crown* (1631); *The Hierarchie of the Blessed Angels* (1635); *Pleasant Dialogues and Dramas selected out of Lucian, &c.* (1637); and *The Life of Merlin surnamed Ambrosius* (1641).

HEZEKIAH (יְחִזְקִיָּהוּ, חִזְקִיָּהוּ, יְחִזְקִיָּה or חִזְקִיָּה "Jehovah makes strong"; Ἐζεκίας; *Ezechias*; the *Ha-za-ki-ya-hu* or *Ha-za-ki-a-hu* of the Assyrian inscriptions), one of the greatest and best of the kings of Judah, succeeded his father Ahaz when still a young man (at the age of twenty-five according to 2 Kings xviii. 2; and this is probably correct if the LXX. be followed in reading "twenty-five" instead of "twenty" in 2 Chr. xxviii. 1; *cf.* 2 Kings xvi. 2). The year of his accession was most probably 717 B.C.,[1] and he ruled for twenty-nine years with a vigour and a success that deeply impressed later historians; "he trusted in the Lord God of Israel; so that after him was none like him among all the kings of Judah, nor any that were before him" (2 Kings xviii. 5; *cf.* Ecclus. xlviii. 17-25). The very outset of his reign was marked by an emphatic reversal, both in foreign and in domestic affairs, of the policy which had been so disastrously followed by his weak and foolish predecessor. While Ahaz had shown distinctly paganizing tendencies in religion, Hezekiah was ardent in his zeal for the exclusive worship of Jehovah, which he sought to simplify, centralize, and refine even at the expense of abolishing many cherished institutions which had the sanction of ancient usage. "He removed the high places, and brake the pillars, and cut down the Asherah, and brake in pieces the brazen serpent that Moses had made: for unto these days the children of Israel did burn incense to it; and he [or, perhaps, they] called it Nehushtan" (*i.e.*, according to the A.V., "brazen"; but, if this was the popular name, it is probably derived from *nahash*, serpent; see 2 Kings xviii. 4). How great were the strength of conviction and the courage which were necessary to such reforms as these is incidentally shown by the appeal to conservative feeling which some years afterwards could still be made by a skilful diplomatist with at least some hope of success (2 Kings xviii. 22). The details of the reforming activities of Hezekiah, extending even to the northern kingdom, as given with characteristic fulness and minuteness by the compiler of the book of Chronicles, are not now accepted by the majority of critics as absolutely trustworthy, a prevalent opinion being that actions have been attributed to Hezekiah which ought really to have been assigned to Josiah, and that some at least of the chronology is imaginary; but it is obvious that the influence of such prophets as Isaiah and Micah must have been powerful enough to bring about many thorough-going changes even during the earlier reign. As in the internal religious affairs of the theocratic kingdom so in its relations with foreign powers Hezekiah innovated very conspicuously on the policy of his father, although not here entirely on the lines laid down by the great contemporary prophet. Confirmed in the consciousness of military strength by a successful war against the Philistines (2 Kings xviii. 8), and having no longer anything to fear either from Damascus or from Samaria, he began to cherish the hope (at least with Egyptian support and the active cooperation of Egyptian cavalry) of being able to shake off entirely the yoke of Assyria, and with this view he set about extensive fortifications and other engineering works in and about Jerusalem. "He made the pool and the conduit and brought the water into the city," "stopping the upper outlet of Gihon and bringing it straight by an underground way;" he also "built up all the wall that was broken, and raised thereupon towers" (2 Kings xx. 20; 2 Chr. xxxii. 5, 30; and *cf.* Isa. xxii. 8-11, which also has been referred by the sagacity of Ewald to this period). It is not clear from the sacred historians how far Judah was affected by the successful expedition of Sargon against Ashdod in 711 B.C., which is mentioned in Isa. xx. 1 (and in which possibly Sennacherib may have held the rank of a rabsaki or general); but Ewald's brilliant conjecture, to the effect that Isa. xxii. 1 *sqq.* alludes to hardships suffered by the people of Hezekiah at that time, is remarkably confirmed by the cuneiform inscriptions. It was not, however, until after the accession of Sennacherib (705) and the resolution of that monarch to direct one of his great expeditions against Egypt (*c.* 701), that matters were brought to a sharp and immediate crisis between Nineveh and Jerusalem. The capture of all his "fenced cities," Jerusalem excepted, coupled with the inactivity of Egypt, convinced Hezekiah of the uselessness of a struggle with the greatest military power of his century, in a way that Isaiah, with often repeated admonitions, had failed to do; and the payment of a large sum of money by way of tribute readily purchased a temporary relief. But when Sennacherib sent from Lachish his "tartan," or commander-in-chief, along with the "rab-saris," or head eunuch, and the "rab-shakeh," or chief of the staff (the rendering "chief cup-bearer" seems based on a wrong etymology), with a large force to demand the surrender of Jerusalem itself, it was felt by king and prophet alike that the time for resistance to the utmost had come. Probably the resolution thus formed was in part, at least, due to the fact that the main body of the Assyrian army was already finding it necessary to fall back before Tirhakah, the Ethiopian king of Egypt, from Lachish to Libnah; it was at all events justified, not only by the indecisive battle at Altaku near Ekron, but also by the pestilence (2 Kings xix. 35) which speedily compelled the withdrawal of Sennacherib with the remains of his army from Libnah to Nineveh. The relation between the accounts of this retreat given by Sennacherib himself, by the sacred historians, and by Herodotus (ii. 141) will be considered in the article SENNACHERIB. The sickness and recovery of Hezekiah, recorded in 2 Kings xx. 1-11 and (with additional details) in Isa. xxxviii., seem to have preceded the invasion of Sennacherib by three years at most; they were almost immediately followed by the arrival of the messengers of Merodach (not Berodach) Baladan, the son of Baladan, who for some six months, until repressed by Sennacherib, usurped the throne of Babylon about the year 703. The excessive courtesy shown to these ambassadors gave occasion, it is recorded (2 Kings xx. 17, 18), to a prediction by Isaiah of the Babylonian exile, which took place more than a century afterwards. Of the later portion of Hezekiah's reign no details have been preserved; but it appears to have been characterized by peace and prosperity. He was succeeded in 688 by Manasseh, his son by Hephzibah, born apparently about 702. Besides being a patron of literature (Prov. xxv. 1), Hezekiah was himself a poet; and his sole remaining production (Isa. xxxviii. 10-20), if somewhat deficient in originality, abounds in depth and tenderness of religious and poetic feeling.

HIBERNATION (frequently, but less correctly, written HYBERNATION) is the term employed by naturalists to denote the peculiar state of torpor in which many animals which inhabit cold or temperate climates pass the winter. In hot and dry countries, on the contrary, various animals pass into a similar condition during the hottest season of the year; and this state is called "Æstivation." Several of the animals which hibernate during the winter are liable to fall into a similar state at intervals during mild weather, and Dr Marshall Hall has applied the term "Diurnation" to the day-sleep of bats, which he regards as precisely analogous to hibernation

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[1] [illegible] give respectively 727 and 725 B.C.; and these dates were accepted with slight modifications by all subsequent chronologists until the decipherment of the Assyrian inscriptions, when it became apparent that the destruction of Samaria by Sargon and the Egypto-Palestinian expedition of Sennacherib were separated by a wider interval than eight years, and therefore that 2 Kings xviii. 10 and 2 Kings xviii. 13 cannot both be right. In the present article the chronology of Schrader (art. "Sanherib," in Schenkel's *Bibel-Lexicon*, [illegible] *Die Keilinschriften u. das Alte Testament*) is that which is substantially followed. A full exposition of the bearings of the cuneiform inscriptions on the chronology of the time must be postponed to the article on the history of Israel. See also BABYLONIA, vol. iii. p. 187.

MAMMALIA.—Although comparatively few mammals hibernate, the phenomena of hibernation and similar conditions have been better studied in this class than in any other. Dr Marshall Hall has laid down the principle that the amount of respiration is inversely as the degree of irritability of the muscular fibre. Every gradation may be met with between ordinary sleep, the imperfect or abnormal hibernation of some animals, and the profound hibernation of others, in which all the functions of life are almost suspended. Such a condition is always accompanied by reduced respiration, and increased irritability of the muscular fibre. If the respiration is reduced without this irritability being increased, death results from torpor and asphyxia, whereas, if the respiration is increased simultaneously with increased irritability (as when an animal is aroused too suddenly), death likewise results from too great stimulation of the vital powers The well-known danger of suddenly awakening a patient from a state of somnambulism is doubtless due to a similar cause.

Hibernation, however, is a physiological condition, and not produced simply by cold, though it is favoured by it, because cold induces sleep, which may afterwards pass into hibernation. It is an error to suppose that hibernating animals are capable of resisting any amount of cold, though their capacity of doing so must vary according to their species and to the climate which they inhabit. They always seek secure hiding places where they may be protected from too great a degree of cold, as well as from interference. During hibernation the temperature of their bodies sinks to a point corresponding nearly to that of the surrounding atmosphere; but if they are exposed to an unusual amount of cold, they are first awakened by it, and then sink into a fatal torpor like other animals. Many hibernating animals perish in this manner during severe winters.

Respiration being almost suspended during hibernation, the maintenance of vitality depends almost wholly on the action of the heart, which will continue for a long time after an hibernating animal has been decapitated. Animals may also be placed in carbonic acid or under water for several hours, without injury, when in this condition, though they would die in a very few minutes if they were in their normal state.

Man.—Long-continued suspension of consciousness in man, whether voluntary or otherwise, is rare in temperate climates, but it is more frequent in India, where some religious ascetics are stated on unimpeachable authority to possess the power of throwing themselves into a state closely resembling hibernation for an indefinite period. Many curious cases have been recorded by Mr Braid in his small treatise on *Human Hybernation*, published in 1850, the most celebrated of which is that of a fakir who was actually buried alive at Lahore, in 1837, in the presence of Runjeet Singh and Sir Claude Wade, and who was dug up and restored to consciousness several months afterwards, after every precaution had been taken to prevent any one from disturbing the grave in the interval

Bats.—Dr Marshall Hall says that the hibernating bat never wakes at all, except from warmth or excitement, and that the digestive functions are suspended to a far greater degree than in the dormouse or hedgehog. Respiration is also suspended, and when the animal is disturbed it quickly subsides again into total quiescence, after a few feeble respirations. It is to be regretted that Dr Hall has not stated to which species of bat his remarks refer, as the habits of the various species differ. Earlier or later in autumn, according to the species, they retire to caves, hollow trees, and similar hiding-places, where they cluster together, hanging head downwards by their hinder claws, and clinging to each other, as well as to the walls and sides of their retreat, so that a great number can crowd themselves into an amazingly small space. Although such assemblies frequently consist of more than one species, yet the various species do not all retire to their winter quarters at the same period; the noctule is rarely seen abroad later than July, whereas the pipistrelle may be seen flying on mild evenings almost every month in the year. It is only natural to suppose that the hibernation of the former species is much more profound than that of the latter, which doubtless feeds in winter as well as summer; for though insects are far less numerous in winter than in summer, yet some species appear only at that season of the year.

Bear and Badger.—These animals retire to winter quarters in northern climates, and pass the greater part of their time in sleep; but the brown bear and badger do not fall into a state of genuine hibernation. When the bear retires for the winter, he is very fat, and it is said that the black bear will not hibernate if this is not the case. Digestion is suspended, and his intestines become stopped up with an indigestible mass chiefly composed of pine leaves, which is not discharged till spring. The brown bear of Europe and Siberia is very dangerous if disturbed during the winter; but the black bear of America can scarcely be aroused from his torpor, which there is thus reason to believe is a state of true hibernation, differing from that in which the former species passes the winter.

Hedgehog.—This animal hibernates more completely than almost any other. In the autumn it retires to a hole among rocks or under the roots of a tree, where it remains for the winter, seldom or never awakening till spring, and of course taking no food until then. If a sleeping hedgehog is disturbed, it merely stirs, and then coils itself up more closely; but if a hibernating hedgehog is interfered with, it takes a deep sonorous inspiration, followed by a few feeble respirations, and then by total quiescence. The tenrec, an allied animal found in Madagascar, sleeps for three months in its burrow during the hottest period of the year.

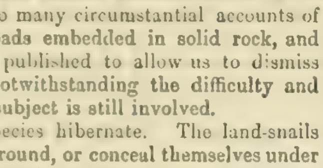
Rodentia.—Several animals belonging to this order hibernate more or less completely, among which we may mention the hamster, the porcupine, the dormouse, the squirrel, and the marmot. Several of these awake at intervals to feed, and therefore lay up a store of provisions before they retire, although they all become very fat before winter. Other species of this order hibernate less perfectly, or only occasionally, like the hare, which will lie beneath deep snow in a small cavity, just large enough to receive her body, for some weeks unharmed. But this is not true hibernation, as respiration is maintained during the whole time, a small air-hole being always kept open by the warm breath of the animal. In a similar manner sheep (though belonging to a very different order of animals) have sometimes been buried in snow-drifts in Scotland for several weeks without sustaining any injury. The dormouse not only hibernates in the strict sense of the term, but will sleep at intervals for several days together during mild weather. When a *Myoxus*, an allied animal inhabiting Africa, was brought to Europe, it hibernated as if this were its normal habit. Whether it aestivates in its native country is not known, but its hibernating in Europe shows a greater power of adapting itself to changed conditions of life than we should have been inclined to suspect.

AVES AND PISCES.—It was formerly supposed that various species of swallows hibernated, and it was even asserted that the sand martin was accustomed to bury itself in the mud at the bottom of the water; but this has long been regarded as an exploded error. For the hibernation of fish, compare the article on ICHTHYOLOGY.

AMPHIBIA AND REPTILIA.—All the animals belonging to these classes hibernate in cold or temperate climates. Land tortoises bury themselves in holes in the ground, and fresh water tortoises in the banks or at the bottom of lakes and rivers. Lizards and snakes retire to holes in trees, under stones, or among dead leaves, where many species congregate in large numbers, and pass the winter closely entwined, and in a still more torpid condition than that of the hibernating mammals, their digestion and respiration being entirely suspended. Many tortoises, crocodiles, and serpents bury themselves in mud in both South America and Africa, and æstivate in the hard baked ground during the dry season of the year. When the viper is disturbed during the winter its bite is harmless; but this is not the case with the venomous serpents which æstivate in tropical countries.

Frogs generally hibernate in masses in the mud at the bottom of the water, and if awakened from hibernation by warmth can remain eight times longer under water without drowning than frogs in the breeding season. We should hardly expect the habits of such an animal as the frog to be greatly affected by domestication, but Professor Bell was acquainted with a gentleman living at Kingston, whose kitchen was built on the banks of the Thames, and whose servants made a pet of a frog which had his hole in the skirting. It was unnecessary for the frog to hibernate, and instead of doing so he came out of his hole every evening to bask before the kitchen fire for three successive winters. It is impossible to say how long frogs and toads may continue to retain a dormant life, if the mud in which they bury themselves should become hardened around them during hibernation. Too many circumstantial accounts of the discovery of live toads embedded in solid rock, and even in coal, have been published to allow us to dismiss them all as fabulous, notwithstanding the difficulty and obscurity in which this subject is still involved.

MOLLUSCA.—Many species hibernate. The land-snails bury themselves in the ground, or conceal themselves under the bark of trees, in holes in walls, or even in the stems of large umbelliferous plants. They close the mouth of the shell with a calcareous plate, technically called an epiphragm, which they secrete by means of their mantle, and which is perforated by a small hole to admit the air. In winter they bury themselves with the head upwards, and do not grow at all during the winter; but while growing they bury themselves in summer, with the head downwards, at occasional intervals, for several days together, and then grow very rapidly. Snails are not considered in season at Paris till after the first frost, when they are closed with a white epiphragm. In dry weather, and during the heat of summer, snails also close their shells with an epiphragm, to protect themselves from drought, but this covering is thinner than that which they construct during the winter. In the British Museum is preserved the shell of a specimen of *Helix desertorum*, from Egypt, which revived after having been gummed to a board for four years in the Museum, and lived for two years afterwards. Other instances of the revival of land-shells after a still longer period are equally well authenticated. Some species retire to winter quarters earlier than others, and their pulsation, which ranges from 30 to 110 during summer, ceases entirely in winter. Slugs also bury themselves in the ground, and become torpid during frosts or droughts, but it is doubtful whether their condition is that of genuine hibernation. The fresh water mussels (*Anodonta*) hibernate before the close of autumn, and bury themselves in the mud till the beginning of spring. It is believed that many of the marine *Mollusca* also hibernate, but very little is known of their habits at present.


Helix Desertorum.

INSECTA.—Most of the insects which pass the winter as larvæ or perfect insects hibernate during the period that they can obtain no food. Larvæ which are full grown in autumn frequently lie dormant during the winter, and do not assume the pupa state till spring. In the case of insects which have more than one brood in the year, the last brood generally hibernates, sometimes retiring to winter quarters quite early in the autumn, while the perfect insects of the previous brood are still flying about, and while the weather is still fine and warm. Insects which hibernate in the perfect state do not pair till spring, and are probably not fully developed till after hibernation. Hive-bees probably do not hibernate, and it is well known that they require food during the winter. It is asserted that the aphides, on whose sweet secretion ants chiefly subsist in inclement weather, become torpid at exactly the same low temperature as the ants themselves.

CONCLUDING REMARKS.—The seeds of many plants, and the eggs of many of the lower forms of animal life, may remain dormant for years in cold or dry climates, until heat or moisture awakes them to vitality. Many plants die down in winter, the roots remaining in the ground, while many trees then shed their leaves, the sap retiring to the roots. Similar phenomena take place in tropical countries during the hot, dry season, wherever the amount of humidity in the atmosphere is insufficient to maintain a perennial vegetation during the year. These phenomena in the vegetable world are regarded as analogous to those of hibernation in animals, and the term "hibernation of plants" is sometimes applied to them.

Dr Marshall Hall, in Todd's *Cyclopædia of Anatomy and Physiology*, art. "Hibernation"; Braid's *Observations on Trances or Human Hybernation*; Bell's *British Quadrupeds and British Reptiles*; Humboldt's *Views of Nature*; Gwyn Jeffrey's *British Conchology*; Tate's *Land and Fresh-water Mollusca*; Kirby and Spence's *Introduction to Entomology*, &c. (W. F. K.)

HICKES, GEORGE (1642–1715), a learned English divine of the nonjuring party, and an eminent Anglo-Saxon scholar, was born at Newsham near Thirsk, Yorkshire, on June 20, 1642. In 1659 he entered St John's College, Oxford, whence after the Restoration he removed first to Magdalen College and subsequently to Magdalen Hall. In 1664 he was chosen fellow of Lincoln College, and in the following year proceeded M.A. On his return from a Continental tour in 1673 he graduated in divinity, and in 1675 he was appointed rector of St Ebbe's, Oxford; in the following year he as private chaplain accompanied the duke of Lauderdale, the royal commissioner, to Scotland; and shortly afterwards he received the degree of D.D. from the university of Glasgow. In 1680 he became vicar of All Hallows, Barking, London; and after having been made chaplain to the king in 1681, he was in 1683 promoted to the deanery of Worcester. At the revolution of 1688, having declined to take the oath of allegiance to William and Mary, he was first suspended and afterwards deprived,—he meanwhile affixing to the cathedral doors a "protestation and claim of right" that he was, and still did "continue to be, the only rightful and legal dean of this cathedral church of Worcester." After remaining some time in concealment in London, he was employed by Sancroft and the other nonjurors on a mission to the Continent on matters connected with the proposed action of his party relative to the continuance of their episcopal succession; upon his return he was himself consecrated by Lloyd, White, and

Turner suffragan bishop of Thetford in 1694. His later years were largely occupied in controversies the interest of which has now almost wholly passed away; but to them we owe the two works which constitute his chief claim to an enduring reputation, the learned *Institutiones Grammaticæ Anglo-Saxonicæ et Mœso-Gothicæ* (1689), and *Linguarum veterum Septentrionalium Thesaurus grammatico-criticus et archæologicus* (1703–1705). In 1713 he united with Bishops Campbell and Gadderar to consecrate Jeremy Collier, Samuel Hawes, and Nathaniel Spinkes to be bishops in the nonjuring church. He died December 15, 1715.

Even apart from the two works already mentioned, Hickes was a very voluminous and laborious author. His earliest performances, which were anonymous, were suggested by contemporary events in Scotland that gave him great satisfaction,—the execution of Mitchel on a charge of having been implicated in the murder of Archbishop Sharp, and that of Kid and King, Presbyterian ministers, "for high treason and rebellion" (*Ravillac Redivivus*, 1678; *The Spirit of Popery speaking out of the Mouths of Fanatical Protestants*, 1680). In his *Jovian*, an answer to Johnson's *Julian the Apostate*, 1683, he endeavoured to show that the Roman empire was not hereditary, and that the Christians under Julian had recognized the duty of passive obedience. His *Two Treatises*, one "On the Christian Priesthood" and the other "On the Dignity of the Episcopal Order," originally published in 1707, have been more than once reprinted, and form three volumes of the *Library of Anglo-Catholic Theology* (1847). In 1705 and 1710 were published *Collections of Controversial Letters*, in 1711 a collection of *Sermons*, and in 1726 a volume of *Posthumous Discourses*. Other treatises, such as the *Apologetical Vindication of the Church of England*, are to be met with in Gibson's *Preservative against Popery*.

HICKORY. The hickory trees are natives of North America, and belong to the genus *Carya* of botanists. They are closely allied to the walnuts (*Juglans*), the chief or at least one very obvious difference being that, whilst in *Carya* the husk which covers the shell of the nut separates into four valves, in *Juglans* it consists of but one piece, which bursts irregularly. The hickory trees are of lofty growth, and are held in high estimation, both on account of their durable timber, and from the excellent nuts which some of the species produce. The timber is both strong and heavy, and remarkable for its extreme elasticity, but it is not much used either for shipbuilding or for architectural purposes, as it decays rapidly when exposed to heat and moisture, and is peculiarly subject to the attacks of worms. It is very extensively employed in manufacturing musket stocks, axle-trees, screws, rake teeth, the bows of yokes, the wooden rings used on the rigging of vessels, chair backs, axe-handles, whip-handles, and other purposes requiring great strength and elasticity. Its principal use in America is for hoop-making; and when it is remembered how large a proportion of the productions of the United States is packed in barrels, some estimate may be formed of the consumption of hoops and of the consequent demand for hickory wood, which is the only American wood found perfectly fit for that purpose.

The wood of the hickory is of great value as fuel, on account of the brilliancy with which it burns and the ardent heat which it gives out, the charcoal being heavy, compact, and long lived. The species which furnish the best wood are *Carya alba* (shell-bark hickory), *C. tomentosa* (mocker-nut), *C. olivæformis* (pecan or pacane nut), and *C. porcina* (pig-nut), that of the last named, on account of its extreme tenacity, being preferred for axle-trees and axe-handles. The wood of *C. alba* splits very easily and is very elastic, so that it is much used for making whip-handles and baskets; the whip-handles are greatly esteemed for their suppleness, and considerable numbers of them are annually imported into England. The wood of this species is also used in the neighbourhood of New York and Philadelphia for making the back bows of Windsor chairs. The timber of *C. amara* and *C. aquatica* is considered to be of inferior quality.

Most of the hickories form fine-looking noble trees of from 60 to 90 feet in height, with straight, symmetrical trunks, well-balanced ample heads, and bold, handsome, pinnated foliage. When confined in the forest they shoot up 50 or 60 feet without branches, but when standing alone they expand into a fine head, and produce a lofty round headed pyramid of foliage. They have, observes Downing, all the qualities which are necessary to constitute fine graceful park trees, and are justly entitled to a place in every considerable plantation. The most ornamental of the species are *C. olivæformis*, *C. alba*, and *C. porcina*, the last two also producing delicious nuts, and being worthy of cultivation for their fruit alone.

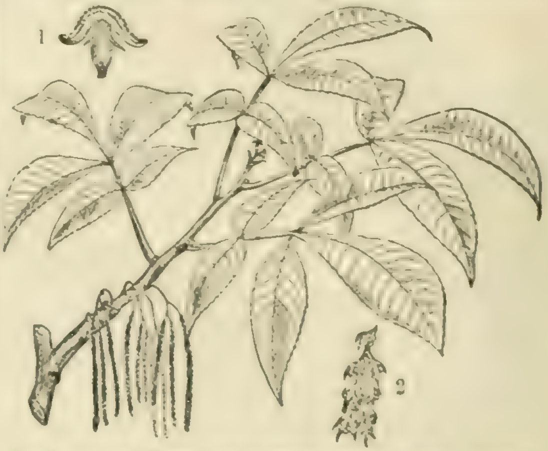


FIG. 1.—Shell-bark Hickory (*Carya alba*) in flower (⅓ nat. size). 1. Female flower (nat. size); 2, portion of male inflorescence (nat. size).

The husk of the hickory nut, as already stated, breaks up into four equal valves or separates into four equal portions in the upper part, while the nut itself is tolerably even on the surface, but has four or more blunt angles in its transverse outline. The hickory nuts of the American markets are the produce of *C. alba*, which is called the shell-bark hickory because of the roughness of its bark, which becomes loosened from the trunk in long scales bending outwards at the extremities and adhering only by the middle. The nuts are much esteemed in all parts of the States, and are exported in considerable quantities to Europe. The pecan nuts, which come from the Western States, are from an inch to an inch and a half long, smooth, cylindrical, pointed at the ends, and thin-shelled, with the kernels full, not like those of most of the hickories divided by partitions, and of delicate and agreeable flavour. The thick-shelled fruits of the pig-nut are generally left on the ground for swine, squirrels, &c., to devour. In *C. amara* the kernel is so bitter that even the squirrels refuse to eat it.

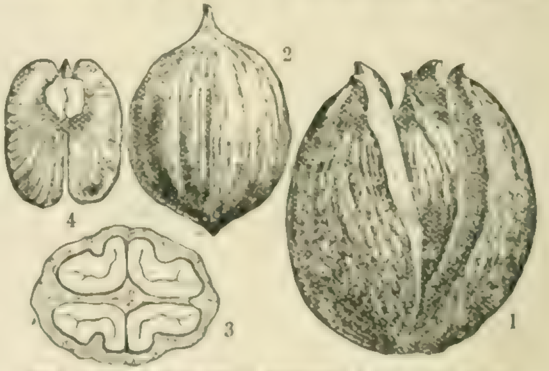


FIG. 2.—1, Fruit of *Carya alba*; 2, hickory nut; 3, cross section of nut; 4, vertical section of the seed. All natural size.

HICKS, ELIAS (1748-1830), founder of the Hicksites, one of the two great sections into which the Society of Friends in America has since 1828 been divided (see QUAKERS), was born at Hempstead, Long Island, on March 19, 1748. During the earlier part of his life he followed the business of a carpenter and house-builder, but this occupation he latterly exchanged for that of farming. Reared in a Quaker family, he began, when about twenty-seven years of age, to "have openings leading to the ministry," and to be "deeply engaged for the right administration of discipline and order in the church." In the intervals of business, accordingly, he began to visit the meetings and families of Friends throughout an extensive range of country, and soon he established a very considerable reputation as an eloquent and popular itinerant preacher. His first literary effort seems to have been made no earlier than 1811, when he published *Observations on Slavery*; those doctrinal divergences from the received orthodox creed of the Friends, by which his name was brought into the prominence it now possesses, appear not to have become visible until 1820, when he wrote a *Doctrinal Epistle* (published in 1824), which was followed by much controversy, and resulted in 1828 in the formal separation from the Hicksites of their more orthodox Quaker brethren. The points involved were justly considered to affect the fundamental doctrines of the Christian religion, such as those of the Trinity, the Incarnation, and the supreme authority of Scripture. Hicks died at Jericho, Long Island, on February 27, 1830. See *Journal of the Life and Labours of Elias Hicks* (Philadelphia, 1828).

HIERAPOLIS. Of the many cities in the Greek world bearing this name the following are the most important.

1. A city of Syria Cyrrhestica, situated on some hills about 16 miles south-west from the junction of the Euphrates and the Sajur. Besides the natural strength of its position, it was important as lying on the line of intercourse between Northern Syria and Mesopotamia, and was always a great trading city. Its early history is quite unknown. It is not mentioned during the Assyrian wars in this part of Syria (see Sayce, *Academy*, October 1876). Abul Faráz asserts that Josiah was defeated there by Pharaoh Necho (611 B.C.) on his march towards Carchemish; but according to 2 Chron. xxxv. 20 the battle took place at Carchemish, which lay on the Euphrates a little further north on the site of the modern Jerablûs, or Jerabîs; and probably Abul Faráz confounded the two cities. The same confusion perhaps has caused the statement of Ammianus that Hierapolis was identical with Ninus Vetus on the Euphrates. Jerablûs is clearly a corruption of Hierapolis, by which name therefore Carchemish must at some time have been styled by the Greeks; but it is surprising to find two great cities of the same name so near one another. No proof exists that Hierapolis was an important city before the time of the Seleucidæ, and Professor Sayce suggests that it then succeeded to the trade and name of the older city, which had now decayed. Its original name is given in Greek as Βαμβύκη, which points back to a form Bambyg or Mambug, while the Syrian form is given by Pliny as Mabog, *i.e.*, Mabbog for Mambog. The romance of trade by which this name has become naturalized in many European languages deserves a passing notice. As the city lay on the highway to the East, cotton and silk were important branches of its trade. Probably cotton plantations existed there in old time; and after the cultivation of silk was introduced to western Asia in the time of the Sassanian kings, large groves of mulberry trees surrounded the city. The name Mambe was afterwards confounded with the Persian word pambe, silk; and the Greek form Βαμβύκη also was similarly mixed up with the word βόμβυξ,[1] which originally denoted the fly supposed to spin on trees the cotton or silk (for the two substances were confused by the Greeks and Romans) which men then gathered off the trees (Virg., *Georg.*, ii. 121). Hence the "Bombycinæ vestes" of the Roman writers; while the city itself is called "Bombycina urbs." In Asia cotton seems to have been known as a distinct article, and was named after the city which was the chief seat of its manufacture, as muslin is from Mosul. By the crusaders the stuff and the name were carried to Europe, and the latter exists in English in the form "bombazine." The Syrian goddess Atargatis, called by the Greeks Derceto, a personification of the nature power worshipped under different names over the whole of western Asia, had one of her most famous temples in the city; and perhaps Mambe may have been a local name of the goddess. Hence in the 3d century B.C., when, under the Seleucid kings, Bambyce became a great Greek city and the most important station between Antioch and Seleucia, it was called Hierapolis or Hieropolis. The latter form is found on coins, the former is used in classical literature. The coinage of Hierapolis begins under the Seleucidæ. The autonomous coins, probably for commercial reasons, imitate closely the coins of Antioch. The temple was plundered by Crassus on his Parthian expedition (53 B.C.). Under Diocletian or Constantine, Hierapolis became the capital of the new province of Euphratensis, a name which soon gave place to the older name Commagene. As paganism decayed, Hierapolis ceased to be the sacred city, and recovered its ancient name; at the same time its importance and population declined. In the time of Julian, who concentrated there the Roman troops for the fatal Parthian campaign, it was still one of the greatest cities of Syria; but under Justinian, who made some attempt to restore it, great part of its area was a desert, and the once strong fortifications were so decayed that the place was not defensible against the Parthian king Chosroes. At the Arab conquest it passed into the hands of the caliphs. Haroun al-Raschid (786–808) restored it and strengthened its walls, and it is mentioned about 1150 by Edrisi as a strong city. As the empire of the caliphs dwindled, Mambedj became a frontier post in the struggle between Christians and Mahometans, and its possession carried with it the rule in this part of Syria. The emperor Romanus Diogenes captured it in his gallant struggle against the Turks (1068). Recaptured by the Seljuk Turks, it soon afterwards fell into the power of the crusaders, until it was stormed by Saladin (1175). It was for some time the headquarters of the Mongol host under Hulagu Khan; and, as with many other Syrian cities, its desolation dates from this time. The ruins which still exist called Kara Bambuche or Buyuk Mambedj, have been described by Pococke and others, and most carefully by Chesney (*Euphrates Expedition*, i. 420).

Strabo (xvi. p. 748) confuses this Hierapolis with Edessa in Mesopotamia. A very full account of the city to supplement the brief outline here given may be found in Ritter, *Erdkunde*, x. 1041–65.

2. A city in Phrygia, at the junction of the Lycus and Meander, on the road from Apamea to Sardis. In it there were warm springs which had and still have a remarkable power of forming incrustations. Its name Hierapolis is due to the sanctity conferred on it by these hot springs, and by the Plutonium, a small cave under a projecting rock, from which there constantly emanated a dark vapour deadly to man and beast (Strabo, xiii. 629; Vitruv., viii. 3; Apuleius, *De Mundo*, p. 65). In reference to this we find sometimes on its coins Pluto carrying off Proserpine.

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[1] Βόμβυξ is borrowed from the Persian word (Benfey, *Wurzellex.*, ii. 113), though the form it has taken in Greek is influenced by the word βομβέω, to buzz. It is used by Aristotle, &c., to denote a gnat found in Asia Minor, which has certainly nothing to do with silk.

The water was also much used for dyeing. Nothing is known of the origin of the city; from the legend ἀρχηγέτης on coins, with a radiate head of the sun-god, Eckhel concludes that a Greek foundation was made under the guidance of Apollo; but a native city may have already existed there. The native name of the sun-god was Λαιρβηνός, which often occurs on coins; he was probably a Phrygian form of the Greek Zeus. The goddess of healthful drinking, Euposia, is also seen on coins. Cybele also, who is found on the coins, was one of the chief deities of the place. Little is known of the history of the city. The philosopher Epictetus was born there; and there St Paul founded a church (Coloss. iv. 13). The very considerable ruins which still exist, called Pambuk Kalessi ("Cotton Castle"), have been described by Pococke, Leake, &c. The ancient theatre and gymnasium are in a state of remarkable preservation.

HIERARCHY. From ἱεράρχης, meaning a steward or guardian of holy things, is derived ἱεραρχία, naturally signifying the office of such a steward or guardian (not a "ruler of priests" or "priestly ruler"; see Boeckh, *Corp. Inscr. Gr.*, No. 1570), but most commonly used in ecclesiastical language to denote the aggregate of those persons who exercise authority within the Christian Church,—the patriarchate, episcopate, or entire threefold order of the clergy. The word, which does not occur in any classical Greek writer, owes its present extensive currency to the celebrated writings of Dionysius Pseudo-Areopagita, which, originating probably in the age of Justinian, exerted during the 9th and following centuries so remarkable an influence on the current of theological speculation, both in the Eastern and in the Western Church. Of these the most important are the two which treat of the celestial and of the ecclesiastical hierarchy respectively. Defining hierarchy as the "function which comprises all sacred things," or, more fully, as "a sacred order and science and activity, assimilated as far as possible to the godlike, and elevated to the imitation of God proportionately to the Divine illuminations conceded to it," the author proceeds to enumerate the nine orders of the heavenly host, which are subdivided again into hierarchies or triads, in descending order, thus:—Seraphim, Cherubim, Thrones; Dominations, Virtues, Powers; Principalities, Archangels, Angels. These all exist for the common object of raising men through ascending stages of purification and illumination to perfection. The ecclesiastical or earthly hierarchy is the counterpart of the other. In it the first or highest triad is formed by baptism, communion, and chrism. The second triad consists of the three orders of the ministry, bishop or hierarch, priest, and minister or deacon (ἱεράρχης, ἱερεύς, λειτουργός); this is the earliest known instance in which the title hierarch is applied to a bishop. The third or lowest triad is made up of monks, "initiated," and catechumens. To Dionysius may be traced, through Thomas Aquinas and other Catholic writers of the intervening period, the definition of the term usually given by Roman Catholic writers—"coetus sacrorum praesidum et sacrorum ministrorum ad regendam [illegible] in hominibus sanctitatem divinitus institutus,"[1] although it immediately rests upon the authority of the sixth canon of the twenty-third session of the council of Trent, in which anathema is pronounced upon all who deny the existence within the Catholic Church of a hierarchy instituted by divine appointment, and consisting of bishops, priests, and ministers.[2] This definition, however, relates only to what is called the "hierarchy of orders," to which hierarchy, it must further be borne in mind, belong the lesser orders of sub-deacon, acolyth, exorcist, lector, and doorkeeper (to which that of singer is sometimes added); though these are to be regarded as institutions of ecclesiastical authority only, while the other three are of divine right, and therefore pre-eminently "holy." The "hierarchy of jurisdiction," as distinguished from that of "orders," is represented by the Roman pontiff alone, who enjoys supreme authority over all bishops, even when these are assembled in general council. This supreme authority he holds by divine right as the successor of Peter, who received immediately from Christ the primacy of honour and of jurisdiction over the universal church.[3] Between the pope and the bishops occur the metropolitans or archbishops and the patriarchs; but these intermediate grades are not regarded as essential, and, for the present at least, the rank of patriarch may almost be said to be, in the Roman communion, purely titular. The Greek Church, like the Roman, recognizes a threefold clerical order, distinct *jure divino* from other Christians, of bishops, priests, and deacons. The five patriarchs, of equal dignity, hold the highest rank in the episcopate; and the episcopal body united in a general council represents the church, and infallibly decides, under the guidance of the Holy Ghost, all matters of faith and ecclesiastical life. The Anglican Church acknowledges the superior and divinely conferred authority of the episcopal order, but, seeking its hierarchical doctrine in the records of a comparatively early period of church history, holds the substantial equality of all bishops, and, while acknowledging the validity, does not maintain the necessary infallibility, of their decisions when met in general council. Thus in form of government the Roman Church may be said to be a hierarchical monarchy, the Greek in some sense a patriarchal oligarchy, and the Anglican an episcopal aristocracy. For historical and other details relating to the growth and development of the hierarchical system the reader is referred to the articles APOSTLE, ARCHBISHOP, BISHOP, CARDINAL, CHURCH, CLERGY, COUNCIL, DIOCESE, EPISCOPACY, EXARCH, PATRIARCH, POPE, &c.

Some kind of hierarchy, both of orders and of jurisdiction, may, from the nature of the case, be looked for in every religious system that has attained any considerable degree of visibility and external organization. The ancient Jewish and Egyptian hierarchies, for example, find parallels in Parsism and Mahometanism; while in some regions Buddhism has attained a degree of complexity in its ecclesiastical government strikingly suggestive of many features of the present Roman hierarchy.

HIERAX, or HIERACAS, a learned ascetic who flourished about the end of the 3d century at Leontopolis in Egypt, where he lived to the age of ninety, supporting himself by calligraphy and devoting his leisure to scientific and literary pursuits, especially to the study of the Bible. He was the author of Biblical commentaries both in Greek and Coptic, and is said to have composed many hymns. He ultimately became leader of the so-called sect of the Hieracites, an ascetic society from which persons living in the married state were excluded, and of which one of the leading tenets was that only the celibate could enter the kingdom of heaven. This doctrine was based on a somewhat too literal interpretation of the parable of the ten virgins; on other points, however, Hierax followed Origen in allegorizing Scripture; thus he thought that the narrative of the fall and the doctrine of the resurrection ought both to be taken in a spiritual sense. It is upon this apparently Manichæan view of matrimony, taken along with his denial of the resurrection and of a visible paradise, and his assertion that infants, as incapable of "striving lawfully," cannot inherit the kingdom of God, that his reputation as a heretic chiefly depends.

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[1] Perrone, *De Locis Theologicis*, pt. i., sec. i., cap. 2.

[2] Si quis dixerit in ecclesia catholica non esse hierarchiam divina ordinatione institutam, quae constat ex episcopis, presbyteris, et ministris, anathema sit.

[3] Perrone, *De Locis Theologicis*, pt. i., sec. i., cap. 1, 2, 3.

HIERO, the name of two rulers of Syracuse.

Hiero I., displacing his infant nephew, succeeded his famous brother Gelon as tyrant of Syracuse in 478 B.C. His rule was more tyrannical than Gelon's had been, and his jealousy of his more popular brother Polyzelus (who was at the head of the army, and had married Gelon's widow Demarete, daughter of Theron of Agrigentum) ended in an open quarrel, in which Theron sided with Polyzelus. The brothers, however, were reconciled, and Hiero married Theron's sister. From the slight information extant regarding Hiero, his influence seems to have been very great. He removed the inhabitants of Naxos and Catana to Leontini, and peopled Catana, which he renamed Ætna, with Dorians. He was also an important factor in the history of Agrigentum, of Rhegium, and of Locri; and he saved the Greeks of Campania from the Etruscans, whose naval power he destroyed by his great victory at Cumæ (474 B.C.). Though despotic in his rule, he was a hearty patron of literature, and numbered among his friends such names as Æschylus, Bacchylides, Epicharmus, Simonides, and Pindar—the last of whom celebrated his victories in the Grecian games. He died at Catana in 467 B.C.

Hiero II., king of Syracuse, was the illegitimate son of a Syracusan noble, Hierocles, who claimed descent from Gelon (see GELON). His birth must have taken place before the year 306 B.C. On the departure of Pyrrhus from Sicily (in 275 or end of 276 B.C.), the Syracusan army and citizens alike marked their approval of Hiero's military and popular qualities by placing him at the head of the troops, and he materially strengthened his position by marrying the daughter of Leptines, the leading citizen. A body of Campanian mercenaries, who had been employed by King Agathocles of Syracuse, had taken the designation of Mamertines, and occupied Messana. From this stronghold they harassed the Syracusans. Hiero led his army against them, and in the engagement that ensued he abandoned to the enemy his mercenary troops, whose fickle disposition he distrusted, and retreated with the rest of his soldiers to Syracuse. There he raised a native force, with which he drove the Mamertines into the corner of the island, defeated them in a pitched battle, and was prevented from capturing Messana only by Carthaginian interference. His grateful countrymen then chose him king (270 B.C.). In 264 he again returned to the attack, and the Mamertines called in the aid of Rome. Hiero at once joined the Punic leader Hanno, who had newly landed in Sicily; but being defeated by the consul Appius Claudius, he withdrew to Syracuse. Pressed by the Roman forces, he was in 263 compelled to conclude a treaty with Rome, by which he was to rule over the south-east of Sicily and the eastern coast to Tauromenium. From this time till his death in 216 he remained the fast friend of Rome, rendering frequent and valuable services during the First Punic War by supplying men, material, and provisions. Presents were sent him in acknowledgment of these good offices; but the strong desire of the Romans to occupy Sicily prevented his receiving any accession of territory at the close of the war. When the Second Punic War broke out, he was faithful as ever, joined his fleet to that of Sempronius, and offered supplies of food and clothing. At home, he was a wise and just ruler. He retained the republican senate, and governed as a constitutional monarch. Munificent in his gifts to foreigners—witness his presents to Olympia, to the Rhodians, to King Ptolemy, and above all to the Romans—and in the erection of public buildings within his own domain, he was exceedingly simple in his personal tastes; he wore a citizen's dress, and was not attended by guards. So wise were his financial arrangements that they were retained by the Romans after the reduction of Sicily. He kept up a powerful fleet for defensive purposes, and employed his famous kinsman Archimedes in the construction of those engines that, at a later date, played so important a part during the siege of Syracuse by the Romans. His only son, Gelon, predeceased him, and he was succeeded by his grandson Hieronymus.

HIEROCLES, a Roman proconsul, first of Bithynia and afterwards of Alexandria, flourished during the reign of Diocletian (284-305 A.D.), and is said to have been the instigator of the fierce persecution of the Christians under Galerius Cæsar in 303. He was a man of considerable intellectual culture, and wrote a work entitled Λόγοι φιλαλήθεις πρὸς τοὺς Χριστιανούς in two books, in which he endeavoured to persuade the Christians that their sacred books were full of contradictions, and that in moral influence and miraculous power Christ was inferior to Apollonius of Tyana. For our knowledge of the nature of this treatise, which has not come down to our times, we are dependent on Lactantius (*Instit. Div.*, v. 2), and still more on Eusebius, who is the author of a refutation entitled ἀντιρρητικὸς πρὸς τὰ Ἱεροκλέους.

HIEROCLES, a Neo-Platonic writer of the 5th century A.D., was apparently a native of Alexandria. He was born most probably about the beginning of the 5th century, studied under the celebrated Neo-Platonist Plutarch at Athens, and taught for some years in his native town. He seems to have been banished from Alexandria and to have taken up his abode in Constantinople, where he endured some persecution for his religious opinions. His death must be referred to the closing decade of the 5th century, probably about 490. The only complete work of his which has come down to us is the commentary on the great Pythagorean *Carmen Aureum*, but several other writings, specially one on Providence or Foreknowledge, are quoted or referred to by Photius and Stobæus. The commentary contains several remarkable utterances, and is written with much elegance. Philosophy is there regarded in its practical aspect, as a discipline for purifying or elevating the mind by inculcating virtue and leading to truth. The most curious doctrines contained in the work are those bearing on providence and the human soul. The activity of the Divine Being, the supreme God, although eternal and all-reaching, is viewed as extending specially or immediately only to spiritual existences, or rather to the genera of such existences. The individuals are not directly the objects of divine operation, but are left to natural chance or law. In more modern phraseology there is only, according to Hierocles, general, not particular, providence. As against divine foreknowledge, perfect freedom of individual will is maintained. All that is preordained is but the connexion between volitions and their natural consequents. As regards the human soul, the teaching of Hierocles in the main resembles Neo-Pythagoreanism. He states the doctrine of transmigration and pre-existence, holds that there is an ethereal body which is purified by trial along with the soul, and regards the world as the means by which judgment upon the past actions of the individual spirit is carried out.

The earliest edition of the commentary is the Latin translation by Aurispa in 1474; the Greek text was first given by Curterius in 1583. The fragments of the works on Providence and Fate were published in 1593 by Morellus. Later editions of all that is preserved appeared in 1654-5, 1673, and 1709. The commentary alone has been edited by Ashton (1742), by Wolf (1710), by Gaisford in his edition of Stobæus (1850), and finally by Mullach (1853). The jest book entitled ἀστεῖα (edited by Schier 1768, and Eberhard, 1869), though frequently attributed to this author is certainly the work of a later hand. The most complete information regarding Hierocles is to be found in Mullach's edition, and in the relative portions of his *Fragmenta Phil. Græcorum*, 1860, i. 408 *sq.* *Cf.* Zeller, *Phil. d. Griechen* (2d ed.), iii. 2, pp. 681-7

HIEROGLYPHICS

Introduction.

THE term hieroglyphics is used, with others, by Greek and Latin writers to describe the sacred characters of the ancient Egyptian language in its classical phase. It is used by the moderns for various systems of writing in which figures of objects take the place of conventional signs. This article is limited to an account of Egyptian hieroglyphics, with some notice of the derived systems called hieratic and demotic.

It is no longer necessary in an article like the present to give a history of the interpretation of hieroglyphics and a sketch of the grammar of ancient Egyptian. What students need is a statement of the main results as to the Egyptian characters themselves and a systematic bibliography.

The written language of the ancient Egyptians remained the same from the date of the earliest monuments (Third Dynasty) until the age of the Ethiopian kings (B.C. cir. 700), when a vulgar dialect expressing the common speech is first found in written documents. Then, if not earlier, the older phase of the language became the classical Egyptian, sometimes called the sacred dialect, to distinguish it from the vulgar dialect. The classical Egyptian was used almost as late as the fall of paganism generally for all documents but legal and commercial ones, for which the vulgar dialect was used.[1]

It is necessary to observe that although Egyptian is not proved to be a Semitic language, it contains in its oldest known form undoubted Semitic elements, both in structure and roots. The constant comparison with the Semitic languages which is here necessary is therefore not merely employed for the sake of the analogies that may be discovered, but on the ground of partial affinity, which, however, must not be strained.

It must also be borne in mind that the grammar of ancient Egyptian is in its infancy. We know many of its principal facts, but we do not know them accurately. For instance, we know the forms of many tenses of the verb, and can perhaps place these tenses in groups, as past, present, and future, but we cannot define the different senses of the various tenses of each group. Similarly, in Coptic we do not always know the shades of difference within a group of tenses. It may be that in Coptic these shades have disappeared through the decay of the language, but it would be rash to affirm this of the classical Egyptian. Thus this essential part of the grammar will not be understood until the verb has been thoroughly worked downwards from the oldest texts through the classical language, then through the demotic, and then the Coptic, and again in inverted order from the Coptic upwards. The same labour has to be performed for the whole grammar in each of the three phases of the language, before we can speak with any certainty of Egyptian grammar. This is said in no disparagement of the admirable work already done, but as a necessary caution to the student.

The following sections are abridged (to p. 806, end of section on "Secret Writing"), with additions and modifications, which are noted by their being included in parentheses, from M. de Rougé's *Chrestomathie Égyptienne*, Abrégé Grammatical.

The Systems of Writing.

The elements of Egyptian writing are composed of a certain number of actual objects, natural or artificial imitated by drawing or engraving.

Egyptian writing falls into three systems—(1) hieroglyphic, (2) hieratic, (3) demotic or enchorial, the hieratic being a simplified form of hieroglyphic, and the demotic of hieratic. The complete designing of hieroglyphics required skill and time. They thus came to be reduced in writing to the simplest forms which retained the leading characteristics. These were called by Champollion linear hieroglyphics. The linear forms not lending themselves with sufficient readiness to very rapid writing, a further abbreviation was made, by which the forms became almost conventional,—the original type usually ceasing to be immediately recognizable: this cursive system Champollion called hieratic. The demotic writing is a new abbreviation of the hieratic: it gradually departs so far from the original types as to appear to consist of arbitrary signs.

Hieroglyphics are written either in horizontal lines or vertical columns, and are ordinarily read from the right. The heads of animals and the like shew from what direction to begin reading. Hieratic and demotic are written from right to left, in horizontal lines. In very early times hieratic is sometimes written in vertical columns.

(The hieroglyphic is a lapidary system, the hieratic and demotic purely systems for common writing. Consequently the hieroglyphic is the most difficult of the three to read, as the engraver or painter paid great attention to the symmetrical appearance of each group of signs, and grammatical forms were hence often omitted. In hieratic and demotic the signs follow each other without interruption of the natural order, and the grammatical forms are usually given, and even more fully.)

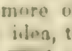
Characters in Relation to their Use in Writing.

Egyptian writing is composed of a mixture of signs of two distinct classes—(1) ideographic, each sign representing an idea; (2) phonetic, representing a sound, either (α) a simple articulation (alphabetic) or (β) a complete sound, *i.e.*, a complete syllable (syllabic). The two classes were combined according to fixed rules in writing words.

Ideographic Signs.

This class may be best divided into (α) representative signs and (β) symbolic (tropical).

The representative signs exactly express the idea of the object of which they present an image, as ★ a star.

The symbolic (tropical) signs represent an idea by the aid of certain analogies which the mind sees between the symbol and the idea attached to it. A simple symbol presents a single object, as the sun ☉, when used in the symbolic sense "day." A symbol is complex when uniting more objects than one to convey to the mind a single idea, thus a star suspended beneath the celestial vault  represented "night." Under complex signs should be placed figures of divinities in which the human form has special headdresses or insignia.

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[1] As early as the time of the Empire differences of dialect due to difference of speech in Upper and Lower Egypt had crept in, [illegible] (Brugsch, *Gram. Hier.*, 93). Ultimately vulgar forms and constructions [illegible] are distinctly traceable in the sacred language [illegible] *Gram. Hier.*, [illegible]. There are also natural [illegible] and artificial changes [illegible] grammatical forms and the growth [illegible] of natural changes, [illegible] of [illegible] words by the scribes of the [illegible], and, what is [illegible] the [illegible] of Egyptian words, are examples of artificial changes (Maspero, *Hist.*, 557, 558).

The value of ideographic signs may be discovered in various ways. The representative signs only need that the thing represented should be determined. The symbolic signs are often (rather, sometimes) explained by classical authors; they may also be explained by careful study of bilingual documents, as the Rosetta Stone (and the Decree of Canopus). The sense, and more certainly the reading, can be discovered by an exact knowledge of the words written by phonetic combined with ideographic signs, and above all by the variants allowed in writing the same word with signs of different classes.

(The result may be thus tabulated :

Ideographic Signs.		Phonetic Signs.	
Representative.	Symbolic.	Alphabetic.	Syllabic.

Dr. Brugsch in his *Gram. Hiér.* (p. 3) gives the following scheme :

Phonetic Signs.		Ideographic Signs.	
Alphabetic.	Syllabic.	Special.	General.

Here the ideographic signs are classed, not according to their nature but according to their use, which will be later noticed. M. de Rougé's seems the more logical classification.)

PHONETIC SIGNS.

As the phonetic signs represent either (α) a simple articulation or (β) a complete sound, *i.e.*, a complete syllable, the hieroglyphic method comprehends (α) an alphabet and (β) a syllabary.

Champollion held that the alphabet originated from giving to each object the phonetic value of the initial of its name: thus the mouth "ro" would become "r." This probable principle cannot now be tested for a great part of the alphabet, probably in consequence of the loss of many archaic words.

The alphabet of the Greek and Roman periods presents a great number of homophones for each articulation. The more we advance towards antiquity the more the method simplifies, and the alphabet of primitive times admits but a very small number of homophones. Dr. Lepsius (*Lettre à Rosellini*) first scientifically treated this distinction.

ARTICULATIONS OF THE EGYPTIAN LANGUAGE.

The determination of the exact number of articulations which the scribes distinguished in the Egyptian language presents great difficulties. Comparison with the articulations of languages which occur in bilingual texts cannot give sufficiently precise results, for the shades of sound are far from being the same in the languages thus placed in juxtaposition. The Romans and Greeks had many letters which, though quite distinct in their languages, the Egyptians confounded in their transcriptions. On the other hand, there were some Egyptian articulations preserved in the Coptic language which had no special representative in Greek or Latin; hence certain letters derived from the demotic were added to the Greek alphabet on its adoption by the Copts. (It must also be remarked that the Greek and Roman rule was an age of literary decay and ruin for classical Egyptian, in the depression of which little effort seems to have been made to represent accurately foreign sounds. The student must not be misled by the greater accuracy at this time in rendering the vowels, which was merely due to the decay of the system of writing, by which the Egyptian vowels usually following certain consonant signs came to be disregarded.) Happil those Egyptian articulations which were unknown t the Greeks and Romans have at least analogues in the Semitic languages. Moreover, the many transcriptions of Semitic words (made while the Egyptian was in full vigour), joined to the traditions of the Coptic language (which has ceased for a hundred years to be a living speech), enable us to appreciate sufficiently those articulations unknown to the Greeks and Romans (and this indication may be followed in the cases of the rest of the letters).

The words common to Egyptian and Semitic in the earliest known condition of the Egyptian language must be omitted from comparison; the more exact transcriptions of the scribes of the Ramessides (Dynasties XIX., XX.) must take precedence of the looser ones of the earlier period of the Empire (Dynasty XVIII.). Coptic, having long existed in a languishing state and under the influence of Arabic, whence the colouring of the latest dialect, the Bashmuric (Revillout ap. Rossi, *Gram. Copto-Ger.*, 30, n. 1), and certain peculiarities of the present pronunciation, is not an absolutely safe guide.

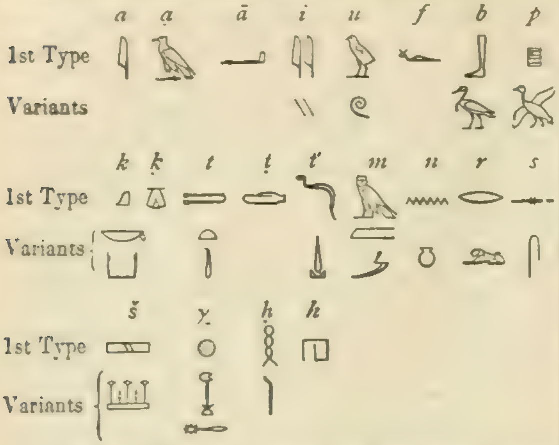
It might be thought that the study of the various modes in which words are written would furnish an exact table of homophones, and give us at once the list of distinct articulations; thus we might suppose that variants shewing two characters might enable us to assume their identity, as when in reading Greek we assume that θ is the same as ϑ. But in Egyptian, as in other written languages, there are certain licensed irregularities of orthography, and also oscillations between the different shades of sound in the same class of letters when used for the same word: a small number of variants between two letters therefore does not prove their perfect homophony. Hence certain differences of opinion among Egyptologists, according to the weight, greater or less, which they give to this or that series of variants. Thus the number of letters under the "t" group differs with different scholars.

Without denying that there may have been some shades of sound in the different signs here called homophones, as in the sounds represented by the English "th," the chief guide should be the estimate the Copts made of the elements of their language, when they adopted the Greek alphabet, completing it for their purpose by adding six special letters taken from demotic writing.

The Egyptian Christians in adopting the Greek alphabet, which had vowels with fixed sounds, made their writing undergo a radical change: up to that time they had only vague vowels which were, as in the Semitic alphabets, simple aspirations, susceptible of being coloured by the sounds of different vowels (but this vague character must be limited by the vowels falling, as in Semitic, into three groups of sounds; the vagueness was therefore not unlimited. This characteristic of the old Egyptian influenced the Coptic, which presents in the vowels varieties of orthography of the same word, these varieties, however, usually falling within the three ancient groups. It is only in the Coptic helping vowel that absolute vagueness is found, like that of the primitive "shĕva" of Hebrew.)

Following these indications we find 15 leading articulations in Egyptian: the shades of sound which may be most certainly distinguished would indicate an alphabet of 21 divisions. They are transcribed by letters taken, one, χ, not to be confused with the Coptic ϫ, excepted, from the Latin alphabet, according to the principles of the Standard Alphabet. Cf. Lepsius. *Standard Alphabet.*

The simple letters used by the Egyptians in the earliest times to write these articulations are as follows:



During the Pharaonic periods ten homophone letters were added: one is very ancient; some appear under the Ramessides; others under the Saïtic Twenty-sixth Dynasty. Probably they were introduced in order to render it easier to fill spaces in sculptured inscriptions.

It must be observed that all simple letters can in writing radical forms be replaced by syllabic signs.

These articulations have now to be examined under natural classes: their interchange has to be noticed, their use in the transcription of Latin, Greek, and Semitic words, and the rules according to which Egyptian words are transformed into Coptic words in the two chief dialects, the Sahidic and Memphitic. (This branch of the subject is of great importance for comparative philology, as our endeavour should be to ascertain as nearly as we can the fundamental sounds of ancient Egyptian, and then to compare these sounds with those of languages to which it has relation.)

Soft Aspirate, and Vague Vowels.

The Egyptian vowels have two distinct uses—(1) as aspirates, or initials in the syllable, and (2) as vague vowels, either final or medial.

The Copts have marked no difference of aspiration between the initial vowels of syllables in their language, which correspond to ancient words beginning with , , or .

When these signs are employed as vowels, or "matres lectionis," it does not appear that one of them was used by preference for one sound more than another; they remain vague in the full force of the term. This vague "a" is unlike the ا of prolongation of the Arabs, which, although otherwise susceptible of being coloured by all the vowels, then becomes a true *a*. (Notwithstanding this vagueness it is safest to transcribe this group by *a*, as there were special signs for the semi-vowels *i* and *u*, and the helping vowel which we write *ĕ* was not written. The *a* must, however, be considered a symbol, vague to the extent of the Hebrew א when not vowelled.)

The final vague vowels do not vary much between themselves in the ancient texts; the orthography of each word was very stable, and, besides, the choice of the final vowel depended much on the preceding consonant, each sign having a vague vowel which it seems to prefer (see the Section on "Expletive Vowels and Complements of Simple Letters," and observe the course of syllabic signs). They sometimes interchange, and are even replaced by the vowels *u* and *i*, which also then share these vague character. This system lasted to the latest periods of hieroglyphic writing. (Coptic shows the same instability of *a* and the kindred vowels.)

The three signs of the soft aspirate sometimes interchange: and serve equally as initial *a*'s in Greek and Roman names, as well as in Egyptian words. The group of two *a*'s, *aa*, was ordinarily written *aa*, and is found as variant of initial.

is used with a marked preference to transcribe the Semitic א

On the contrary seems preferentially used to express long vowels, or such as were emphatically pronounced. In the Semitic transcriptions it corresponds habitually to ע, when that letter is initial. But it was not the same articulation. Under the Nineteenth and Twentieth Dynasties, and particularly in the papyri, a great degree of exactness was sought in the transcription of Semitic words. The scribes often then expressed the ע by the syllabic , which has the value of *ūa*. It seems that the arm alone did not offer them an approximation which they judged sufficient.

The Hebrews transcribed by ע in many words. The ⲱ of the Copts answers oftener to than to the other vowels, and this seems a convincing proof that the signs of the *u* vowel had no stable sound).

There are also some cases of permutation between *a* and the aspirate *h*, analogous to the variants between ה and א (but we must be careful not to confound true variants with a root in Egyptian augmented by a preformative *h*).

When the vowel *a* should form a syllable by itself it is often followed by the sign , which indicates the voice, by the representation of a man, his hand to his mouth. Transcriptions of proper names thus beginning, as *a pp i*, Apophis, shew that should ordinarily be pronounced *a*.

The final vague vowels could be omitted in writing; numerous variants shew there was no rule in this matter; but the hieratic preserves them more habitually. In writing the medial vowel of a syllable of two (or three) consonants, it was very ordinarily placed after the consonants and not between them; this is true of *a*, *a*, *ā*, *u*, *i*. Thus the name of the divinity , χensu, is constantly transcribed by χωνs in proper names. There is a striking instance of this orthography in the word , *ani* for *ain*, transcription of the Hebrew עין "eye" and "fountain."—List of cities of Syria taken by Thothmes III.

U and *i* could be initial semi-vowels or vague vowels; *u* initial answers in many Coptic words to the diphthongs ⲞⲨⲰ, ⲞⲨⲈ, &c., without being followed in writing by a second vowel: here it is an initial semi-vowel. *U* necessarily carried with it its aspiration; there are some variants with the aspirate , *h*, which recalls *ὑ*. The two signs , , interchange readily, and may be considered to be absolute homophones, but was much more frequently used in the earliest times.

U, considered as a vowel, was vague, and in a larger measure than the Hebrew ו, for we find it transcribed even by *i* and by *e*. It interchanges with *i* in Egyptian words, and sometimes even with *a*. In Hebrew we remark frequently the same oscillation between the sounds *u* and *i* in the kĕri kĕthib of the Biblical text. In Coptic this vowel has generally produced ⲞⲨ, Ⲟ, Ⲱ, but very often also Ⲉ and the other vowels or diphthongs; the group , *au*, answers to Ⲉ, ε, in the Coptic and the Greek transcriptions; it would be thus equivalent to א in the Masoretic system.

Of the two signs for *i*, and \\, the second is evidently shorthand for the first. *I* initial should always be considered to be a semi-vowel with the value *ia*, *iu*: in this use we ordinarily find , which better fills the initial space; \\ serves oftener for *i* vague final. Thus the verb *i*, "to go," was written with vague *a* initial for the aspirate, and , or \\, as final vowels , , or , the legs determining the idea of movement: it is transcribed *ai*, in Coptic Ⲓ, ⲈⲒ, "to go," "come." We also find the variant , *u*, which is regular in consequence of the vagueness of the vowels. (The two forms are traceable in Coptic.) The signs and \\ interchange as much as their forms permit, which fit very differently into the composition of groups.

I, semi-vowel, does not vary with any other letter; it is only found in a very small number of Egyptian words, but it is much used in the Semitic transcriptions; the Coptic derivations are initial Ⲓ and ⲈⲒ.

I, the vague vowel, interchanges with *u* and *a*, *a*, *au*, *ai*. The Greek transcriptions oscillate principally between ι, ε, ει. The

Semitic transcriptions have a much wider range, which comprehends nearly all the vowel sounds.

(The unwritten aspirate or short vowel is not noticed in this place by M. de Rougé. It will be seen, under the Section on "the Transcription of Vowels Omitted," that he does not admit the transcription of an unwritten vowel except as a makeshift, or in other words, that he does not allow the Egyptians to have had a vowel sound never written. The existence of the supposed vowel seems, however, certain on these grounds. Some syllables never take a vowel except for an unusual form,—the root and the ordinary derivatives never being vowelled, and a vowel only appearing in what is obviously a derivative formed by lengthening the vowel. Further, the Coptic has such a vowel marked by peculiar forms ` or — above a letter, or in the latter case above a letter or syllable, indicating that the sound, here generally ⲉ, was omitted in writing by the ancient Egyptians; and still more remarkably the Coptic use is sometimes found where the older writing would lead us to expect it. In ancient Egyptian the use of this helping vowel is implied, as an aspirate in a syllable written with a consonant alone, as 𓈖 *n*, 𓅓 *m*, 𓂋 *r*; in Coptic ⲛ̀, ⲙ̀, ⲣ̀, and as a medial vowel in a syllable of two consonants, as 𓏏𓍃𓅓 *tm*, "not," in Coptic ⲧⲙ̄. In Coptic, as already mentioned, it is generally read ⲉ, ĕ, but had this been its constant sound it would have been represented by ⲉ, and would of course have been needless. It is safest to read the old Egyptian helping vowel ĕ. It resembles the Hebrew Shĕva, as including its variants Hateph-Pathah, Hateph-Segol, and Hateph-Kames.

M. de Rougé's section on this subject seems wanting in his usual clearness. This is, however, due to the inherent difficulty of the subject. The Egyptian vowels, except when used as semi-vowels, are undoubtedly vague. Thus, in the writing of Semitic words under the Ramessides, while the consonants are most carefully represented, the vowels affected by those consonants are frequently used, and the apparent pronunciation is distorted. Consequently, though we have no difficulty in separating the vowels into the *a*, *i*, and *u* group, adding the helping vowel, or short ĕ, because the use of the *i* and *u* vowels as semi-vowels gives them and the third vowel (*a*) thus limited a certain definite character, yet, when we have to treat of vowels pure and simple, the distinction of these classes vanishes. Thus the idea of fixed vowels, with however wide legitimate extension, is constantly rising in the enquiry to be as constantly suppressed by the vagueness of their use. It must, therefore, be held that the transcriptions we adopt do not give the accurate pronunciation, inasmuch as the vowel constantly, but not always, depended upon the consonant preceding, and vowel complements are even added where they were not pronounced. This is proved by Greek transcriptions, as will be seen later. On the other hand, the vowelling of Greek and Latin proper names shews that the vagueness of the vowels was not absolute, for the Egyptian scribes in the decay of the old style, no longer bound by the ancient usage of complements, employed the vowels with such accuracy as their limitation in sounds permitted, subject to the carelessness of the age. Of course these vowels could not accurately represent the Latin five or the Greek seven. Perhaps it may be suggested, in conclusion, that some idea of the Egyptian vowel system may be formed by a comparison with unpointed Hebrew.)

LABIALS.

While approaching *ph* or *f*, 𓆑 is distinct, for the Copts who adopted ⲫ as necessary for the aspirated *p* of the Memphitic dialect, also considered the 𓆑 needful, of which their ϥ is the demotic sign in a modified form. In some words 𓆑 is employed as a variant of *u*. On account of this function it has been transcribed by *u* instead of *f*. In consequence of this use it was sometimes omitted: thus 𓊃𓈖𓏭𓌙, *sni*, for 𓊃𓈖𓆑𓌙, *snef*, "blood," Coptic ⲥⲛⲟϥ. (M. de Rougé calls this letter, so used, a vowel or variant of *u*, and in the example just cited characterizes it as a short vowel, but it seems more analogous to ו after a vowel, when not quiescent, in the present or ordinary Hebrew pronunciation.) In Greek words 𓆑 does not render φ, the Egyptians used either 𓊪, *p*, or the combination 𓊪𓉔, *ph*. But in the transcription of Semitic words we sometimes find 𓆑 for פ. In Coptic, besides ϥ, this letter sometimes becomes ⲫ and ⲃ.

Like the Hebrew ב the Egyptian *b* comprised the two shades of sound בּ *b* and ב (*bh* or) *v*, at least in the less ancient periods. The Copts seem also to have known the two sounds, though their one ⲃ has been generally transcribed by *v*. The transcriptions of the Greeks do not aid us, for their β was probably sounded *v*. The evidence of the Semitic words is perhaps more precise in the system of transcription of the (hieratic) papyri of the Nineteenth Dynasty. בּ, *b*, is rendered either by *p* or by the group 𓃀𓅮, *bp*; ב (*bh*) by 𓃀 alone: the ordinary sound of *b* should therefore approach *v*. In the hieroglyphics they were often content with 𓅡, *b*, homophone of 𓃀, for בּ. (The weight of this reasoning partly depends upon the antiquity of the Masoretic punctuation, which is, however, supported by the double rendering of the Egyptians.)

The compound *bp*, introduced for Semitic words, is found later employed in hieratic for Egyptian words, no doubt to characterize the pronunciation *b*, בּ, better than by 𓅡 alone, or the group 𓃀𓅡, which serves as its variant in these same words. The signs 𓃀 and 𓅡 sometimes interchange; oftener 𓃀𓅡 replaces 𓅡 alone; they also exchange, but rarely, with *p* and *f*. The ancient *b* produced regularly the Coptic ⲃ, and by affinity ⲟⲩ, ⲡ, ⲫ, ϥ, and ⲙ.

The two signs of *p*, 𓊪 and 𓅮, are complete homophones. The Memphitic dialect aspirated *p*, and used ⲫ in many words where the Sahidic used ⲡ. Here the Sahidic has been more faithful to the ancient pronunciation: in fact φ Greek was sometimes rendered by the group 𓊪𓉔, *ph*, and the Hebrew פ by 𓆑, *f*. This ancient Egyptian letter was then *p*; it also corresponds exactly to פּ. It was further used to transcribe approximately בּ, as already remarked.

It produced regularly in Coptic the Sahidic ⲡ and the Memphitic ⲫ. Affinities occasionally introduced ϥ or ⲃ. The ancient *p* also presents some instances of varying with *b*.

PALATALS.

This class of letters lends itself to great varieties of pronunciation which render them difficult to understand; it is in their nature to modify themselves considerably by the simple change of the vowel which follows them. The Greek and Roman transcriptions would lead us to consider the four signs ⊿, ⊂⊃, ⊔, and Δ as perfect homophones. But we are led to another opinion, if we consider the transcriptions of Semitic words, and the Coptic derived words.

The Semitic transcriptions afford the following results: 1, ג and (ע answering to) غ (*gh*) are almost always rendered by Δ; 2, כ corresponds to ⊂⊃, and ק to ⊿; but this second rule is not so faithfully observed as the first.

In the Coptic language there are here two distinct types: 1, ⲕ Sahidic, aspirated as ϫ in the Memphitic; 2, ϭ Sahidic corresponding to ϫ Memphitic, but sometimes identical.

Taking the Copts as guides we distinguish two palatals, which we mark as *k* and *ḳ*. ⲅ did not exist in their writing, but in some rare cases which do not correspond to a special ancient letter: in a small number of words where it is derived from ⊂⊃, *k*, it is produced by the presence of the nasal which precedes; thus ⲁⲛⲅ, I, from 𓇋𓈖𓎡.

In studying more closely the three signs ⊿, ⊂⊃, ⊔, we are easily convinced of the perfect homophony of ⊔ with ⊂⊃. The equality of ⊿ and ⊔ may seem more doubtful; variants exist, but they are not frequent. However, we find the group ⊿⊔, where the first letter only doubles the second, as we have seen in the group 𓃀𓅡, and we are thus authorized to connect intimately ⊿, ⊔, and ⊂⊃, and transcribe them by *k*.

To this articulation correspond regularly, in Coptic, ⲕ Sahidic and ϫ Memphitic, ϭ and ϫ less frequently, ϧ and ϩ as rare exceptions.

The rule of derivation is different in what concerns Δ, and it is there above all that we recognize the distinct type preserved in the Coptic ϭ. The sign Δ, which we transcribe *ḳ*, shows some ancient cases of variants with the preceding signs, and the Greek transcriptions do not give us sufficient reasons for making a distinction. The Semitic transcriptions are more decisive; the Δ, as already noticed, is quite specially set apart to render ג, and ע answering to غ. The Coptic derived forms strengthen this first result; they quite regularly class themselves under the Sahidic ϭ, answering to the Memphitic ϫ, or under the ϭ in both dialects. The exceptions are as follows, in order of frequency:—1, ϭ Sahidic, ⲕ Memphitic; 2, ⲕ Sahidic, ϫ Memphitic; 3, ⲕ in both dialects; 4, ϫ Sahidic, ϭ Memphitic.

The graphic origin of the Coptic ϭ is doubtful. It is incorrect in our judgment to derive it, as hitherto, from the demotic, coming from, hieratic of 𓎡: the suffix of the second person ⲕ has been rendered as far as the latest periods, almost contemporary with the Coptic, by this demotic sign; consequently we ought to find it in Coptic under the form ϭ if this letter came from that sign; on the contrary, ⲕ is used for this pronoun. ϭ may have come from the demotic form of 𓎼, through the hieratic.

DENTALS.

The exact appreciation of the Egyptian dentals is hard. It seems certain that the three homophones ⊐, 𓏏, 𓍘, answer to a *t*, and that 𓍿, 𓆓, are represented in Coptic by the special articulation ϫ. The sign 𓂧 seems to have the character of an intermediate shade of sound. In the Greek and Roman names, τ, θ, and δ are transcribed by all the signs without distinction (the Roman being transcribed through Greek forms). In the Semitic transcriptions ת and ט are rendered by ⊐, 𓏏, 𓍘, and more rarely 𓂧; ד is transcribed by 𓂧 with a marked preference, ז and צ answer exclusively to 𓍿 and its homophones (including a later sign).

The Coptic offers two certain types, ⲧ, becoming ⲑ Memphitic, and ϫ; the trace of a third variety seems also preserved in the syllabic ϯ. We are thus led to distinguish three consonants *t*, *ṭ*, and *t'*.

The three signs ⊐, 𓏏, 𓍘, *t*, conduct themselves as perfect homophones. The Greek and Roman names shew them to be used for τ, θ, δ; but the hierogrammats when they sought a more scrupulous transcription of θ used the group 𓏏𓉔, *th* (cf. 𓊪𓉔, *ph*), which shews that originally the Egyptian *t* did not lend itself to the aspirated sound. The Leyden MS. with Greek transcriptions thus places θαν in correspondence to an Egyptian word, written 𓏏𓄿𓉔𓄿𓈖 *Tahan*, in which the first *a* is a "mater lectionis," of no value in pronunciation. In Semitic words ⊐, 𓏏, 𓍘, served to transcribe regularly ת and ט, sometimes also ד, but more rarely.

We [illegible] no preference for transcriptions of ט; this letter, which is not frequently found, corresponds even to 𓂧, *ṭ*, in the name of Potiphar. We may conclude that the special sound of the ט had no existence in old Egyptian. The Coptic derived forms have but one type ⲧ for ⊐ and its homophones; the Memphitic aspiration changes it to ⲑ; following the rules of affinity we find some cases of derivation with ϫ.

We pass at once to the third dental, *t'*, of which the differential characteristics are more marked; perhaps the intermediate consonant may be more easily defined afterwards. The two signs, 𓍿, 𓆓, which we transcribe *t'*, interchange in many Egyptian words; they are both varied with the very common syllabic, *t'a*, which became an alphabetic sign though retaining its vowel, like [illegible] they act in [illegible] in the transcriptions and in the Coptic derived words. The [illegible] but very rarely, [illegible] the Greek τ and δ and the [illegible] by Sesonchis, and *Har* [illegible] by [illegible].

In the cartouche of Cambyses the Persian articulation *z*, *j* of Kambujiya, [illegible], is found; it is transcribed by 𓆓, *t'*, but not constantly [illegible] a simple *t* 𓏏. Therefore there was not a [illegible] between the Egyptian *t'* and the Persian *z*. The [illegible] cerebrals, ז and צ, they are constantly transcribed by 𓍿, *t'*, and its homophones and not by *t*; but we do not remark a preference in favour of the [illegible] the Semitic letters [illegible] shews that there was but approximative correspondence.

The Coptic derived forms from the ancient *t'* are classed according to two rules:—they are written either (1) with ϫ in the two dialects, or (2) with ϫ Sahidic, corresponding to ϭ Memphitic,—the dialect of Upper Egypt shewing a higher exactness. The exceptions shew us—1, ⲧ Sahidic, ⲑ Memphitic; 2, ϭ Sahidic, ϫ Memphitic; 3, ϣ; 4, the palatals; *i.e.*, all the letters which shew a kind of affinity with this dental, of which we cannot now fix the pronunciation beyond saying that it approached the sibilants and the cerebrals. The Copts preserved it in ϫ, which comes from the hieroglyphic 𓆓, through the hieratic, becoming in demotic: this was developed and made regular by the Copts. The Copts cannot now give precise information as to the pronunciation of ϫ; in the last century, an attempt was made to indicate it by *sj*. Dr. Brugsch proposes for the ancient letter *z*, and Dr Birch *j*; it seems to us that the conventional *t'* is more suitable to the Egyptian variants of the articulation, which constantly make it approach 𓂧, *ṭ*.

In the eyes of the ancient Egyptians the letter 𓂧, *ṭ*, was a near neighbour of 𓍿, *t'*; it could even be considered as a homophone if we had only the evidence of the variants; for variants between 𓍿 and 𓂧 are numerous, and found in the earliest texts. The variants between 𓂧 and ⊐, 𓏏, 𓍘, are rare enough, and belong above all to the late periods. But the Semitic transcriptions indicate the principle of a distinction. Far from using it to render ז and צ, 𓂧 is connected with ד with a very marked preference. From the Nineteenth Dynasty, when the system of these transcriptions appears to have been made regular, on account of the many relations established with the neighbouring nations by conquests and emigrations (into Egypt), this preference became so constant that it led Dr Brugsch to transcribe 𓂧 by a *d*.

The exceptions to this rule place the 𓂧 beside ט and ת, rather than the cerebrals.

In Coptic the derivatives of 𓂧, *ṭ*, do not act like those of ancient words usually written with *t'*. We find the derivatives of 𓂧 regularly under the dentals ⲧ, ⲑ, ϯ, sometimes also under ϫ, but in very small number. The verb *ṭu*, "to give," ordinarily written 𓂞, becomes in Coptic ϯ. This sign, which the earlier Copts pronounced *di*, was considered a simple ligature for ⲧ and ⲓ. But Dr. Brugsch has remarked that ϯ resembles the demotic, corresponding to 𓂞, "to give," too much for the likeness to be due to chance; there was here a recollection of the softened sound peculiar to 𓂧, and the Copts took the ϯ from demotic with their other special letters.

Evidently these two groups of documents may induce us to mark the 𓂧 as a special letter, but this letter could not be a *d*. In fact, the Copts excluded ⲇ from their native words, and the hierogrammats indicated that the 𓂧 was not a true *d*: when they would transcribe more exactly the Latin *d*, which they found in foreign names, they employed a double letter, *nt*. We notice this in variants of the cartouche of Darius for the Persian *d*, and for the Latin *d* in the surname [illegible], [illegible], for Dacicus, inserted in the cartouche of Trajan. This wholly artificial orthography aids us to appreciate a peculiarity of the Egyptian dentals, that after the nasal the pronunciation inclined in the direction of *d*. This explains many Greek transcriptions which shew the δ, as Ζωνδερης, which represents [illegible]. The *d* being out of the question we select *ṭ* as near the point of view of the Egyptian variants where 𓂧 replaces 𓍿.

LIQUIDS.

The three signs 𓅓, 𓐝, and 𓌳 exactly answer to *m*; the transcriptions are uniform, always μ Greek and מ Semitic.

The Coptic derived forms are almost always ⲙ, with rare exceptions presenting ⲛ, ⲃ, ⲡ. One must be very careful in Coptic not to confound a radical ⲙ with that which comes from ⲛ by assimilation before a labial, as in the Sahidic particle ϩⲙ, coming from ϩⲛ, "in," before the article ⲡ. It is also to be remarked

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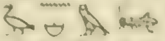
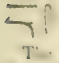
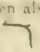
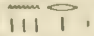
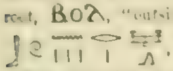
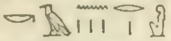
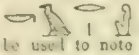
[1] [illegible] the Greek [illegible] Sahidic [illegible] from the other but by the absence of the [illegible] *n*, and [illegible] *t*.

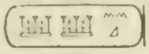
that we often find in Coptic the ⲙ added to the ancient root as a sort of final, which scarcely modifies its signification: thus, ⲟⲩⲱϩ, "to add," ⲟⲩⲱϩⲙ, "to repeat;" ⲥⲱⲣ, "to strew," ⲥⲱⲣⲙ̄, "to wander," &c. (cf. also the Hebrew ם added to the root). This peculiarity has not yet been noticed in the ancient language.

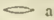
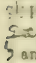
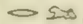
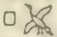
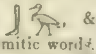
N was regularly transcribed ν and נ: an undoubted exception shews the change of ל into n in the word  [illegible], "[illegible]," [illegible]. The example justifies us in searching for ל under the transcription n, which is more easily explained as the ancient Egyptians originally had not any sign to express the articulation l.

The Coptic ⲛ transcribes the ancient n, but in course of time the liquid ⲗ having [illegible] by softening in the pronunciation, a part of the Coptic words in which it figures derive it from the ancient n; thus, , *nes*, "tongue," became ⲗⲁⲥ.

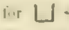
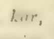
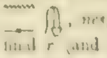
The nasal presents many peculiarities worthy of remark in the Egyptian writing and language. It influenced certain consonants, in the direction of modifying the pronunciation; thus it softened *t*, as in the group *nt* for writing *d*. The *s*, preceded by a nasal seems to have been also analogously modified; for the Greeks transcribed the particle , *nes*, which begins certain proper names, by ζ, as we have seen in *Ζβενδετης*. The similar action of *n* on *k*, which was thus modified enough for the Sahidic dialect to have sometimes rendered it by ⲅ, has been previously observed. *N*, as already remarked, sometimes became *l*, the Coptic ⲗ; the combination *nr* must have more frequently given occasion to the pronunciation *l* through the softening of *r*, *nr* is often written , where represents a sounding *n*. The group , which has the value *na*, is a syllabic: the *a* is of no force in the pronunciation. In illustration of the modification of *nr* (where the *n* was originally sounding), the Coptic root, ⲃⲟⲗ, "outside," may be cited; it comes from the Egyptian , *bunar*, of the same sense.

The Egyptian grammarians evidently considered the nasal a simple accident of the vowel, to be indicated or omitted at will in writing; thus the same person's name is written  *kanra*, and , *kāra*. In such cases a bar above the vowel may be used to note the omission of the nasal. Thus the particle may be transcribed *ā*, when we find it written under the form , which it would be difficult to recognize without this note in transcription. The examples of this curious peculiarity are frequent; it is a grammatical view analogous to the "anusvara" of the Indians; it is known that the omission of the nasal has also been remarked in the ancient monuments of classical epigraphy.

The Egyptians used very readily the nasalized vowel; they sometimes introduced it into Semitic words which they adopted, or even only transcribed: thus they wrote , *Šašank*, the name of the king called in the Bible שִׁישַׁק, *Šišaq*, a name apparently of Semitic origin. (Here the nasal helps to express the sound of the Hebrew ק.)

The Coptic possesses the two letters ⲣ and ⲗ; it is difficult to ascertain if the ancient dialects of the Egyptian language knew the distinction of these two liquids, but it is certain that the hieroglyphics admitted but one type, represented by the signs  and , which serves indifferently to transcribe ρ and λ Greek, and ל and ר; only at certain times we remark a preference given to the lioness for transcribing *l*, but without regularity, and it is not until the last stage of demotic writing that the letter derived from this sign seems to attach itself regularly to the liquid *l*. In Egyptian words is rare; it is sometimes joined to , as a doubled letter , like the groups , , &c. It is frequently employed in the transcription of Semitic words. In the Bible the Egyptian liquid is rendered by ר in all the words given, never by ל: thus the ancient articulation was *r*.

The Coptic derived forms are divided between ⲣ and ⲗ.—See also above for the combination *nr*.—The Bashmuric dialect is characterized above all by the exclusion of ⲣ (and use of ⲗ in its stead, from the influence of Arabic.)

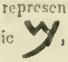
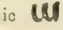
This liquid approached the semi-vowels in its nature; hence it was sometimes permissible to omit it in writing, like the nasal: thus , *ka*, for , *kar*, , *nes*, for , *neter*, "flame." By a frequent exception final *r* (and *l* in Bashmuric) is obliterated in Coptic words, thus the particle , *er*, has become ⲉ.

SIBILANT.

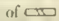
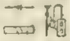
The two signs for *s* are homophones. The Greek transcriptions have always σ, and the Semitic render *s* by ס or שׂ, an exception which is common enough makes the Egyptian *s* equivalent to שׁ, but probably this is only apparent. We know how easily the pronunciation varies between ס and שׁ in the Semitic languages. The celebrated story of the word shibboleth שִׁבֹּלֶת (Judges xii. 6) shews that even among the Hebrews the pronunciation varied according to the tribes. The pronunciation of Ephraim, which doubtless followed that of the different peoples situate north of Palestine, shews why we find sometimes an Egyptian *s* in relation to שׁ Hebrew, particularly in the names of Syrian towns or nations. (This should be qualified, for Ephraim was in middle rather than northern Palestine, and it is possible that שׁ was always anciently *sh*.) The Coptic derivatives of the Egyptian *s* fall under ⲥ, but there are many exceptions to this rule, the ancient *s* sometimes becoming ϣ, and more rarely ϭ; it seems to have passed into ⲧ in some roots. We also find the sibilant written in Coptic MSS. by ⲍ; but the instances are so few as to be unauthoritative. It has been already remarked that ζ was used by the Alexandrian Greeks to transcribe the combination *ns*.

HUSHING LETTER (*Chuintante*).

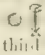
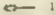
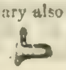
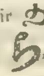
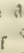
(The term M. de Rougé uses is important as distinguishing this letter from the sibilant. We can only suggest the English "hushing" as here equivalent.)

The letter *š* (*ch*, French) having no representative in the Greek alphabet, the Copts preserved the demotic , regularized as ϣ: it comes from the hieratic  hieroglyphic . The Greeks ordinarily rendered *š* by σ, sometimes by χ and σχ. The exact sound of *š* is found in Persian and the Semitic languages; it is constantly rendered by in the names of Persian kings; we also find in the cartouches of Darius and Artaxerxes. For the Hebrew שׁ we find equally a little oftener than .

The Coptic derivatives are very regular; they use ϣ; some exceptions shew the ancient *š* passing into ϫ, ϭ, and rarely ϩ, and ϧ.

The transcriptions and derivations shew us that from a very ancient time and were homophones; but perhaps we cannot affirm that it was so from the origin of Egyptian writing. Dr. Hincks conjectured that had the value of σχ. This idea rests on—(1) the fact that presents a certain number of variants with , χ; (2) that it seems to double itself with an initial *s*, without change of value, so that we sometimes find instead of  alone. On the other hand, there has not yet been noted a variant between and . It is then possible that primitively marked some intermediate shade of sound of which the trace was afterwards lost in pronunciation. Perhaps we may attribute to this oscillation the most ancient orthography of *sexa*, "to write," Coptic ⲥϧⲁⲓ, which in the earliest times was written . The sign in question must, however, be classed as homophonous with

ASPIRATED GUTTURAL.

The aspirated guttural, here rendered by the Greek χ, is represented in the alphabet by and . These letters sometimes interchange, and are found grouped as a double letter , a reduplication analogous to those noted above.  is a third homophone, of a little rarer use but very old. The Greek transcribed the aspirated guttural by χ; this was but an approximate value, for the Copts who adopted the ⲭ for the aspiration of ⲕ in the Memphitic dialect, judged it necessary also to take their ϧ from the demotic alphabet, in which the  represented , hieratic of . It was used side by side with χ and in the same dialect. The Copts noted carefully shades of sound which appear to us very near.

The cartouches of the Persian kings render the Persian *Kh* by 𓄡 and by 𓐍; these two signs answer to ח of Hebrew words, but we must here draw a distinction. We know that the ח comprises two shades of sound which Arabic distinguishes by ح, خ; the hieroglyphic transcriptions establish the antiquity of this distinction in the pronunciation, for they render the ח sometimes by 𓐍 or 𓄡, the Egyptian χ, and sometimes by 𓎛, *ḥ*, as will be shewn later.

The Coptic derivatives of the ancient χ are of two classes. In the first the Memphitic dialect faithfully observes the ancient orthography, preserving the ϧ; we find in the same words a Sahidic ϩ. In a second class of words the ancient χ is softened, and we find a ϣ in the two dialects. The exceptions, conforming to the laws of affinity, are the Memphitic ϫ, the ϭ, and the ⲕ.

ASPIRATES.

The Copts borrowed but one aspirate, ϩ, from the demotic alphabet. The Semitic transcriptions indicate, however, two shades of sound at least as marked as those which are found in French in the letter *h*. The Greeks who had lost the habit of writing the aspiration H of their own alphabet, equally omitted it in most cases, but note Ὧρος (as well as Ὧρος for *ḥar*) to transcribe the Egyptian *h*, at least when they had no occasion to indicate it by an aspirated letter, as φῆβις for *p-hb*, "the ibis." As to the hierogrammats they sometimes used their *h*, 𓉔, to indicate the breathing at the beginning of Greek words which they transcribed, or in seeking to render aspirated letters by the combination *ph*, 𓊪𓉔, *th*, 𓏏𓉔, for φ, θ.

The Hebrew ח, as already stated, answered to two shades of sound; these also existed in Egyptian, so that the Semitic transcriptions take the following progressive order. 1, ה = 𓉔, *h*; 2, ח, ح = 𓎛, *ḥ*, 3, ח, خ = 𓐍, χ. It is therefore needful to distinguish these two aspirates in the point of view of the transcription of foreign Semitic words, for they have a considerable importance for the determination of these words. The distinction of 𓉔, *h*, and 𓎛, *ḥ*, the latter being a strengthened aspirate, would be less useful for Coptic, for this distinction had been lost, the Copts having taken from the demotic the sign of the strong aspirate ϩ, coming from 𓎛, hieratic , demotic .

The Coptic derivatives have almost all preserved faithfully the ϩ in the two dialects. The exceptions are rare; they introduce the Memphitic ϧ, the ϣ, and the ⲕ. It is also possible for the aspiration to be obliterated and the Coptic to present an initial vowel. The rare variants which may be remarked in the Egyptian texts between the aspirates and the other letters are limited to χ or to the initial vowels.

SYLLABIC SIGNS.

An ideographic sign could be employed in four different ways. Of this the sign 𓋹, the symbol of "life," may be taken as an illustration.

1. It could be used alone, 𓋹, to indicate the idea of "life" and the different words conveying this idea ("life," "to live," "living").

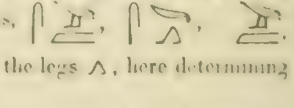
2. The same sign could be written after the phonetic expression of one of the words signifying life, thus 𓂝𓈖𓐍𓋹, *ānχ*, Coptic ⲱⲛϧ, "life." Here the sign takes no part in the pronunciation; it simply determines the idea which we should attach to the word *ānχ* preceding it: in this use it is called, following Champollion, a determinative.

3. The same sign could be accompanied by all or by a part of the letters used to write the word *ānχ*: the letters thus used have been termed phonetic complements; their choice (as to number) is ordinarily ruled by the necessities of design, in which the squareness of the group was much considered. Thus we find ordinarily 𓋹𓈖𓐍, with the second and third complement; but 𓂝𓋹𓈖𓐍 and 𓂝𓋹𓐍 would be equally in accord with rules. A group of this kind is said to be written in the mixed manner.

4. The same sign, once attached to a word such as *ānχ*, could be used in writing for the phonetic value of this word with a complete loss of the primitive sense. This is exactly a rebus in principle. Thus, 𓋹𓂈𓂈, *ānχ*, "ear;" 𓋹, "oath," Coptic, ⲁⲛⲁϣ. A determinative often indicates to the reader, as in the first example, this radical change in the use of the sign. In this case the sign is said to be employed as a syllabic. (The Assyro-Babylonian syllabary is remarkable as affording a double system of this kind, arising from the original Akkadian sounds of a sign and the later Assyro-Babylonian ones. The difference is in the extensive polyphony of this syllabary.)

Probably in principle all hieroglyphics were susceptible of use as syllabics; but in fact, it was necessary for this—1, that a symbol should represent a word composed of a simple syllable, and, 2, that we should find this syllable in different words. The list of the most usual syllabics of known value, in the Pharaonic period, amounts to considerably over three hundred.

It is therefore not enough to have established the fact that a certain syllable corresponds in reading to a symbol, for us to consider the symbol as being properly a syllabic. We must also have found it sometimes more or less turned from its ideographic value and corresponding to a simple sound, to write which it takes the place of the letters of the alphabet. Thus the essential character of the syllabic is the abstraction made of the ideographic value for its use as a sound pure and simple. It is only as syllabics and determinatives that the ideographs belong to grammar. Those that do not play these parts have their proper place in the dictionary.

Syllabics, as well as ideographs, can be written alone or with phonetic complements in the mixed manner; the choice (and arrangement) of the complements depended on the needs of the designer. Thus we find 𓇏, *sm*, grouped thus,  &c., the legs 𓂻, here determining movement.

The second phonetic complement is found frequently; the first is more rare, and there are syllabics for which it has not yet been discovered. The writer seems to have had full liberty in this matter. From these facts it is evident that we cannot retain Champollion's term, "initial signs," nor adopt Lepsius's division, in his *Lettre à Rosellini*, into "initial signs" and signs intended for the middle of a group. Bunsen's division into syllabic signs and mixed signs is equally untenable.

A sign could wholly lose its ideographic value, although written as a determinative. Thus the word 𓏏𓂋𓆳, *tar*, determined by a shoot(?) of palm, signified "season," "time;" but to write the syllable *tar*, in another word, as *ḥtar*, "horses," it was not necessary to drop the determinative 𓆳, and the whole group 𓏏𓂋𓆳, *tar*, could be retained; thus 𓎛𓏏𓂋𓆳𓃗, *ḥtr*, Coptic ϩⲧⲟ, "horse." This peculiarity may embarrass the interpreter, particularly in texts carelessly written, where the determinative of the idea is often omitted or incorrectly given. (Mr le Page Renouf distinguishes this use of the determinative by the term determinative of sound from the ordinary use as determinative of sense.)

Syllabics are divided into two classes:—1. an articulation and one or more vowels; 2. two articulations usually with a medial helping vowel or vague vowel. All are to be classed as syllables, although a syllabic [illegible] has the appearance of a [illegible] here, either the [illegible] has been lost, or the [illegible] with a long vowel.)

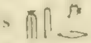
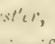
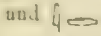
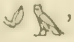
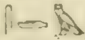
The first class of syllabics, an articulation and a vague vowel, is scarcely distinguishable from the letters of the alphabet. The distinction is thus determined: 1. the simple letters were used as phonetic complements; 2. the syllabics do not seem to have been used quite indifferently for all kinds of words. We frequently find also [illegible] or remote, which have originally induced [illegible] the purpose of writing a later than radical. (This is strictly analogous to the principle of the syllabary of Assyro-Babylonian in its Akkadian and Semitic developments, though in its application that principle led to more polyphony in consequence of an ideograph taking different sounds according to the cognate senses in which it was used.)

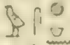
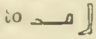
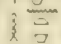
It is also possible that the syllabics were sometimes employed to give an idea of the sound of the vowels. But if they had this use primitively, they did not retain it, for we cannot establish this property in a constant manner in the hieroglyphic transcriptions of Greek or Semitic words. (It is indeed the converse use of the vowel not affected by a consonant or of the syllabic with its vowel which is our chief embarrassment in the reading of Semitic transcriptions.)

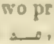
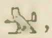
There were also some signs corresponding to three articulations which could be used as syllabics. Here the cases of homophony are much more rare; we have to do with different acceptations rather than different radicals, but the ideal bond between these different acceptations may escape us now. (These are still monosyllables.)

POLYPHONY.

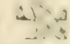
There are characters which had various pronunciations. There are three kinds of polyphones:—

1. A sign can answer to various words which belong to the same class of ideas; thus, the calf's ear, , answers to the words , *mest'er*, , *ānkh*, and , *at*, which seem to have all signified the ear or some special part of this organ. The words , *sem*, and , *setem*, "to hear," are two new values, on the same principle. One might add to this first class the very near values produced by variants of pronunciation or writing for the same word, such as *ṭa*, *taa*, *ṭa*, *at*, *aat*, *aat*, *aatu* for , and the forms more or less developed of a single root, but these are rather extensions of a word than true instances of polyphony.

2. The same sign might have been chosen as symbol of a certain number of ideas without any true bond between them, at least to our view: thus answers to the phonetic , *usex*, "largeness," to , *āb*, "offering," and , *ḥent*, "regent" (fem.)

3. A sign may have become syllabic and be used for several purely phonetic values taken from the words in which it figures, on the two principles explained. Thus in the syllabary, the sign , which symbolizes the idea "gift," answers to two roots, *ṭu* and *mā*; these give in their turn to the values , *ṭu*, and , *mā*, even in words where the idea of gift no longer exists.

Such is the series of facts which has produced Egyptian polyphony. The number of figures suitable to design and with which one could reasonably charge the memory being limited, we should expect to find polyphony more or less developed in every system of writing originally ideographic. The syllabic polyphony of Assyrian seems to have been produced by wholly analogous circumstances, though the change from the original language habitually veils the connection of values.

Polyphony is a source of great difficulty, and science has still much to do to fix the different phonetic values of the polyphones. Often our decision is made on the evidence of phonetic complements, and in hieratic it is seldom that this aid is wholly omitted. Thus  is easily recognized as *mā*. But our ignorance is not always thus aided, and the choice of the suitable word sometimes can only be indicated by a profound study of analogous texts.

The following list gives an abridgment of De Rougé's lists of syllabics and contains the most common signs, the important polyphones being indicated by asterisks, and their principal varieties of sound being given in the fourth column. The method is varied from that of the *Chrestomathie*.

TABLE OF THE MOST COMMON SYLLABIC SIGNS.

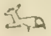
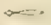
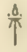
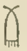
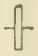
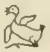
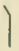
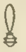
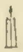
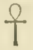
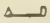
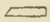
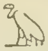
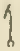
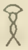
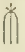
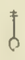
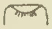
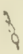
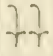
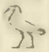
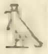
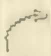
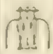
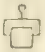
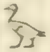
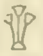
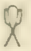
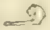
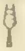
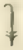
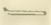
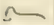
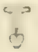
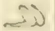
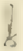
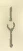
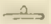
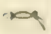
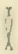
SIGN.		SOUND		SIGN.		SOUND.	
ʾ 1*		*aā*	*uu*	K 1*		*ka*	*kạ*
2		*ȧa*		K 1*		*ḳạ*	*kĕt*
3		*ạb*, *ub*		T 1		*tạ*	
4		*ab*		2		*tu*	
5		*ap*		3		*tĕp*	
6*		*at*	*sĕm, sĕt, sĕṭ*	Ṭ 1		*ṭĕb*	
7		*am*		T' 1		*t'ạ*	
8		*am*		2		*t'er*	
9*		*ā*	*kạ, kĕm, ḳĕm, nĕḥ*	M 1		*mạ*	
10		*an, āa*		2*		*mā*	
11		*ānχ*		3*		*mā*	*ṭu*
12		*as*		4		*mā*	
U 1		*ua*		5*		*mā*	*nĕḥ*
2		*uat*		6*		*mĕt*	*kạ, bāh*
3		*un*		7		*mĕn*	
4		*ur*		8		*mer*	
5		*uạs*	*sĕm*	9		*mĕr*	
6		*uạḥ*		10		*mĕs*	
F 1		*fu*		11		*mĕḥ*	
B 1		*bu*		N 1		*nạ*	
P 1		*pĕr*		2*		*nu*	*nĕ*[illegible]
2*		*pĕḥ*	*kĕt*	3		*nĕfĕr*	
				4		*nĕb*	
				5		*nĕb*	
				6		*nĕm*	
				7		*num*	

Table of the Most Common Syllabic Signs.—*continued.*

SIGN.		SOUND.		SIGN.		SOUND.	
8		*năn*		3		*šĕn*	
9*		*nĕn*	*na, an, χĕm*	χ 1		*χa*	
10*		*nas*	*tep*	2		*χu*	
11		*nĕh*		3		*χĕt*	
r 1		*rĕt* *rut, rut*		4		*χĕa*	
2		*ru*		5*		*χĕnt*	*fĕnt*
s 1		*sa*		6		*χĕr*	
2		*sa*		7*		*χĕr*	*hip*
3		*sa*		h 1		*ha*	
4		*sa*		2		*hā*	
5		*saa*		3		*hi*	
6		*su*		4		*hu*	
7*		*sĕb*	*ṭau*	5		*hu*	
8		*sĕtĕp*		6		*hĕt*	
9		*sĕm*		7*		*hĕk*	*pĕh*
10		*sĕu*		8		*hĕt, hĕn,* *hĕt*	
11		*sĕn*		9		*hĕtĕp*	
š 1		*ši*		10*		*hĕn*	*pĕh*
2		*šet*		11		*hĕr*	
				12		*hĕs*	

Determinatives.

Champollion described as determinatives certain ideographic signs which were placed after words phonetically expressed. The use of each of these signs is more or less extended. The greater part are used for one radical, or at least for one and the same idea. For such determinatives the proper place is the dictionary. But there is a class of determinatives placed after different words, often many in number, and therefore called generic determinatives. The determinative is attached to the radical, and has nothing to do with the grammatical use of a word as noun or verb. (M. de Rougé gives a list of above a hundred as necessary for the student of Egyptian grammar, leaving out those of more restricted use.) Science has not yet wholly accomplished its task in this section. (Necessarily the exact definition of the range of a determinative requires a careful induction from its use.)

The table, which [illegible] but slightly abridged from M. de Rougé, [illegible] in his *Chrestomathie Égyptienne*, [illegible] The [illegible] of determinatives than of syllabic signs [illegible] of the determinatives [illegible] arranged by M. de Rougé [illegible] a key to the whole construction of the Egyptian [illegible] signs, and affords a remarkable insight into [illegible]

Table of Generic Determinative Signs.

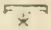
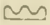
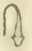
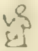
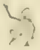
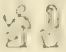
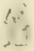
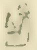
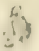
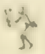
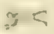
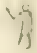
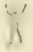
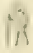
SIGN.		VARIANTS.	REPRESENTING	DETERMINING IDEAS.
1			ceiling	sky, ceiling; to raise, superiority
2			ceiling with star	night, obscurity
3			sun	sun, light; divisions of time
4			star	star, constellations, gods, divisions of time
5			hilly country	country, mountains, nations
6			oval	islands, oases, maritime countries
7			?	cities, villages
8			country divided	nomes, districts, fields
8a			same?	territories and their portions, dikes, mud
9			waves	water, liquid, seas, rivers, to wash, freshness; level
10			flaming censer	fire, heat; zeal
11		|	man (squatting)	proper names; pronouns and participles
12			man acting	more general, often used in Saitic period for the more special determinatives following the text
13			man and woman	human race its divisions, classes, participles pl.
14		Varied by many attributes	man with long beard	gods, august persons, kings
15			personage on throne holding whip	ancestors, princes, kings
16			similar, kneeling	same, defunct persons [illegible]
17			man squatting, his hand to his mouth	actions of the mouth, eating, speech, thought
18			man raising hands	adoration, invocation, prayer
19		[illegible] of prisoner	man bound	enemies, prisoners, perverse
20			[illegible]	impiety, perversity; [illegible]
21			man, slain	enemies, to strike, death, massacre
22			man his right hand raised	exclamation, invocation
23		(seated)	man, arms raised	height, grandeur, joy
24			man [illegible]	chief, great, distinguished

Table of Generic Determinative Signs—continued.

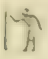
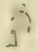
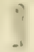
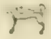
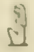
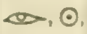
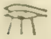
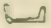
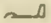
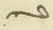
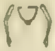
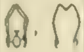
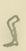
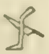
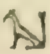
SIGN		VARIANTS	REPRESENTING	DETERMINING IDEAS
25			[illegible] leaning on staff	old age, to lead
26		(striking, holding ear)	man holding club (? [illegible])	force in general, violence
27			child, hand to mouth	infancy, youth, to suckle, [illegible]
28		[illegible]	mummy	[illegible] statues, images, types, forms
29			funeral couch, without or with mummy	[illegible] to lie down, rest
30		varied by many attributes	woman squatting	woman, goddess; fem. pronouns and participles
31			head of man in profile	head; superiority
32			curl	hair; black, colours in general, grief, turns
33			human eye iris, pupil	to see, to awake, to know, enemy
34			eye weeping	tears, grief
35			nose, calf's head	to breathe, smell; joy, pleasure
36			tooth	eating; speech; hard objects, stones, &c.; regions, directions; everything relating to the earth and fields
37			hand holding small club	all actions implying the use of any force
38			hand, the palm below; foot of bird lying down	arms, shoulders, sides; directions; gentle actions, rest, gentleness, accord, songs
39			a breast and two arms, arms and vase, arms	to embrace, unite; to squeeze, enclose; event, fortune
40			extended arms	negation, prohibition; adytum
41			phallus	male, generation; pollution, to pour out; parts of generation, in front; veins
42			bent leg	leg, foot, knee, &c.; walk; diminution and enlargement; measures of length
43			same and knife	to carry off, leap over, surpass, diminish, annihilate, violate
44			legs walking	locomotion
45			the same reversed	return, send back, repel
46			lion's hind part	behind, to follow; to revolt, [illegible], force, violence
47			**Typhonian animal**	revolt, violence, disorder; tempests, storms

Table of Generic Determinative Signs—continued.

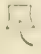
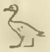
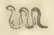
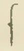
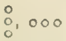
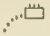
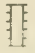
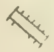
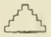
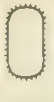
SIGN		VARIANTS	REPRESENTING	DETERMINING IDEAS
48			calf's face, head	nose, nostrils; lungs, to smell, breathe, sleep; pleasure; to separate, shut up, revolt
49			head of ox on support (?)	throat, gullet, lungs, &c.; to eat, breathe
50			piece of skin	quadrupeds; objects in leather
51			bone with flesh ?	members in general
52			Nile duck	birds; flying insects
53			wagtail	smallness; vile, wicked
54		(varied)	wing	wings, feathers; to fly, rise
			egg	egg; oviparous animals; race, descent; feminine
56			crocodile	crocodiles of different kinds, divinities connected therewith; to conceal oneself, to spy; destruction
57			kind of fish	fishes, fishing; impurity, prohibition
58			serpent	reptiles, worms; sacred serpents; names of certain genii
59			kind of tree	trees of all kinds
60			dry branch ?	different kinds of wood; objects made of wood
61			palm-shoot ?	season, year, time; youth; to renew
62			bunch of flowers	plants, flowers; objects composed of plants
63		 (varied according to kind of grain)	grains	cereals of different kinds; to labour, to harvest; measures
64		(varied)	bushel pouring out grain, vase full of grain	cereals of different kinds; harvest; tribute; to measure, bushel
65			ground-plan of room	abodes; places in general
66			rampart	walls, fortifications, enclosures
67			the same, falling	to stagger, crumble, destroy
68			steps	stair, to mount; to approach; foot of a monument
69			fortified enclosure	names of fortified cities (written within the determinative)
70			basin	waters, rivers, seas, canals, basins; to irrigate. cultivate

Table of Generic Determinative Signs—*continued.*

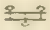
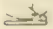
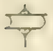
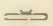
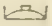
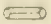
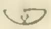
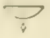
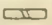
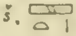
SIGN.		VARIANTS	REPRESENTING	DETERMINING IDEAS.
71			canal, or road	ways, journeys; separation, to chase; times, periods
72			block of stone	stones, bricks, different kinds of rocks; objects in stone; mineral substances
73			boat	ships, boats; navigation; voyages, journeys
74			sail	sails; air; to breathe; freshness, pleasure; winds and their geographical directions
75			roll of papyrus	writings, books; designs, paintings, calculations, quantities, to know, thought, &c.
76			tie of a roll	to write, books; knowledge; to tie, close, finish
77		(varied)	cover of mummy-case; different forms of case	mummy-case, embalming; abode, divers places
78			post	to wander, journey, land; foreign peoples and names; impiety, &c.
79			graver, or plane?	to lessen, polish; ivory, bone; to clean, embalm, &c.
80			knife, or sword	to cut, prick, &c.; kill, beat, separate; whet
81			loaf	bread; victuals; provisions of all kinds; riches
82			basket with diamond-shaped object	festivals; joy, pleasure
83			basket	largeness; victuals and offerings carried in basket
84			vase with cover	oil; wax; perfumes; salt provisions
85		 (especially for wine)	vase, or double vase	perfumes, fats, ointments, wine, liquids in general
86			vase	midst; repose; heart; feelings
87			saltier	crossing, mixture, [illegible]; [illegible]; reflexion; transitive verbs
88			knot or packet	stuffs, dresses; bands, &c.
89			oval band (or seal?)	oval where names of royal personages are written within it (cartouche)
90			ring or circle	renewal, a time; totality; circle

Table of Generic Determinative Signs—*continued.*

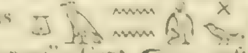
SIGN.		VARIANTS.	REPRESENTING	DETERMINING IDEAS.
91	○ ○ ○	○ (often confused with 92)	rings	metals; precious solids; resins, &c.
92	○ ○ ○	• • •	round grains	sand; powder; flour
93			packet	to envelop, embalm; develop, count
94			same with jet of liquid	smells (good and bad) and odoriferous objects; filth, corruption

The Reading of Ideographic Signs.

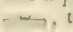
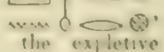
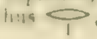
The Egyptians used not only simple letters and syllabic signs, but also ideographs, to write words. The reading of these ideographs is obtained in divers ways. It is often furnished by the analysis of proper names of which there are transcriptions, though the result is sometimes approximative. Another method is the study of variants, when a phonetic form of a word replaces the ideographic sign, in the same text. Often also the ideograph is written as a determinative after the phonetic equivalent. (Hence the great importance of publishing collations of known texts, a work to be recommended to new students.)

When a word is written by a single ideograph, and above all when it is a substantive, it is most commonly distinguished by the marks |, ⌓, or their combinations ⌓|, ⌓⌓. Thus  is the letter š, , šc, the basin.

The Combination of Signs of different kinds in Writing Words.

In texts which shew a certain development, and above all in hieratic manuscripts, where the signs are always more abundant, many words are written phonetically and followed by one or more determinatives. In such a case, the determinative which is most general is written last: thus , *hanen*, "to become weak, feebleness"—Copt. ϭⲛⲟⲛ, soft,—where the phonetic letters are followed by the determinatives for (1) repose, feebleness, (2) crossing, bending, (3) evil, unfortunate. A word expressed by an ideograph may be followed by a generic determinative. (The same is the case when a word is written phonetically with its ideograph as a first determinative, of course special.)

Expletive Signs.

There are a few expletives which were not pronounced, and had a purely graphic use. The most important is the roll , the determinative of writing, knowledge, &c. It is sometimes used as a sign of separation or as disjunctive. The signs ⌓, |, ⌓|, ⌓⌓, are often used as pure expletives, adding nothing to the idea or the sound. | or ⌓ is frequently added to a determinative; it is almost the rule, when the space needs it: as , *men-nefer*, Memphis. In such cases the expletive ordinarily follows the gender of the substantive, | for masc., ⌓ for fem. The phonetic value of ⌓, *t*, as feminine final, sometimes causes perplexity, but its expletive character is clear in other cases. The sign |, which (like ⌓) is not always expletive, has similar uses. It is written after thus , even for final *r*. With it forms the group , not only for the substantive *ḥar*, , "face," but also for the particle *ḥar*, "upon," &c. In hieratic, | is attached to many characters, probably to distinguish them from very similar ones; thus for is clearly distinguished from for . It is thus used as a diacritical sign, though very variably. At the end of words we find, above all in late times, the expletive .

Expletive Vowels and Complements of Simple Letters.

Although the vowels were often omitted, sometimes they are added in a wholly expletive manner, which their vagueness can only aid us to understand. This is easily proved from certain words transcribed, such as θαν, the Egyptian , *tahan*. In any other system the first *a* would produce a separation of syllable between *t* and *h*, transcribed here by θ. (It should be remembered, however, that the Greek could not represent a sound like *t'h* than otherwise than by θ. The Egyptian vowel may here represent a disjunctive.) The same remark applies in the consideration of the Egyptian transcriptions of divers foreign words, of which the grammatical form is well known. Thus the Hebrew מֶרְכָּבָה is written , *mārkabuta*, and the name of the Hebrew harp כִּנּוֹר, is written , *kenaunaur*. It has been remarked that each consonant had a kind of favourite complement, and that this complementary sign should often be treated as an expletive in reading. It has been proposed to admit for these letters inherent vowels, but this idea seems exaggerated: the alphabet is not a syllabary, for most of the letters unite with the different vowels. The knowledge of the ordinary complements of each letter is useful, especially in reference to transcriptions.

, *f*, seems to take \\, but , *fa*; , *fā*; , *fu*, are common. has as favourite final *u*, or indifferently: we also find , *la*; , *bā*; , *bi*; but , *ba*, is rare: *ba* is expressed ordinarily by ; we find , or , equally. thus has as favourite complement.

It is the same with *p*, , which has for complement *u*, , , and we find the syllables , , ; but *pa* was written , or . In the spelling of , which is often found for the article *pi*, the variant , *pai*, introduces the complementary , *a*

For , *k*, we find all the combinations , , , , , but the favourite vowel seems to have been , *a* We observe equally the use of all the vowels after , except, perhaps, , *á*, which we have not remarked. The complementary vowel seems to be , or \\, according to the writers. , *k*, shews a decided preference for , but we also find , , . With , *k*, we observe , , , , but is more frequent; sometimes the expletive | is added, even when is not a substantive.

, *t*, somewhat prefers : it is joined to , , , , or \\. , *t*, takes , , as complementary vowel; but it is not repugnant to any other combination of vowels. ordinarily takes , or , much more rarely and . , *ṭ*, is most often followed by : and are used; some texts shew \\ as expletive of . , *t'*, seems also to be completed by \\. The syllables , , , are not rare but *t'a* is rendered by , the eagle being the favourite complement of : this sign also forms the groups , .

We cannot establish any special complement for *m*; the ordinary syllabic combinations are , , , . The transcriptions shew that is often expletive after . The eagle is more readily attached to , as ; next in frequency is . often takes as expletive |, . It is also combined as , , .

For , *n*, the complementary vowel seems to be , , , are more used than , for this syllable was ordinarily written as final, and by the syllabics , , as initial.

, *r*, is completed by the expletive |, forming the group , hieratic . is the favourite syllabic of ; we also note often , , , but is extremely rare. also often takes the expletive |, hieratic , and is joined to the final vowels without exception.

, *s*, is often completed by expletive: the name of the band seems to have been *set*. \\ is frequent after , but , , , , are used. is found; but syllabic homophones were used more readily for this syllable. In other cases the vowel was suppressed, as = , *sak*. is also completed by , and follows exactly the same rules as . The name of the letter was undoubtedly , *ses*, "bolt."

, *š*, most readily takes , , . prefers , without excluding the others. *χ*, takes \\ as expletive, and we find very often , : , , are more rare, the last syllable being almost always written with , or the group . The eagle is evidently the complement of : thus the syllables , have as ordinary variants , *χai*, *χau*. is ordinarily followed by consonants; its vowel is with the expletive , it is the substantive *χá*.

, *h*, takes as complement; we also find , , in which often causes variants, as in the case of , *χ*. To the harder aspirate, *ḥ*, was rarely added except with the introduction of as , or , *ḥq*. alone united with , , , , its ordinary expletive is . for *ḥ* is rare: we have only found it followed by consonants or the vowel *a*. The syllabic , *ḥe*, much used for *ḥ*, has the expletive .

These remarks are of much use when one desires to fill up *lacunæ* of small extent in Egyptian texts. They explain usages, on which one general remark may be added, that the vowel , *a*, did not unite itself readily to a certain number of letters. Hence the introduction of an intermediate letter and the pleonastic forms , &c. for *pa*, *χe*, &c. (It must also be remembered that on the one hand the expletive vowel cannot in all cases be [illegible] in roots which are always monosyllabic, on the other that [illegible] by its own force. Was it used to modify the consonant as when a broad pronunciation of *q* in English is written by grammarians *qa* or [illegible]? In transcriptions the expletive vowel appears [illegible] must be disregarded and the same is [illegible] of the complementary vowel. In English *q*, our [illegible] *a* as its complementary vowel. Consequently [illegible] the Semitic koph, as in *qoran*, [illegible] and even write [illegible].

On applying these observations to the orthography of *markabuta* for מרכבות and [illegible] for כנור, it is immediately evident that the deviations from the Semitic are due to the Egyptian vowel-system. In the word *markabuta*, the *u* is the favourite complement of the *b*, and the final *t* requires a vowel. In [illegible] the doubled *n* is resolved into two syllables; it could have been written with the disjunctive sign between the two "*n*"s and a final vowel.

It has been shown that the transcriptions of the scribes of the Ramesside age from Semitic into Egyptian were very accurate so far as the consonants were concerned. It is equally evident that this was scarcely possible and probably was not the case with the Semitic vowel-system. This remark should be borne in mind in all comparisons of Hebrew and Semitic.)

THE TRANSCRIPTION OF VOWELS OMITTED.

The vowels, particularly the complementary ones noticed above, were omitted at will in writing, and must often be added in transcription. This is easy when a definite fuller form of a word is known. But there are many words for which the variants give different vowels, and many others for which a vowelled variant has not yet been found. Most Egyptologists here use *e* for the absent vowel, which must only be regarded as a conventional sign for a gap to be filled. (There are, however, cases in which a very common word is never vowelled: here we may safely assume a very short vowel best represented by *ĕ*, as already noticed.)

ABBREVIATIONS AND EXCEPTIONS.

Abbreviations were rare; ideographs and syllabics rendered them needless. But there are cases in usual formulæ; as , *nuter a*, for , *nuter atef*, "divine father," the title of an order of priests. In the formula , *ānχ uťa senb*, "life, balance, health," a kind of good wish added to king's names and rendered in the Rosetta Stone *ὑγίεια*, is *ānχ*, *ťa* is an abbreviation, for we find the complete word , *uťa*, in the same formula; but the for is of a more trenchant character.

There are some words of which the writing is exceptional, due to causes which may sometimes be traced. Thus , which should according to rule be transcribed *senkti*, was a variant of *sti*. The syllabic , *set*, received as hieratic abbreviation , the last line being exactly like the , , of that time: thus it resembles the hieratic group for the three letters , and the scribes took occasion to trace in hieroglyphics for *set*. This is an imitation of the cursive style taken into the monumental, of which there are a certain number of cases.

SECRET WRITING.

Intentionally accumulated exceptions in certain texts compose what Champollion has called the Secret Writing. The most ancient traces we have found are of the Eighteenth Dynasty. In this system we remark—(1) objects rare or unused in ordinary writing; (2) syllabic signs used as simple letters; (3) phonetic values obtained by turning the signs from their ordinary ideographic values; (4) variants between the values of neighbouring sounds. Thus every deviation was made from the usual principles of writing by which it was possible to produce exceptions. This is an enigmatic system intended to be unintelligible to the ordinary reader. The causes of this method are of interest, for from them originated the new values which strangely complicate the hieroglyphic writing of the time of the Greeks and Romans (the secret writing thus passing in a certain degree into the common writing).

THE USE OF HIEROGLYPHICS IN GRAMMAR.

Although, as already stated, an outline of ancient Egyptian grammar is not given in this article, it is necessary to explain how hieroglyphics were used for grammatical purposes.

In expressing roots or derivatives, whether pronominal, verbal, or of particles, both phonetic and ideographic signs could be employed, either apart or in combination. There is, however, in all but verbal roots a marked preference for phonetic expression, with again a preferential use of alphabetic signs.

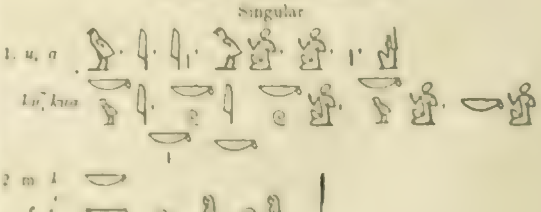
The masculine and feminine of nouns are marked, especially when they were ideographically written, by | and ⌓; the former was not pronounced, it is doubtful whether the latter was, and if so in what cases (De Rougé, *Chrestomathie*, ii. 7, 8).

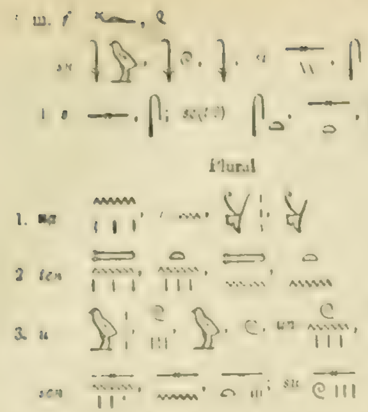
The plural of nouns, pronouns, and the pronominal affixes which were also used to indicate the persons of verbs, is indicated by the abstract symbol, ııı, . In the case of nouns it may be replaced by a phonetic ending or the tripling of the word when written ideographically or even phonetically. The principle of expressing the dual, which is proper to nouns, appears to have been the same, though as to this there are difficulties.

The pronouns and cognate words, including the article, are mostly written alphabetically. The affixed personal pronouns, which are identical in form with a very few exceptions, whether used as possessives, as inflexional verbal suffixes, or as direct complements, or in other words, in their genitive, subjective, and objective uses, afford instructive instances of the different modes of writing. It may be observed that in Egyptian these are the primitive forms of the personal pronouns. The following table is taken from M. de Rougé's *Chrestomathie*, ii. 42, with the omission of some late forms.

AFFIXED PERSONAL PRONOUNS.

Singular


1. u, a
1 n, kua
2 m. k



It will be remarked that all the phonetic forms but one are written with [illegible] signs; that the [illegible] of ideographs, either as [illegible] symbols, gives the common first person singular [illegible] and, and further confuses the [illegible] of the second person singular [illegible] by the same symbol only. The principle of writing [illegible] the use of the pronoun, phonetically expressed, [illegible] represented by that symbol, is carried farther in the first person singular than the table shows, there being special signs for [illegible].

In the case of the articles and the pronouns of more common use alphabetical signs are employed with ideographic signs for the pronouns [illegible] occurs. Syllabic signs are used for some of the [illegible], and ideographs for substantives employed as pronouns. The other forms of pronouns are produced by alphabetic signs, [illegible] the case with the compounds that introduce [illegible].

The verbal [illegible], identical with that of the noun, is expressed in every [illegible] hieroglyphics can be used. It is, however, [illegible] the inflexions, and the substantive verb, [illegible] is really an inflexional word [illegible]. The derivative forms are produced by prefixes which are always alphabetic or by repetition of the radicals ([illegible] repeated). The inflexions are formed by the [illegible] the persons and other prefixes and affixes [illegible] always placed before the pronominal [illegible] the expression is alphabetic with the exceptions afforded by the pronominal affixes as already shewn. The forms of the substantive verb are phonetic, either alphabetic, , *pu*, rarely , *pa*, , *pui*, , *ar*; , *au*; , *tu*; or syllabic , , *un*; , , *χeper*, , *ari*. This mode of writing leads to the identity of some forms of this verb and of other parts of speech: thus *pa* is [illegible] in form is the definite article, and *pui* with the affixes as the possessive article, and *pu* as the demonstrative article. These identical forms are here cited as evidence of the result of the use of alphabetic writing.

The radical particles shew the same phenomena. The prepositions are expressed phonetically, the majority, including nearly all the most common, alphabetically. The simple adverbs, including the negatives, are written phonetically, with perhaps about an equal use of alphabetic and syllabic forms. The few interjections are written alphabetically. In consequence of this mode of writing, particles of different sense are sometimes identical in form. Thus , *ēm*, is both "in" and "not," but most apparent instances of this kind are due to the use of a particle as both preposition and conjunction or adverb.

The bearing of these results on the problems of the formation of the Egyptian hieroglyphic writing and the growth and origin of the language is significant.

The earliest Egyptian writings, which are hieroglyphic, shew a predominant use of ideographic signs. The phonetic signs gradually grow in importance until the full development of the character and language. We are thus led to ask whether there was a period in Egyptian writing when it was wholly ideographic, the supposed first stage of all such systems, when the figure of each object conveyed its name or names and nothing more.

A stage of pure picture writing would express a language in the condition which is supposed to have been the earliest in the case of all monosyllabic languages, the condition before grammar. It is precisely to such a condition that the linguistic phenomena of Egyptian seem to point. For its simple necessities ideographs alone would be sufficient, and the phonetic signs wanted for grammatical machinery would be [illegible] when a higher condition was reached.

It may be further enquired whether the growth of Egyptian was wholly [illegible], or whether it was [illegible] from without; in other words, whether there is any reason to assign the roots which serve the purposes of grammar, and even the verbal roots to more than one source. The basis of the inquiry by which this question might be answered lies in the undoubted identity of the personal pronouns in Egyptian and Semitic. The inquiry is beyond the scope and limits of this article. It requires an extensive comparison of the Egyptian vocabulary, including the structural words, and of the system of grammar, with the Semitic and with the families of language which geographical and ethnological considerations would lead us to include in the category of possible cognates to the Egyptian. The leading results of a limited examination may, however, be stated. In the verbal roots a certain small number occur apparently common to Egyptian and Semitic. Of these roots a good proportion are proper to civilization, and thus belong to a stage above that of barbarism. In the pronominal roots the personal pronouns are undoubtedly Semitic, whereas the articles seem to be identical in source with a non-Semitic form of the substantive verb. The roots of particles fall into two classes, those which are purely metaphysical, probably including Semitic equivalents, though in the case of practically uniliteral forms the comparison is hazardous, and such as have become particles by the diversion of substantives to a tropical sense.

It would thus appear that the Egyptian language was originally purely monosyllabic without inflexion and written by ideographic signs, that the first stage towards inflexion was the use of substantives in tropical senses for prepositions and adverbs, the primitive ideographic signs being still sufficient for the purposes of writing, and that the second stage was attained by borrowing from Semitic, so far as was necessary, grammatical forms and particles, with perhaps some verbal roots needed in a civilized condition, and that at this time phonetic signs became absolutely necessary. The importance of the phonetic signs for expressing grammatical forms would tend to their prevalent use for the whole category, except where the radical sense was dominant in the tropical, as in our own use of the word "head" in such prepositional phrases as "at the head of" the table, the army, the administration, &c. This view is put forward as a mere hypothesis, to be sustained or refuted by the study which the subject deserves. The importance of the question is great as its solution will mainly tend to determine whether the Egyptian belongs to an early stage of Semitic, as has been conjectured on very insufficient grounds. In the previous remarks it is assumed that such a view may at present be set aside, otherwise we could not speak of borrowing from Semitic.

THE SUPPOSED DERIVATION OF THE PHŒNICIAN FROM THE EGYPTIAN ALPHABET.

M. de Rougé endeavoured to shew that the Phœnician alphabet was derived from the Egyptian in its hieratic form. The hypothesis has been accepted by M. François Lenormant in his *Essai sur la Propagation de l'Alphabet Phénicien*, 2d ed., of which the first Plate presents a comparative table of hieratic and archaic Phœnician letters. The method leaves nothing to be desired. The conclusion is, however, scarcely established. It must be remembered that the Egyptian alphabet presents one or more alternative forms of more than half its letters. Most of these correspond to a single Phœnician letter. Thus there is in half the Phœnician alphabet a choice between two or more hieratic forms. This diminishes the effect of the comparison. Again the hieratic forms vary, like all cursive forms of writing, with the hand of each scribe. Consequently the writer who desires to establish their identity with Phœnician can scarcely avoid straining the evidence. Any one who will compare M. Lenormant's plate with M. de Rougé's hieratic alphabets in the *Chrestomathie*, Pls. I. seqq., will see that the signs chosen for comparison by M. Lenormant do not agree throughout with any of the three types given without that object by M. de Rougé. It may be remarked in illustration that if we endeavoured to connect the demotic in its latest form with the Arabic Koofee in its earliest, which is of course absurd, it would be possible, by selecting the demotic variety nearest in form to the typical Koofee of coin-inscriptions, to shew a very good apparent agreement of many letters. Any one may try the experiment with the Koofee alphabet in Soret's *Numismatique Musulmane*, Pl. I. and M. de Rougé's demotic in the *Chrestomathie* (l.c.), taking care to use only one type where it was repeated by the Arabs for other letters, and in the case of their alphabet to compare only the isolated or final forms. The result would shew the great caution needed in the inquiry.

There are two objections to the proposed derivation of the Phœnician alphabet which must have great weight against any but the strongest evidence of resemblance. The Egyptian letters represent objects the names of which begin with these letters; similarly the Phœnician letters had names indicating an origin from a hieroglyphic system on the same principle of acrophony. It would be supposed if the Phœnician letters were derived from the Egyptian ones that their names would describe the original signs. This, however, is not the case in a single instance. Aleph signifies an ox and not an eagle, Beth a house and not a bird, Gimel a camel and not a basket, and so, as far as we know, to the end. It is difficult to imagine the complete loss of the original form, and the naming of letters from a supposed resemblance to another form, which form can scarcely be traced in the most archaic Phœnician. Yet, if the derivation from hieratic be true, we are tied to this archaic form on account of its apparent similarity to the hieratic, and any deviation to explain the Semitic names of the letters would weaken, if not destroy, the foundation of the theory.

Again, it is very noteworthy that the oldest monuments of the Phœnician alphabet are to be found not in Egypt but in Palestine and Assyria. These are the Stele of Mesha, king of Moab, and the inscriptions on the Nemrood bronze lion-weights. These weights take us a step farther in the argument, for they shew us on official documents of a palace of Assyrian kings the use of this alphabet, side by side with the Assyrian character, as a kind of demotic or perhaps commercial writing, of necessity well-known in Assyria itself. Of course it is not to be supposed that the languages expressed were the same, but they were so closely allied that their joint use in Assyria was natural, and particularly to a nation accustomed to the Turanian Akkadian. This appearance of the Phœnician alphabet in Assyria would suggest that it had its origin rather from Assyrian than Egyptian writing. Is there, however, any evidence that any such alphabet was derived from cuneiform?

Among the systems of writing which present a sufficient similarity to the Phœnician, and its descendant the Greek, to justify our conjecturing their common derivation, though not necessarily their immediate connexion, is the Cyprian. This is radically different from the Phœnician in being syllabic, and thus having a much larger list of characters, but the formal resemblances suggest the same source. In the case of the Cyprian, Dr Deecke has endeavoured to show the source to be the Assyrian cuneiform in its later form. His arguments are very strong; here it is only necessary to mention the syllabic character of the Cyprian, the agreement in form of many signs, without the readjustment of their elements suggested as theoretically possible by the Moabite and Aramean variants, and the striking fact that the Cyprian is found in two inscriptions written in cuneiform, each stroke having the Assyrian typical shape (Deecke, *Der Ursprung der Kyprischen Sylbenschrift*, Strasburg, 1877).

This probable solution of the Cyprian problem suggested to Dr. Deecke the comparison of the Phœnician alphabet with Mesopotamian cuneiform. The result, published in the *Zeitschrift der Deutschen Morgenländischen Gesellschaft* (xxxi. 102 seqq.), is well worthy the attention of scholars. The inquiry was founded on the comparison of forms and sounds in cuneiform. The forms were much less numerous than the extent of the list of signs would lead us to expect, for the great majority of these signs are far too complex to have been the prototypes of such simple signs as the Phœnician letters. The sounds on the same side present no little difficulty, as the adoption by the Babylonians and Assyrians of the Akkadian system of writing produces a confusion of kindred sounds, and excludes some proper to the Semitic alphabets. A further difficulty arises from the polyphony of the Assyro-Babylonian cuneiform signs, whether ideographic or syllabic, which gives a variety of sounds to the same group and thus greatly diminishes the degree of probability in an agreement. These signs are all conventional transcriptions of original hieroglyphics. These hieroglyphics can sometimes be traced in the rare hieratic forms, and even occasionally in the regular cuneiform types. When we know the original form we can sometimes select the radical sound, but where we find more than one cognate sense with a different sound, the selection becomes difficult, if not impossible. Supposing such a sign to be represented by the English figure 1, standing for "one" and "first," the discovery of the radical sound would be apparently hopeless. It would be obviously so if the sign also stood for "beginning" and "union." The result seems satisfactory to the extent of about one-third of the Phœnician alphabet, signs like the Phœnician having like sounds. This result would have little force did it not seem to be supported by the meaning of some of the signs as compared with the names of the Hebrew letters of which we know the meaning, seventeen in number. But the difficulty in discovering the original radical sound and sense in cuneiform shakes this conclusion. Consequently the five agreements which might be accepted were we certain of the original Assyrian sound and sense cease to have much weight. There are also some probable agreements which, of course, have still less strength. It is, however, to be noted that the syllable *kit*, &c., taken as the origin of Heth, and *tip*, as that of Teth, have forms in the hieratic cuneiform agreeable to the meaning of the words from which these syllables are supposed to be abbreviated, *kittu*, a "graver," and *dippu*, a "writing-table." This explanation of the signs Heth and Teth, consecutive, be it remembered, and without certain renderings, in the Hebrew alphabet, is very remarkable as a confirmation of the theory. For the present it is no more than a theory, but perhaps it is as probable as the derivation of the Phœnician alphabet from Egyptian hieroglyphics through the hieratic types.

It is of course possible that the old Semitic alphabet had an origin independent of Egyptian hieroglyphics or the conventional hieratic forms of Assyro-Babylonian cuneiform. The discovery of a new hieroglyphic character in the Hittite inscriptions, containing, in a list of greater extent, certain of the forms indicated by the names of the Hebrew letters, is a new factor in the problem, and must be defined before its true value can be ascertained. All that can be said at present is that the Hittite characters wear the aspect of an Egyptian origin. Considering the geographical position of this mode of writing, its *prima facie* evidence is in favour of M. de Rougé's derivation of the Phœnician alphabet from Egyptian.

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[illegible] F. von [illegible]; Brugsch, H., *Inschrift von Rosetta*; Lepsius, R. [illegible] *Die* [illegible]; Pierret, P., [illegible]; Lepsius, R., [illegible] *Urkunden der* [illegible]; Pierret, P., *Recueil des Inscriptions inédites du Louvre* [illegible]

BOOK OF THE DEAD AND COGNATE WORKS.—Lepsius, R., *Todtenbuch der Aegypter*, and *Aelteste Texte des Todtenbuchs*; [illegible]; Lieblein, J., [illegible] *hiératiques*; [illegible] *et commentaire*; Renouf, Le Page, [illegible]; Lefébure, E., *Le Mythe Osirien*, *Les Yeux d'Horus*, [illegible]; Pierret, P., [illegible]; [illegible] Naville, E., [illegible] *d'Horus*, *Edfou*; Brugsch, H., [illegible] *Horus*.

HISTORICAL PAPYRI AND BOOKS.—Birch, S., *Select Papyri in the Hieratic Character, British Museum*; *Inscriptions in the Hieratic and Demotic Character, British Museum*; [illegible] *British Museum*; Eisenlohr, A., *Der grosse Papyrus Harris*; Prisse, E., *Fac-simile d'un Papyrus*; Chabas, F., *Les Papyrus hiératiques de Berlin*; *Voyage d'un Égyptien*; *L'Égyptologie*; [illegible] Eisenlohr, A., *Ein mathematisches Handbuch der alten Aegypter*; [illegible] *Correspondenzen aus der Zeit der Ramessiden*; Lieblein, J., *Deux Papyrus Hiératiques du Musée de Turin*; Maspero, G., *Études Égyptiennes*, [illegible] *du Papyrus Harris No. 500*; Mariette, A., *Les Papyrus Égyptiens du Musée de Boulaq*; Pleyte, W., et Rossi, *Papyrus de Turin*; [illegible], *Hieratische Texte aus den Museen zu Berlin und Paris*; Ebers, G., [illegible] *die Arzneimittel der alten Aegypter*.

DEMOTIC.—Brugsch, H., *Grammaire Démotique*, and *Hieroglyphisch-Demotisches Wörterbuch*; Leemans, C., *Papyrus Égyptiens Démotiques à Transcriptions Grecques*; Revillout, E., *Le Roman de Setna*.

TRANSLATIONS.—Birch, S. (ed.) *Records of the Past*; Chabas (ed.) *Mélanges Égyptologiques*; Lepsius, R., Brugsch, H. (edd.), *Zeitschrift für Aegyptische Sprache und Alterthumskunde*.

It is obviously impossible to specify the many valuable translations and dissertations which have been produced by Dr Birch, Dr Brugsch, M. Chabas, Dr Dümichen, M. Devéria, Dr Lepsius, M. Mariette, M. Maspero, M. Pierret, M. E. de Rougé, and other scholars. Many of these works contain Ancient Egyptian texts either in part or entire. (R. S. P.)

HIERONYMITES, HIERONYMIANI, or SANCTI HIERONYMI EREMITÆ, an order of monks, originally hermits, who resolved to adopt the cenobite life under the patronage of St Jerome and the rule of St Augustine. The order first arose in the 14th century in the neighbourhood of Toledo, through the influence of a Franciscan Tertiary named Vasco, and Fernando Pecha, chamberlain of Pedro the Cruel. It soon received papal sanction (from Gregory XI. in 1373), and made considerable progress in Spain and Portugal, where its chief seats were at Guadalupe and Yuste (both in Caceres, the latter being the scene of the cloister-life of Charles V.), and at the Escorial, the palace-monastery of Philip II. near Madrid; afterwards it gained a footing in America also. From about the close of the 16th century it rapidly decayed, and now it is wholly extinct. The dress of the order consisted of a coarse white frock with tan-coloured scapulary and cowl. About 1375 an order of nuns of St Jerome was originated by Maria Garcias de Toledo, and for a time was highly popular. As branches of the Hieronymite order must be reckoned the Congregation of the Eremites of St Jerome of the Observance, which, originated by Lupus Olivetus, third general of the Hieronymites, was sanctioned by Martin V. in 1426, and still subsists in some parts of Italy as the Congregation of St Jerome of Lombardy, and the Pauperes Eremitæ Sancti Hieronymi, a congregation founded by Peter of Pisa in 1377, which obtained some foothold in Tyrol and Bavaria, as well as in Italy, and subsisted until 1688. See Reinkens, *Die Einsiedler des heiligen Hieronymus*, Schaffh., 1864.

HIGDON, or HIGDEN, RANULF, was a Benedictine monk of the monastery of St Werberg in Chester, in which he lived, it is said, for sixty-four years, and died "in a good old age," probably in the year 1363. He was buried, we are told in a note prefixed in the 16th century to the MS. of his work belonging to the library of Christ Church, Oxford, "in St Werberg's Church (now Chester Cathedral), on the south side of the church near the choir, not far from the door which leads into the churchyard; an arch was made for him in the wall, and on the wall is the inscription, 'Non hic sub muro, sed subter marmore duro.'" This monument, extant in the 16th century, seems now to have entirely disappeared. Higdon was the author of a long chronicle, one of several such works based on a plan taken from Scripture, and written for the amusement and instruction of the society to which the compiler belonged. Its chief interest perhaps lies in the fact that it closes the long series of general chronicles, which were soon put completely out of date by the invention of printing. It is commonly styled the *Polychronicon*, from the longer title *Ranulphi Castrensis, cognomine Higdon, Polychronicon (sive Historia Polycratica) ab initio mundi usque ad mortem regis Eduardi III. in septem libros dispositum.* The work is divided into seven books, in humble imitation of the seven days of Genesis, and, with exception of the last book, is a summary of general history, a compilation made with considerable style and taste. It seems to have enjoyed no little popularity in the fifteenth century. The Christ Church MS. says that Higdon wrote it down to the year 1342; the fine MS. at Christ's College, Cambridge, states that he wrote to the year 1344, after which date, with the omission of two years, John of Malvern, a monk of Worcester, carried the history on to 1357, at which date it ends. According, however, to its latest editor, Higdon's part of the work goes no further than 1326 or 1327 at latest, after which time it was carried on by two continuators to the end. Gale in his *Quindecim Scriptores* published that portion of it, in the original Latin, which comes down to 1066; an English translation of the whole was made by John of Trevisa, and printed by Caxton at his press in Westminster in 1482, with the addition of an eighth book. There is also an anonymous English translation of the work. The whole is being at this time carefully edited by Professor Lumby, B.D., under the authority of the Master of the Rolls; six volumes have appeared, 1865–1876.

HIGHGATE, a suburb of London, county of Middlesex, is situated on an eminence on the great north road, 5½ miles N.W. of the London general post-office. From various points on the hill, which reaches a height of 426 feet, striking views are obtained of London and its suburbs. The village is composed chiefly of a good class of houses surrounded by villas and gardens; and there are a number of mansions of historical interest in the neighbourhood.

among which may be mentioned Arundel House, in which Bacon died in 1626, and Lauderdale House, once the residence of Lord Lauderdale, one of the "Cabal" of Charles II., now used as the convalescent home of St Bartholomew's hospital. The principal buildings are the church of St Michael, erected in 1832, in the Perpendicular style, containing a monument to Coleridge, who had his residence in Highgate for nineteen years; the new building erected in 1865 for the grammar school founded by Chief-Justice Cholmeley in the time of Elizabeth; the Roman Catholic monastery called St Joseph's Retreat, a splendid and spacious structure in the Italian style, recently erected; the London diocesan penitentiary, the infirmary, the small-pox and vaccination hospital, the Alexandra orphanage, and the Whittington almshouses. Near the foot of the hill is the Whittington stone, erected in 1821 in place of the old one, which was removed in 1795. In 1809 a scheme was projected to avoid the steep ascent at Highgate by means of an arched tunnel, but after the work had proceeded about 130 yards the whole fell in on 13th April 1812. A road was, however, formed in the line of the intended tunnel, passing under an arch over which the ancient road, Hornsey Lane, is continued. The North London cemetery, in the neighbourhood, contains the graves and monuments of a great number of celebrities. Highgate is supposed by some to have received its name from the gate erected by the bishop of London for the purpose of receiving toll from the passengers by the road which at this point entered his park; but it is possible that gate is here used according to its old signification, and that the name simply means high road. The road was constructed in the 14th century, and the toll-house was built on the site of an ancient hermitage. In the time of stage coaches a custom was introduced of making ignorant persons believe that they required to be sworn and admitted to the freedom of the Highgate before being allowed to pass the gate, the fine of admission being a bottle of wine, which was discussed at the conclusion of the ceremony. The population of the parish in 1871 was 6437, and of the township 5331.

HIGH PLACE is the rendering invariably given in the authorized English version of the Old Testament Scriptures to a Hebrew word בָּמָה of uncertain derivation but with much plausibility connected by Gesenius with the Indo-Germanic root which appears in the Persian *bam* (roof, summit), and in the Greek *βωμός* (compare *βῆμα*, Doric *βᾶμα*). By the LXX. the word is sometimes left untouched (*Βαμά* in 1 Sam. ix. 13 and elsewhere); the prevalent rendering of the plural, when a translation is hazarded at all, is in the Pentateuch *στῆλαι*, in the historical books *τὰ ὑψηλά*, *τὰ ὕψη*, and in the prophetical writings *βωμοί*. The Vulgate invariably gives either *excelsa* or *fana*. The habit so widely diffused among primitive peoples of selecting the tops of mountains, or at least elevated sites, as suitable from their comparative isolation from the world and their supposed nearness to the sky for the erection of altars and sacred pillars, is so obviously natural as to require no explanation. Along with that of worshipping under trees or groves (see GROVE), it was fully participated in by the Israelites from an early period, and continued to assert itself down to a very late date, as is abundantly shown by the frequency with which *bamah* and other words (*har*, *gib'ah*, *ramah*) signifying height occur in connexion with their public and private worship, whether Jehovistic or idolatrous. Thus one of our earliest notices with regard to Abraham after his departure from Haran is that after setting up a sanctuary at Sichem at the oak of Moreh, he "removed unto a mountain on the east of Bethel, and there builded an altar unto the Lord" (Gen. xii. 8). It was on a mountain (Ebal) that the first altar to Jehovah was raised by Joshua after the conquest of Canaan had begun (Josh. viii. 30; *cf.* Deut. xxvii. 4, 5); and many other "high places," some of them (*e.g.*, Beth-Shemesh, or Ir-Heres, and Ashtaroth Karnaim) apparently taken over directly from the Canaanites, speedily obtained recognition as sanctuaries. A few of these, such as Shiloh, early became important pilgrimage centres, but this was not regarded as inconsistent with the right of each town or village-community to have its own high place, or with the view that Palestine as a whole was the "house" or peculiar territory of God, and that it was therefore lawful on suitable occasions to erect new and extempore altars or high places within its limits. For example, we find in 1 Sam. x., xi. repeated references made to the *bamah* of Samuel's native village as if it were a thing of course; from 2 Sam. xv. 32 (Hebr.) we gather that even in David's time the top of Mount Olivet was a place "where God was wont to be worshipped;" while at a later period we read of Elijah repairing the altar on Mount Carmel that had been broken down, and complaining of the violation of God's covenant of which those persons had been guilty who had thrown down the altars and slain the prophets (1 Kings xviii. 30; xix. 10, 14). And we read of new altars, generally on high places, being set up by Gideon (Judg. vi. 26, 27), by Manoah (Judg. xiii. 19, 20), and repeatedly by Saul (1 Sam. xiv. 35). The comparatively late author of the books of Kings expressly states, on the one hand, that before the days of Solomon the people "sacrificed in high places because there was no house built unto the name of the Lord" (1 Kings iii. 2), and, on the other hand, that after that king the high places were removed neither by Asa (1 Kings xiv. 15), nor by Jehoshaphat (xxii. 44), Joash (2 Kings xii. 3), Amaziah (xiv. 4), Uzziah (xv. 4), or Jotham (xv. 35). The still later author of the books of Chronicles, indeed, states of Asa (2 Chr. xiv. 5) and Jehoshaphat (xvii. 6) that they did take away the high places "out of all the cities of Judah;" but this apparent contradiction can best be explained if we assume that the chronicler is alluding only to those high places where heathen deities were worshipped or idolatrous practices allowed, while the earlier author had in view the Jehovistic high places which, during many of the earlier reigns at least, were not discountenanced either in the northern or in the southern kingdom. In reading such a passage as Amos vii. 9, it would be a mistake to interpret it as meaning that the multiplicity of *bamoth* was regarded as wrong in itself; the prophet's zeal is directed not against the places but against the cultus and the false value that was attached to it. Hezekiah is the first monarch of whom in the earlier record we read that with some risk to his popularity he removed the high places and altars of Jehovah, and "said to Judah and Jerusalem, ye shall worship before this altar in Jerusalem" (2 Kings xviii. 4 compared with xviii. 22). But it was not until the reign of Josiah that the high places were finally repressed, not on the ground of direct prophetic revelation, but on that of a strict written law. Even then, however, a distinction was made between the "high places" of the southern kingdom, sacred to Jehovah, and those of the northern, dedicated to a mixed worship; the priests of the former were brought to Jerusalem, and, though not allowed to officiate at the altar there, were permitted to share the priests' portion along with their brethren, while those of the latter were put to death (2 Kings xxiii. 8, 20). As for the altars built upon the high places, their construction appears to have been regulated by the law provided for the case in Ex. xx. 24, 25; very often *maççeboth* or pillars were erected beside them (see Ex. xxiv. 4; Josh. xxiv. 26; *cf.* Isa. xix. 19; Hosea iii. 4); and sometimes they were enclosed in "houses" or "temples" (1 Kings xii. 31, xiii. 32; Amos vii. 13). For the bearing of the facts contained in this article on the criticism of the Pentateuch and of its legislation, see PENTATEUCH.

HIGHWAYS. A highway is a public road over which all persons have full right of way—walking, riding, or driving. See ROADS. Such roads in England for the most part either are of immemorial antiquity or have been created under the authority of an Act of Parliament. But a private owner may create a highway at common law by dedicating the soil to the use of the public for that purpose; and, apart from any special dedication, the using of a road for a number of years, without interruption, will support the presumption that the soil has been so dedicated, and the road will be to all intents and purposes a public highway. At common law the parish is required to maintain all highways within its bounds, but by special custom the obligation may attach to a particular township or district, and in certain cases the owner of land is bound by the conditions of his holding to keep a highway in repair. Breach of the obligation is treated as a criminal offence, and is prosecuted by indictment. Bridges, on the other hand, and so much of the highway as is immediately connected with them, are as a general rule a charge on the county; and by 22 Henry VIII. c. 5 the obligation of the county is extended to 300 yards of the highway on either side of the bridge. A bridge, like a highway, may be a burden on neighbouring land *ratione tenuræ*. Private owners so burdened may sometimes claim a special toll from passengers, called a "toll traverse."

Extensive changes in the law of highways have been made by the recent Highway Acts, viz., The Highway Act, 1835 (5 and 6 Will. IV. c. 50), and the amending Acts of 1862 and 1864. It is no longer possible for a private owner, by dedicating a highway to the public, to make the charge of maintaining it a burden on the parish in all cases. To create a new highway of this character he must give three months' notice of his intentions to the parish surveyor, and a meeting of vestry must then be called to consider whether the proposed highway is worth the expense of maintenance. Should the vestry decide against it, the charge of maintenance will not fall on the parish, unless the justices of the peace at the next highway sessions decide otherwise.

The leading principle of the Highway Act, 1835, is to place the highways under the direction of parish surveyors, and to provide for the necessary expenses by a rate levied on the occupiers of land. Two or more parishes may unite to form a district under a district surveyor, and large parishes may appoint more than one surveyor. It is the duty of the surveyor to keep the highways in repair; and if a highway is out of repair, the surveyor may be summoned before justices and convicted in a penalty not exceeding £5, and ordered to complete the repairs within a limited time. The surveyor is likewise specially charged with the removal of nuisances on the highway, or any obstruction or injury rendering it less commodious to the public. A highway nuisance may be abated by any person, and may be made the subject of indictment at common law. The Act contains provisions simplifying the process by which a highway may be widened, enlarged, diverted, or stopped. The amending Acts, while not interfering with the operation of the principal Act, authorize the creation of highway districts on a larger scale. The justices of a county may convert it or any portion of it into a highway district to be governed by a highway board, the powers and responsibilities of which will be the same as those of the parish surveyor under the former Act. The board consists of representatives of the various parishes, called "way wardens," together with the justices for the county residing within the district. Salaries and similar expenses incurred by the board are charged on a district fund to which the several parishes contribute; but each parish remains separately responsible for the expenses of maintaining its own highways.

The Highway Act of 1835 specifies as offences for which the driver of a carriage on the public highway may be punished by a fine, in addition to any civil action that may be brought against him,—riding upon the cart, or upon any horse drawing it, and not having some other person to guide it, unless there be some person driving it; negligence causing damage to person or goods being conveyed on the highway; quitting his cart, or leaving control of the horses, or leaving the cart so as to be an obstruction on the highway; not having the owner's name painted up; refusing to give the same; and not keeping on the left or near side of the road, when meeting any other carriage or horse. This rule does not apply in the case of a carriage meeting a foot-passenger, but a driver is bound to use due care to avoid driving against any person crossing the highway on foot. At the same time a passenger crossing the highway is also bound to use due care in avoiding vehicles, and the mere fact of a driver being on the wrong side of the road would not be evidence of negligence in such a case. When there is a public crossing in a street, the driver is bound to use special care; and the expression has been used that a crossing is the special property of the foot-passengers.

The "rule of the road" given above is peculiar to the United Kingdom. Cooley's treatise on the *American Law of Torts* states that "the custom of the country, in some States enacted into statute law, requires that when teams approach and are about to pass on the highway, each shall keep to the right of the centre of the travelled portion of the road." The same appears to be the general rule on the continent of Europe.

The excessive use of the highway by acts which in moderation are lawful becomes a nuisance if it interferes with the public enjoyment of the roadway. Thus when a carrier, having warehouses on a public street, occupied one side of the street in loading and unloading his waggons several hours at a time, so that foot passengers were incommoded and no carriage could pass on that side, although there was room for two carriages on the opposite side, this was held to be a nuisance; and Lord Ellenborough held it to be a nuisance for stage coaches to stop in the street for three-quarters of an hour taking up and setting down passengers, for the "king's highway was not to be used as a stable-yard." In the same way, at common law a tramway laid along a highway is a public nuisance, although it may be shown to be a common convenience. The construction of tramways is now authorized by 33 and 34 Vict. c. 78.

The Acts 24 and 25 Vict. c. 70, and 28 and 29 Vict. c. 83, regulate the use of locomotives on turnpike and other roads. No engine, so constructed as to be a public or private nuisance, is protected by these Acts. When horses had been frightened by a traction engine, and the jury found that it was likely to frighten horses and that the defendant knew it, he was held liable in damages.

Turnpike Acts.—Many of the more important highways are placed under the management of boards of commissioners or trustees. The number of local and general turnpike acts is very great. No fewer than thirty-three general acts are mentioned in the index to the statutes—the first and principal Act being 3 Geo. IV. c. 126. The trustees are required and empowered to maintain, repair, and improve the roads committed to their charge, and the expenses of the trust are met by tolls levied on persons using the road. The various grounds of exemption from toll on turnpike roads are all of a public character, *e.g.*, horses and carriages attending the sovereign or royal family, or used by soldiers or volunteers in uniform, are free from toll. In general horses and carriages used in agricultural work are free from toll. By the Highways and Locomotives Act of 1878 (41 and 42 Vict. c. 77) disturnpiked roads are to become "main roads," and half the expense of maintenance is to be paid out of the county rate. Ordinary highways may be declared to be "main roads," and "main roads" may be reduced to the status of ordinary highways.

In Scotland the highway system will in future be regulated by the Roads and Bridges Act, 1878, which comes into operation at the latest on the 1st of June 1883, but may be adopted sooner in any county. From and after the commencement of the Act in each county, the management and maintenance of the highways and bridges shall be vested in the county road trustees, viz., the commissioners of supply, certain elected trustees representing ratepayers in parishes, and others. One of the consequences of the commencement of the Act is the abolition of tolls, statute-labour, causeway mail, and other exactions for the maintenance of bridges and highways; and all turnpike roads shall become highways, and all highways shall be open to the public free of tolls and other exactions. The county is to be divided into districts under district committees, and county and district officers are to be appointed. The expenses of highway management in each district (or parish), together with a proportion of the general expenses of the Act, shall be levied by the trustees by an assessment on the lands and heritages within the district (or parish).

Highway, in the law of the States of the American Union, generally means a lawful public road, over which all citizens are allowed to pass and repass on foot, on horseback, in carriages, and waggons. Sometimes it is held to be restricted to county roads as opposed to town-ways. In statutes dealing with offences connected with the highway, such as robbery, negligence of carriers, &c., "highway" includes navigable rivers. But in a statute punishing with death robbery on the highway, railways were held not to be included in the term. In one case it has been held that any way is a highway which has been used as such for fifty years. (E. R.)

HILARION, St, abbot, the first to introduce the monastic system into Palestine, was born of heathen parents at Tabatha, about 5 miles to the south of Gaza, about the year 288, was sent when very young to Alexandria to be educated, and there became a convert to the Christian religion. Attracted by the fame of St Anthony, he went to visit that saint in his solitude, and forthwith became a disciple. Returning to Palestine with some companions while still but a lad of fifteen, he gave away all the property he had inherited by the recent death of his parents, and then withdrew into loneliness in the desert between the sea and the marshes on the Egyptian border. In this solitude he observed the most rigid asceticism, and (to quote the quaint remark of Butler) "thought himself at liberty to practise certain mortifications which the respect we owe to our neighbour makes unseasonable in the world." Twenty years of patient continuance in the way of life he had chosen for himself were rewarded, we are told, with miraculous gifts and with rapidly growing fame; disciples and imitators multiplied to the number of two or three thousand, and all owned the spiritual oversight of Hilarion. Informed by revelation when sixty-five years old of the death of Anthony, he undertook an extended tour into Egypt, where he visited all the scenes of that saint's labours; afterwards he removed in the company of a favourite disciple, Hesychius, into Sicily, where, however, his popularity rendered impossible the quiet and retirement which were essential to his habits; a further migration to Epidaurus was found necessary, and ultimately he found a resting place in Cyprus, the see of his old friend Epiphanius, where in a lonely cell amongst some almost inaccessible rocks he died in 371. According to Sozomen his festival was observed in Palestine with great solemnity as early as the 5th century; he is now commemorated by the Roman Church on October 21st. His earliest biographers were Epiphanius and Jerome.

HILARIUS, or HILARUS (HILARY), bishop of Rome from 461 to 467, who according to some authorities had attained to the archdiaconate as early as the year 417, is known to have been a deacon and to have acted as legate of Leo the Great at the "robber" synod of Ephesus in 449. There he so vigorously defended the conduct of Flavian in deposing Eutyches that he was thrown into prison, whence he had great difficulty in making his escape to Rome. Chosen to succeed Leo on November 12, 461, he issued a brief *De fide catholica*, in which he anathematized Eutyches, Nestorius, and Dioscurus, and reaffirmed the decisions of the councils of Nice, Ephesus, and Chalcedon. In 465 he held at Rome a council which put a stop to some prevalent abuses, particularly to that of bishops appointing their own successors. His pontificate was also marked by a successful encroachment of the papal authority on the metropolitan rights of the French and Spanish hierarchy, and by a resistance to the toleration edict of Anthemius, which ultimately caused it to be recalled. Hilarus, who died November 17, 467, was succeeded by Simplicius.

HILARIUS, St, of Arles (c. 403-449), an eminent prelate and an able if unsuccessful defender of the liberties of the Gallican Church, was born about 403, and in early youth entered the abbey of Lerins, then presided over by his kinsman Honoratus (St Honoré). Having succeeded Honoratus in the bishopric of Arles in 429, he set about the discharge of his episcopal functions with unusual energy and zeal. Following the example of St Augustine, he is said to have organized his cathedral clergy into a "congregation," devoting a great part of their time to social exercises of ascetic religion. As bishop of Arles he held the rank of metropolitan of Vienne and Narbonne, and in this capacity he came into collision in 444 with Leo the Great on the question of the deposition of one of his bishops (Chelidonius); this quarrel resulted in his being deprived of his rights as metropolitan to consecrate bishops, call synods, or exercise ecclesiastical oversight in the province, and in the edict of Valentinian III., so important in the history of the Gallican Church, "ut episcopis Gallicanis omnibusque pro lege esset quidquid apostolicae sedis auctoritas sanxisset." He died in 449, and his name was afterwards introduced into the Roman martyrology for commemoration on the 5th of May. Hilarius enjoyed during his lifetime a high reputation for learning and eloquence as well as for piety; his extant works (*Vita S. Honorati Arelatensis Episcopi* and *Metrum in Genesin*) compare favourably with any similar literary productions of that period. A poem, *De Providentia*, usually included among the writings of Prosper, is sometimes also attributed to Hilary of Arles.

HILARIUS, St, bishop of Pictavium (Poitiers), an eminent "doctor" of the Western Church, sometimes referred to as the "malleus Arianorum" and the "Athanasius of the West," was born at Poitiers about the end of the 3d century A.D. His parents, who were pagans of distinction, afforded him every means of acquiring a good education; and to the ordinary accomplishments of an educated gentleman there was added in his case what had even then become somewhat rare in the West, some knowledge of Greek. After he had attained to manhood his attention was directed to the Old and New Testament writings, with the result that he became convinced of the truth of Christianity, and along with his wife and his daughter received the sacrament of baptism. We have no means of knowing the nature or duration of the services which he rendered the church during the period which immediately followed his admission within its pale; but he appears to have continued to reside in Poitiers, and so great was the respect in which he came to be held by the citizens there that about 353, although still a married man, he was by the unanimous voice elected bishop. At that time Arianism, which under imperial protection had overspread the Eastern, was now under similar auspices threatening also to overrun the Western Church; to resist and repel the irruption was the great task which Hilary now set himself to achieve. One of his first steps was to secure the excommunication, by those of the Gallican hierarchy who still remained orthodox, of Saturninus, the Arian bishop of Arles, along with Ursacius and Valens, two of the most prominent of the supporters of that prelate. About the same time he wrote to the emperor Constantius a remonstrance against the persecutions by which the Arians had sought to crush their opponents (*Ad Constantium Augustum Liber Primus*, of which the most probable date is 355). His labours for the triumph of orthodoxy were not in the first instance, however, crowned with success; for at the synod of Biterræ (Beziers), summoned in 356 by Constantius with the professed purpose of settling the long-standing disputes, Hilary was by an imperial rescript banished along with Rhodanus of Toulouse to Phrygia, in which exile he spent nearly four years. From this hostile region, however, he continued to govern his diocese without undue difficulty, no successor having been nominated to the see; while at the same time he found leisure for the preparation of two of the most important of his contributions to dogmatic and polemical theology, the *De Synodis*, or *De Fide Orientalium*, an epistle addressed in 358 to the bishops in Gaul, Germany, and Britain, expounding the true views (sometimes veiled in ambiguous words) of the Oriental bishops on the Trinitarian controversy, and the *De Trinitate Libri XII.*, composed in 359 and 360, in which, for the first time, it was successfully attempted to express in the Latin tongue the theological subtleties and refinements which had been elaborated with the aid of the more flexible language of Greece. The former of these works was not entirely approved by some of the members of his own party, who thought he had shown too great forbearance towards the Arians, and had expressed himself too hopefully as to the possibilities of an ultimate reconciliation of the contending views; to their criticisms he replied in the *Apologetica ad Reprehensores Libri de Synodis Responsa*. In 359 Hilary attended the convocation of bishops at Seleucia in Isauria, where, along with the Egyptian Athanasians, he joined the Homoiousian majority against the Arianizing party headed by Acacius of Cæsarea; thence he betook himself to Constantinople, and, in a petition (*Ad Constantium Augustum Liber Secundus*) personally presented to the emperor in 360, repudiated the personal calumnies of his enemies and sought to vindicate his Trinitarian principles. His urgent and repeated request to be permitted a public discussion with his opponents, especially with Ursacius and Valens, proved at last so inconvenient that he was sent back to his diocese, which, accordingly, he appears to have reached about 361, within a very short time of the accession of Julian. Though he was received in his diocese with every demonstration of joy, he yet found Arianism strong enough there to demand his best energy and skill for the next two or three years; but in 364, extending his efforts once more beyond Gaul, he impeached Auxentius, bishop of Milan, and a man high in the imperial favour, as heterodox. Summoned to appear before the emperor (Valentinian) at Milan and there maintain his charges in person, Hilary had the mortification of hearing the supposed heretic give answers entirely satisfactory to all the questions which were proposed, nor did his (doubtless sincere) denunciation of the metropolitan as a hypocrite save himself from an ignominious expulsion from Milan as a disturber of the peace of the church. In 365 he published the *Contra Arianos vel Auxentium Mediolanensem Liber*, in connexion with the controversy; and also (but perhaps at a somewhat earlier date) the *Contra Constantium Augustum Liber*, in which he pronounced that lately deceased emperor to have been Antichrist, a rebel against God, "a tyrant whose sole object had been to make a gift to the devil of that world for which Christ had suffered." The later years of Hilary's life were spent in comparative quiet and retirement, devoted in part to the preparation of his expositions of the Psalms (*Tractatus super Psalmos*), for which he was largely indebted to Origen; of his *Commentarius in Evangelium Matthæi*, a work of no exegetical value; and of his no longer extant treatise on the book of Job. He died 13th January 368. His great energy and zeal, courage and perseverance, rendered him a very influential ecclesiastic during his life; while, in virtue at once of the depth and acuteness of his intellect and of the wide extent of his knowledge, he holds the very highest rank among the Latin writers of his century. Designated already by Augustine as "the illustrious doctor of the churches," he by his works exerted an increasing influence in later centuries; and by Pius IX. he was formally recognized as "universæ ecclesiæ doctor" at the synod of Bordeaux in 1851. Hilary's day in the Roman calendar is January 14; the English "Hilary Term" begins on the 11th and ends on the 31st.

Of Hilary's works, which include, besides those already mentioned, some minor treatises, there have been several editions, of which the most worthy of mention are that of Erasmus (Basel, 1523, 1526, 1528), the Benedictine by Coutant (Paris, 1693; reprinted by Maffei, Verona, 1730), and that of Migne in the *Patrologiæ Cursus Completus*. His biography by Fortunatus probably dates from about the middle of the 6th century; other sources for the facts of the life of Hilary are the numerous incidental notices to be met with in his own writings and in those of Jerome, Sulpicius Severus, and Gregory of Tours. See Reinkens, *Hilarius v. Poictiers* (1864).

HILDA, or HILD (614-680), usually called St Hilda, a Saxon lady whose name is intimately associated with the history of the early English church and of early English literature. She was a member of the royal family of Northumbria, her father Hereric being a nephew of King Edwin; and it was along with her royal kinsman that, as a girl of fourteen, she received baptism at the hands of Paulinus. During the pagan reaction which followed Edwin's defeat and death, Hilda was tempted to settle with her widowed sister Hereswith at the monastery of Chelles, 12 miles from Paris; but she was recalled to England by Bishop Aidan, the missionary from Iona, and in 649, two years after her consecration as a nun, she was appointed to succeed Heru the abbess of Heortea or Hartlepool. When, in fulfilment of the vow which he had made before the decisive battle with Penda, Oswy came to dedicate his daughter to God, it was to the care of Hilda that he entrusted her. In 658 the abbess founded the famous monastery on the cliffs at Streoneshalh or Whitby, and for the next twenty-two years she ruled with rare ability and virtue over the double community of monks and nuns which gathered round her. Among those who shed the most abiding lustre on the establishment were St John of Beverley and the Saxon poet Cædmon. Hilda died, full of years, in 680, mourned by her nuns as their common mother. There is a St Hilda's church both at South Shields and at Hartlepool, and the latter preserves her effigy on its ancient seal. At Whitby the tradition long lingered that on a summer forenoon, when the sun shone in the highest windows of the north part of the abbey, a figure of Lady Hilda could be discerned; and the fossil ammonites of the neighbourhood are popularly known as St Hilda's snakes. See Bede, *Eccl. Hist.*, xxiv.; Dr G. Young, *Hist. of Whitby*, 1817; Sir Cuthbert Sharp, *Hist. of Hartlepool*, 1816.

HILDBURGHAUSEN (in old records *Hiltiburgeshusia* and *Villa Hilperti*), the chief town of a circle in the duchy of Saxe Meiningen, Germany, is situated in a wide and fruitful valley on the river Werra and on the Werra railway, 19 miles south-east of Meiningen by rail. It is the seat of a circle court, of a court of appeal, and of the jury court for the duchy. The streets are wide and regular, and the principal buildings are the former castle of the duchy, erected 1685-95, now used as barracks, with a park in which there is a monument to Queen Louise of Prussia; the old town-house, the Government buildings, the gymnasium erected in 1877, the normal seminary, and the lunatic asylum. A monument has been erected to those of the citizens who died in the Franco-Prussian War of 1870-71. The manufactures are very various, and include linen fabrics, cloth, papier mâché, toys, buttons, optical instruments, agricultural machines, knives, mineral waters, condensed soups, and condensed milk. The population in 1875 was 5162.

Hildburghausen belonged in the 14th century to the counts of Henneberg, from whom it passed into the possession of the dukes of Saxony. In 1683 it became the capital of a principality, which in 1826 was united to Saxe-Meiningen.

HILDEBERT (HYDALBERT, GILDEBERT, ALDEBERT) of Le Mans and afterwards of Tours, a prominent churchleader, and one of the best Latin writers of his century, was born about 1055 at Lavardin near Vendôme, became a pupil of the famous Berengarius of Tours, and made so great progress in all the learning of the time that he was made head master of the school, archdeacon, and finally, in 1097, bishop of Le Mans. In the beginning of his episcopate much trouble was caused him by the jealousy of his dean, Geoffrey, who had accused him of immorality; but finally he succeeded in fully vindicating his innocence. He next had to encounter the persecutions of William Rufus, who had captured the city; and these proved so harassing that he ultimately felt it necessary to withdraw to Rome, with the intention of resigning his charge; but Pope Paschalis II. declined to give him his release. On his return to Le Mans, Hildebert found the diocese in a state of great commotion, which had been caused by the preaching of Henry the Deacon; but he speedily succeeded in restoring order after he had banished the agitator. About 1125 he was translated, much against his will, to the see of Tours; and soon afterwards he held the important synod of Nantes, convened for the purpose of correcting the abuses and terminating the disorder which had so long prevailed in Brittany. A dispute with Louis the Fat about the rights of ecclesiastical patronage brought him into much disfavour with that monarch; but their mutual relations had much improved before the death of Hildebert, which took place on December 18, 1134. From some writers he has received the name of Saint, but his name occurs in no martyrology.

The works of Hildebert, which include letters, sermons, and [illegible] 17[illegible] [illegible] of interest [illegible]

lay down the thesis, which is then supported by scripture proofs and by passages from the fathers, especially from Augustine; he finally proceeds by detailed argument to dispose of difficulties and objections with considerable acuteness, and without that excessive subtlety which characterized later scholastic writers.

HILDEBRAND. See GREGORY VII.

HILDEBRANDSLIED. This invaluable example of Old German alliterative poetry is contained in a MS. originally belonging to the library of Fulda, and now preserved at Cassel. It is written on the first and last pages of a volume of Biblical and theological contents by two contemporary hands apparently belonging to the beginning of the 9th century. The conclusion of the poem is unfortunately wanting, evidently from want of space. From such misreadings as *[illegible]* for *[illegible]*, and *[illegible]* for *[illegible]* or *[illegible]* (with *p* for the Runic *w* sign sometimes used here as in Old English MSS.), it is manifest that our text was not written down from memory,—as has often been assumed,—but is a transcript from an older original. This conclusion is confirmed by the state of the language of the fragment, which shows a curious mixture of Low and High German forms that can never have existed in any living dialect of Germany, but can only be explained as the result of an attempt made by a Low German scribe to adapt the forms of a High German original to his vernacular idiom.

The fragment is mostly taken up with a dialogue between Hildebrand and his son Hadubrand. When Hildebrand followed his master Theodoric the Great, exiled from Italy by Odoacer, he left his young wife and an infant child behind him. At his return to his old home, after thirty years' absence at the Hunnic court, he is met by a young warrior and challenged to single combat. Before the fight begins, Hildebrand, asking for the name of his opponent, and discovering his own son in him, tries to avert the fight, but in vain. "Then they let their horses run with their sharp spears, and then they hewed their white shields until they were beaten to pieces with their weapons." With these words the fragment stops abruptly, giving no clue as to the issue of the combat. It is certain, however, from allusions to the tale made in the Old Norse Asmundar Saga, that it must have been fatal to Hadubrand.[1] But in the later traditions both of the Old Norse Thidriks Saga (13th century), and the so-called *Jüngere Hildebrandslied*,—a German popular song preserved in several versions dating from the 15th to the 17th century, but evidently originating at an earlier time,[2]—Hadubrand is represented as defeated simply, and obliged to recognize his father.

The *Hildebrandslied* was discovered and published for the first time as a prose story, as early as 17[illegible],[3] but it was not till 1812 that its true character was recognized by the brothers Grimm.[4] Since that time numerous facsimiles and critical editions have been published, amongst which Lachmann's text holds the foremost rank as to [illegible], although some of the metrical principles laid down by Lachmann, and followed in his text, have since been shown not to be applicable to the Old German alliterative verse in which the *Hildebrandslied* is written.[6]

HILDEBRANDT, EDUARD (1817-1868), was born in 1817, and served his term as apprentice to his father, a house-painter at Dantzic. He was not twenty when he came to Berlin, where he was taken in hand by Wilhelm

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[1] See Müllenhoff and Scherer, *Denkmäler*, p. 264.

[2] See Grimm's [illegible] and Uhland, *Alte hoch- und niederdeutsche* [illegible]

[3] See J. G. Eckhard, *Commentarii de rebus Franciae orientalis*, Würzburg, [illegible] 864 [illegible]

[4] *Die beiden ältesten deutschen Gedichte* [illegible] Cassel, 1812.

[5] [illegible] 18[illegible]

[6] [illegible] 187[illegible] 18[illegible] (reprinted [illegible]).

Krause, a painter of sea pieces. Like other artists who have earned a name for subtle and rapid execution, he worked at first in a formal, smooth, and timid fashion. Several sea pieces exhibited after his death,—a breakwater, dated 1839, ships in a breeze off Swinemunde (1840), and other canvases of this and the following year,—show Hildebrandt to have been a careful student of nature, with certain talents kept down by the conventionalisms of the formal school to which Krause belonged. It is difficult to say what the outcome of his art would have been if Hildebrandt had not felt other influences than those of his native schools. Accident made him acquainted with masterpieces of French art displayed at the periodical exhibitions of the Berlin Academy, and these awakened his curiosity and envy. He made up his bundle and wandered to Paris, where, about 1842, he entered the atelier of Isabey and became the companion of Lepoittevin. In a short time he sent home pictures which might have been taken for copies from these artists. Gradually he mastered the tricks of touch and the mysterious secrets of effect in which the French at this period were already so perfect. He also acquired the necessary skill in painting figures, and having done this he returned to Germany, unsurpassable in technical execution, and well skilled in the rendering of many kinds of landscape forms. His pictures of French street life, done about 1843, are impressed with the stamp of the Paris school, but they reveal at the same time a spirit eager for novelty, quick at grasping, equally quick at rendering, momentary changes of tone and atmosphere in varying space and medium. After 1843 Hildebrandt, under the influence of Humboldt, extended his travels, and in 1864–65 he actually went round the world. But whilst his experience became enlarged his powers of concentration broke down. He lost the taste for detail in seeking for scenic breadth, and a fatal facility of hand diminished the value of his works for all those who look for composition and harmony of hue as necessary concomitants of tone and touch. In oil he gradually produced less, in water colours more, than at first, and his fame will probably rest on the sketches which he made in the latter form, many of which are known to the general public by means of chromo-lithography. His course may best be compared to that of a meteor, being breathlessly rapid, brilliant, and charged with colour. No other had the same art of combining elements singly unpicturesque into a picturesque and striking whole, and this chiefly by contrasts of tint and observation of natural phenomena. Fantasies in red, yellow, and opal, sunset, sunrise, and moonshine, distances of hundreds of miles like those of the Andes and the Himalaya, narrow streets in the bazaars of Cairo or Suez, panoramas as seen from mastheads, wide cities like Bombay or Pekin, narrow strips of desert with measureless expanses of sky,—all alike display the *bravura* of a master who had innumerable admirers in his day on account of this facility, and deserved all the admiration he received, subject to the merited reproach that all these fireworks would have been more satisfactory if combined with deeper meditation on the art of composition and more patient study of detail. Hildebrandt died young at Berlin, on the 25th of October 1868. His pictures are scattered in vast numbers throughout Germany. But good selections are accessible in the royal palaces and in the collections of Borsig, Raabe, and Ravené at Berlin.

HILDEBRANDT, THEODOR (born at Stettin 1804, died at Düsseldorf 1874), was a disciple of the painter Schadow, and, on Schadow's appointment to the presidency of a new academy in the Rhenish provinces in 1828, followed that master to Düsseldorf. Bred in the academy of Berlin, and finished under Schadow (1820–24), Hildebrandt began by painting pictures illustrative of Goethe and Shakespeare; but in this form he followed the traditions of the stage rather than the laws of nature. His artificial modes of thought were not, however, without admirers, and he produced rapidly Faust and Mephistopheles (1824), Faust and Margaret (1825), and Lear and Cordelia (1828). He visited the Netherlands with Schadow in 1829, and wandered alone in 1830 to Italy; but travel did not alter his style, though it led him to cultivate alternately eclecticism and realism. At Düsseldorf, about the year 1830, he produced Romeo and Juliet, Tancred and Clorinda, and other works of the same kind which deserved to be classed with earlier ones; but during the same period he exhibited (1829) the Robber and (1832) the Captain and his Infant Son, examples of an affected but kindly realism which captivated the public of the time, and marked to a certain extent an epoch in Prussian art. The picture which made Hildebrandt's fame is the Murder of the Children of King Edward, of which the original, afterwards frequently copied, still belongs to the Spiegel collection at Halberstadt. It challenges comparison with a similar composition by Paul Delaroche, though rather to Hildebrandt's disadvantage. Hildebrandt chose the moment when the children are asleep, and the murderers pause ere they smother their victims with a pillow. Delaroche with subtler sense of artistic propriety represented the princes seated on their bed, unconscious of the near approach of their assassins, whose vicinity is betrayed by a streak of light at the bottom of the door and the watching of a dog. The execution of Delaroche is spirited and delicate, that of Hildebrandt finished and smooth. But the German master, who was below Sohn and Schadow in power, is also naturally far below his French competitor. Comparatively late in life Hildebrandt tried his powers as an historical painter in pictures representing Wolsey and Henry VIII., but he lapsed again into the romantic in Othello and Desdemona, a fair replica of which, in Schulte's collection at Dusseldorf, gives a good idea of his shiny, ineffective, technical execution. After 1847 Hildebrandt gave himself up to portrait painting, and in that branch succeeded in obtaining a large practice.

HILDEGARD (1098–1179), commonly referred to as St Hildegard, abbess, "prophetess," and a figure of some consequence in the history of mediæval mysticism, was born of noble parents at Böckheleim in the countship of Sponheim, diocese of Mainz, in 1098 (or 1099), and from her eighth year was educated at the Benedictine cloister of Disibodenberg (Mons Disibodi) in the principality of Zweibrücken, now in Rhenish Bavaria, where Jutta, sister of the count of Sponheim, was at that time abbess. From earliest childhood, we learn from Hildegard herself, she was accustomed to see visions which increased in frequency and vividness as she approached the age of womanhood; these, however, she for many years, though with great pain, kept almost wholly secret, nor was it until she had reached her forty-third year (1141) that she felt constrained at last to divulge them. Committed to writing by her intimate friend the monk Godefridus, they now form the first and most important of her printed works, entitled *Scivias* (probably an abbreviation for "sciens vias" or "nosce vias Domini") *s. Visionum et Revelationum Libri III.*, and completed in 1151. In 1147 St Bernard of Clairvaux, having come to Bingen while engaged in preaching the new crusade throughout Germany, chanced to hear of Hildegard's revelations, and on inquiry became so convinced of their reality that he not only wrote to her a letter cordially acknowledging her as a prophetess of God, but also successfully advocated her recognition as such by his friend and former pupil Pope Eugenius III. in the synod of Trèves (1148). In the same year Hildegard, who meanwhile had succeeded Jutta as abbess at Disibodenberg, and had attracted overflowing numbers to that cloister, migrated along with eighteen of her nuns to a new convent at Rupertsberg near Bingen, over which she presided during the remainder of her life. By means of voluminous correspondence, as well as by extensive journeys, in the course of which she was unwearied in the exercise of her gift of prophecy, she wielded for many years an increasing influence upon her contemporaries,—an influence doubtless due to the fact that she herself was so fully imbued with the most widely diffused feelings and beliefs, fears and hopes, of her time. Amongst her correspondents were Popes Anastasius IV. and Hadrian IV., the emperors Conrad III. and Frederick I., and also the theologian Guibert of Gembloux, who submitted numerous questions in dogmatic for her determination. It deserves to be specially mentioned to her credit that, though zealously opposed to the Catharists, she stood almost alone in maintaining that the image of God ought to be respected even in them, and that therefore they ought not to be killed. She died in 1179, but has never been canonized; her name, however, was received into the Roman martyrology in the 15th century, September 17th being the day fixed for her commemoration. Her biography, which was written by two contemporaries, Godefridus and Theodoricus, was first printed at Cologne in 1566, and has frequently been reproduced in various forms since that date.

The works of Hildegard, in addition to the *Scivias* already mentioned, include *Divinorum operum simplicis hominis liber*, a hitherto unpublished treatise containing later visions and revelations, many of them relating to physical and medical questions; *Vitæ meritorum*, also unpublished; *Lives* of St Rupert and St Disibod; *Expositions* of the rule of St Benedict, and of the Athanasian creed; *Letters*, and *Exhortations*. While her "visions" on such themes of the Christian religion as God and His kingdom, the church and its mystical union to Christ, must be regarded as crude and extravagant even to insanity, it is impossible to deny all ethical or religious value to her earnest denunciations of the corruptions of the clergy and mendicant orders, or to the intense expressions (however ignorant and imperfect) of the life-long aspirations of a mind so singularly unselfish and unworldly as hers. The *Scivias* were printed in 1513 and again in 1628. The *Epistolarum Liber*, first published in 1566, appears with some other *Opuscula* in the *Max. Bibl. Vet. Patr.*, vol. xxiii., and in Martene and Durand's *Amplissima Collectio*, vol. ii. The *Opera Omnia* form vol. cxcvii of Migne's *Patrologiæ Cursus Completus*. See Meiners, *De Sanctæ Hildegardis vita, scriptis, meritis*, 1793; Dahl, *Die heilige Hildegard*, 1832; Görres, *Die Christliche Mystik*.

HILDEN, a town of Prussia, in the government and circle of Düsseldorf, on the Itterbach. It is a station on the Rhenish railway, and has a considerable manufacture of silks, both pure and mixed, calico, and machinery; it also possesses a deaconess institute. During the last half century its growth has been rapid. While in 1816 the population numbered only 2056, it amounted in 1875 to 6789. Hilden was constituted a town in 1861.

HILDESHEIM, the chief town of a district in the province of Hanover, Prussia, is beautifully situated on the right bank of the Innerste, 18 miles south-east of Hanover by railway. It has a very antique and quaint appearance, and is surrounded by old ramparts which have been converted into shady alleys and promenades. The streets are for the most part narrow and irregular, and contain many old houses with overhanging upper stories and richly and curiously adorned wooden façades. The town is the seat of a district governorship, a high court of justice, two justice courts, a general superintendency of the Evangelical Church, and a Roman Catholic chapter. The Catholic cathedral, which occupies the site of a building founded by Louis the Pious in 818, dates from the middle of the 11th century. It is chiefly remarkable for the antiquities and notable works of art connected with it, including the bronze doors executed by Bishop Bernward, with reliefs from the history of Adam and Christ; the so-called Irmensäule, at one time believed to have been erected, before it was transferred to its present site, in honour of the Saxon idol Irmin, but now regarded as belonging to an old Roman aqueduct; the Christ column by Bishop Bernward, adorned with reliefs from the history of the Saviour; a brazen font of the 13th century, two candelabra of the 12th century, the sarcophagus of St Godehard, the tomb of St Epiphanius, and an immense number of minor articles of ecclesiastical furniture. The rose-bush on the wall of the crypt is alleged to be a thousand years old. Among the other churches those of special interest are St Godehard's church, completed in 1172 and restored in 1863, a remarkably fine specimen of the Romanesque style, with three massive pyramidal towers; the church of St Michael, an almost equally fine specimen of Romanesque, founded by Bishop Bernward, and restored in 1186 after injury by fire, containing a beautiful painted ceiling of the 12th century, and the tomb and monument of Bishop Bernward; St Magdalene's church, which possesses various works in metal by Bishop Bernward; St Martin's church, now used as a museum and library; the Lutheran church of St Andrew, with very lofty towers; and the fine columnar basilica of the abbey church of Moritzburg, a suburb half a mile south-west of the town. The other principal buildings are the town-house, dating from the 15th century, and containing the archives of the town; the house in the late Gothic style said, but erroneously, to have been built by the Knights Templars; the Michaelis monastery, now used as a lunatic asylum; and the old Carthusian monastery. The educational establishments include a Catholic and a Lutheran gymnasium, a Catholic normal school, a weaving school, and an agricultural school. The other principal public institutions are the Georgstift for daughters of state servants, the maternity hospital, two orphanages, and several other hospitals and infirmaries. The town has iron foundries, manufactures of cloth, damasks, linen fabrics, thread, sail-cloth, wadding, leather, machines, carriages, stoves, glass, tobacco, alcohol, perfumeries, chocolate, and starch. The population in 1875 was 22,581.

Hildesheim, though previously in existence, owes its rise and prosperity to the transference to it in 822 of the bishopric instituted by Charlemagne at Elze in 812. In the 10th century its importance was largely increased under Bishop Bernward, who, if he did not introduce, greatly stimulated by his example and patronage the art of working in metals, for which the town retained a high reputation until the close of the Middle Ages. It also obtained considerable fame by its cathedral school, at which several sons of the emperors received their education. In 1241 it joined the Hanseatic League, and in 1249 received town rights. It was frequently at feud with its bishops, and in the 14th century placed itself more than once under the protection of the house of Brunswick-Lüneburg. The bishops in the course of time had acquired considerable territory, but their feud with the neighbouring princes resulted in 1523 in the annexation of a great part of their possessions to Brunswick. A restitution, however, took place in 1643, and in the beginning of the present century the principality amounted to 682 square miles. The last bishop of Hildesheim possessed also the bishopric of Paderborn, acquired by his predecessor. Both bishoprics were secularized and ceded to Prussia in 1803. In 1807 they were incorporated with the kingdom of Westphalia, but in 1813 they were restored to Prussia, which ceded Hildesheim to Hanover, retaining only Paderborn. In 1866 the principality was united, along with Hanover, to Prussia.

On [illegible], 1868, a unique collection of ancient silver plate was discovered on the Galgenberg near Hildesheim, about 10 feet below the surface. The *Hildesheimer Silberfund*, as it is usually called, has excited great interest among classical archæologists, comprising, as it does, no less than 60 pieces, or a complete service for three persons—plates, dishes, drinking bowls, &c. The workmanship evidently belongs to the Augustan age, and [illegible] that [illegible] have nothing less than the plate that [illegible] to [illegible] himself. The [illegible] of the pieces [illegible] adorned with [illegible] and figures of [illegible] Minerva, and others [illegible] Cybele, and [illegible]. The whole [illegible] in the Berlin Museum. For details see Wieseler, *Der Hildesheimer Silberfund*, Bonn, 1868.

HILDRETH, Richard (1807-1865), an American journalist and author, was born at Deerfield, Massachusetts, June 28, 1807. He was educated at Harvard College, where he graduated in 1826; and after studying law at Newburyport, he was called to the Boston bar in 1830. He had, however, already conceived a predilection for literature, and in 1832 he became joint founder and editor of a daily newspaper, *The Boston Atlas*. Having in 1834 gone to the south for the benefit of his health, he was led by what he witnessed of the evils of slavery to write the anti-slavery novel *Archy Moore*, which, chiefly on account of its subject, met with considerable success in America and England. An enlarged edition of it appeared in 1852 under the title of the *White Slave*. In 1837 he wrote *Banks, Banking, and Paper Currency*, a work which had some influence in fostering the growth of the free banking system in America. In 1838 he resumed his editorial duties on the *Atlas*, but in 1840 he found it necessary on account of his health to remove to British Guiana, where he was editor of two weekly newspapers in succession at Georgetown. He published in the same year *Despotism in America*, and he also made the columns of his newspapers the medium for the dissemination of anti-slavery opinions. In 1849 he published the first three volumes of a *History of the United States*, a work which, if its narrative is rather bald and tame, is characterized by perfect fairness and candour, and displays great industry and care in the representation of facts. The work complete in six volumes appeared in 1852. His *Japan as it was and is* is a valuable digest of the information contained in other works on that country. He also wrote *Theory of Morals* (1844), and *Theory of Politics* (1853), as well as *Lives of Atrocious Judges*, compiled from Lord Campbell's two works. For some time Hildreth was on the editorial staff of the *New York Tribune*, and he was also a frequent contributor to periodicals. In 1861 he was appointed United States consul at Trieste, but ill health compelled him to resign his office and remove to Florence, where he died July 11, 1865.

HILL, Aaron (1685-1749 or 1750), an English poet and miscellaneous writer, was born in London, 10th February 1685. Though left by his father in necessitous circumstances, he was educated first at Barnstaple and then till his fourteenth year at Westminster School, after which he went out to Constantinople, where Lord Paget, a relative of his mother, was British ambassador. Under the care of a tutor he then travelled through Palestine, Egypt, and a great part of the East, returning to England about 1703. Having subsequently quarrelled with his patron, he again went abroad as travelling companion to a Yorkshire baronet. On returning home he published in 1709 his *History of the Ottoman Empire*, which, according to his own admission, had far more success than it deserved. About the same time appeared his poem of *Camillus*, in honour of the famous Charles Mordaunt, earl of Peterborough; and in the same year he was made manager of Drury Lane Theatre, and afterwards of the Haymarket. Both those offices he soon after lost through his indiscretion, and the remainder of his life was spent partly in literary pursuits and partly in commercial speculations, which were all unlucky. One of these schemes called him to the Highlands of Scotland, and while there he wrote *The Progress of Wit, being a Caveat for the use of an eminent Writer*. The "eminent writer" was Pope, who had introduced Hill into the *Dunciad*, though in a way that was in fact complimentary. Hill died in 1749 or 1750, and was buried in Westminster Abbey. Two only of his seventeen dramas are now remembered, *Zara* and *Merope*, both adaptations from the French of Voltaire. His poetry is stilted and commonplace, and even the *Progress of Wit* never rises above a flippant smartness. Though a poor and tasteless poet, and afflicted with an overwhelming sense of his own importance, Hill was an honourable man, and his letters to Savage, on whom he conferred many benefits, show his character in a very amiable light. The *Miscellaneous Works* of Hill were published in 1753 in 4 vols. 8vo, and his *Dramatic Works*, to which a Life was prefixed, appeared in 1759 in 2 vols. 8vo.

HILL, Matthew Davenport (1792-1872), was born August 6, 1792, at Birmingham, where his father, T. W. Hill, was at that time assistant in a charity school. He made such rapid progress in his education that in his thirteenth year he rendered his father efficient assistance in conducting a private school in Birmingham, and in his seventeenth year became the principal teacher. Resolving, however, to adopt the legal profession, he in 1814, while still continuing his scholastic duties, became a student of Lincoln's Inn, and in 1816 began to devote his uninterrupted attention to legal studies. He was called to the bar in 1819, and went upon the Midland circuit, where his ability was soon generally recognized, although for various reasons his acquisition of a profitable practice was not so rapid. In 1832 he was elected one of the Liberal members for Kingston-upon-Hull, but he lost his seat at the next election in 1834. On the incorporation of Birmingham in 1839 he was chosen recorder; and in 1851 he was appointed commissioner in bankruptcy for the Bristol district. Having in the course of his professional duties had his interest excited in questions relating to the treatment of criminal offenders, he in his charges to the grand juries, as well as in special pamphlets, ventilated opinions which have been the means of introducing many important reforms in the methods of dealing with crime. One of his principal coadjutors in these reforms was his brother Frederick Hill, whose *Amount, Causes, and Remedies of Crime*, the result of his experience as inspector of prisons for Scotland, may be said to mark an era in the methods of prison discipline. Hill was one of the chief promoters of the Society for the Diffusion of Useful Knowledge, and the originator of the *Penny Magazine*. He died 7th June 1872.

His principal works are *Practical Suggestions to the Founders of Reformatory Schools*, 1855; *Suggestions for the Repression of Crime*, 1857, consisting of charges addressed to the grand juries of Birmingham; *Mettray*, 1855; *Papers on the Penal Servitude Acts*, 1864; *Journal of a Third Visit to the Convict Gaols, Refuges, and Reformatories of Dublin*, 1865; *Addresses delivered at the Birmingham and Midland Institute*, 1867. See *Memoir of Matthew Davenport Hill*, by his daughters Rosamond and Florence Davenport Hill, 1878.

HILL, Rowland (1744-1833), an eccentric and popular English preacher, sixth son of Sir Rowland Hill of Hawkstone, was born there 23d August 1744. After receiving his early education at the grammar school of Shrewsbury and at Eton, he in 1764 entered St John's College, Cambridge. While at the university he made the acquaintance of the Methodist preacher Whitfield, and stimulated by his example he somewhat scandalized the university authorities and his own friends by preaching, before he had obtained holy orders, in the surrounding villages, and conducting religious services in the houses of the sick and poor. After graduating with distinction he took orders, and in 1773 was appointed to the parish of Kingston, Somersetshire, where he began to indulge his favourite taste for open air preaching, and soon attracted great crowds to the services which he held nearly every day of the week. Having on the death of his father in 1780 inherited considerable property, he built for his own use Surrey Chapel, in the Blackfriars Road, London. The chapel was opened on the 8th June 1783. Though now practically occupying the ecclesiastical position of a dissenter, Hill conducted his services in accordance with the forms of the Church of England, in whose communion he always remained. From the beginning his success was complete, and his chapel soon came to be filled with an audience such as no other preacher in London could boast. During the summer months he made what he called "gospel tours" into all parts of the country, sometimes extending them to Scotland and Ireland, and attracted wherever he went audiences as numerous and as interested as those which had crowded to hear Whitfield. After these tours he always returned with increased enthusiasm to his duties at Surrey Chapel, where he continued to officiate almost to the day of his death, 11th April 1833. The oratory of Rowland Hill, like that of Whitfield, was specially adapted for rude and uncultivated audiences, and it was equally effective although by more varied means. He possessed a voice of great power, and, according to Southey, "his manner" was "that of a performer as great in his own line as Kean or Kemble." Not unfrequently he violated the laws of good taste in the eccentricities of his wit and humour, but the intensity and purity of the purpose by which he was actuated enabled him always to retain uninjured his moral influence over his audience. Among the various publications of Rowland Hill the best known is his *Village Dialogues*, which first appeared in 1810, and reached a 34th edition in 1839.

See *Life* by Rev. Edwin Sidney, 1833; *Memoirs* by Rev. William Jones, 1834; and *Memorials* by Rev. James Sherman, 1857.

HILL, Sir Rowland (1795–1879), author of the penny postal system, a younger brother of Matthew Davenport Hill, and third son of T. W. Hill, who named him after Rowland Hill, the preacher, was born December 3, 1795, at Kidderminster, to which town his father had lately removed from Birmingham. For some years of his childhood his health was very feeble, and as, on account of an affection of the spine, he had to maintain a recumbent position, his principal method of relieving the irksomeness of his situation was by repeating figures aloud consecutively until he had reached very high totals. A similar bent of mind was manifested when he entered school in 1802, his aptitude for arithmetic and mathematics being quite exceptional. But if he owed his subsequent eminence to a peculiar natural talent for figures, he was indebted for the direction of his abilities in no small degree to the guidance of his father, a man of great force of character and of advanced political and social views, which were qualified and balanced by the strong practical tendency of his mind. At the age of twelve Rowland began to assist in teaching arithmetic and mathematics in his father's school at Hilltop, Birmingham, and latterly he had the chief management of the school. On his suggestion the establishment was removed in 1819 to Hazelwood, a more commodious building in the Hagley Road, in order to have the advantages of a large body of boys, for the purpose of properly carrying out an improved system of education. That system, which was devised principally by Rowland, was expounded in a pamphlet entitled *Plans for the Government and Education of Boys in large numbers*, the first edition of which appeared in 1822, and a second with additions in 1827. The principal feature of the system was "to leave as much as possible all power in the hands of the boys themselves;" and it was so successful that, in a circular issued six years after the experiment had been in operation, it was announced that "the head master had never once exercised his right of veto on their proceedings." This doubtless was in no small degree due to the powerful personality of Rowland Hill, which made itself felt whether he was present or not. The system, it must be admitted, had several features of too utopian a character for the present constitution of society; but on the whole Rowland Hill, as an educationist, is entitled to a place side by side with Arnold of Rugby, and was equally successful with him in making moral influence of the highest kind the predominant power in school discipline. After his marriage in 1827 Hill removed to a new school at Bruce Castle, Tottenham, which he conducted until failing health compelled him to retire in 1833. About this time he became secretary of Gibbon Wakefield's scheme for colonizing South Australia, the objects of which he explained in 1832 in a pamphlet on *Home Colonies*, afterwards partly reprinted during the Irish famine under the title *Home Colonies for Ireland*. It was in 1835 that his zeal as an administrative reformer was first directed to the postal system. The discovery which resulted from these investigations is when stated so easy of comprehension that there is great danger of its originality and thoroughness, and its greatness as an element in human progress, being lost sight of. A fact which also enhances its merit was that he was not a post-office official, and possessed no practical experience of the details of the old system. After a laborious collection of statistics he succeeded in satisfying himself and in demonstrating to the world that the principal expense of letter carriage was in receiving and distributing, and that the cost of conveyance differed so little with the distance that a uniform rate of postage was in reality the fairest to all parties that could be adopted. Trusting also that the deficiency in the postal rate would be made up by the immense increase of correspondence, and by the saving which would be obtained from prepayment, from improved methods of keeping accounts, and from lessening the expense of distribution, he in his famous pamphlet published in 1837 recommended that within the United Kingdom the rate for letters not exceeding half an ounce in weight should be only one penny. The employment of postage stamps is mentioned only as a suggestion, and in the following words:—"Perhaps the difficulties might be obviated by using a bit of paper just large enough to bear the stamp, and covered at the back with a glutinous wash which by applying a little moisture might be attached to the back of the letter." Proposals so striking and novel in regard to a subject in which every one had a special personal interest could not fail to command general attention, and perhaps no pamphlet that ever issued from the press has caused so much and such widespread discussion, or been so speedily effective in promoting reforms in any degree so beneficial to the human race. So great became the pressure of public opinion against the opposition offered to the measure by official prepossessions and prejudices that in 1838 the House of Commons appointed a committee to examine the subject. The committee having reported favourably, a bill to carry out Hill's recommendations was brought in by the Government. The Act received the royal assent in 1839, and after an intermediate rate of fourpence had been in operation from December 5th of that year, the penny rate commenced January 10, 1840. Hill received an appointment in the Treasury in order to superintend the introduction of his reforms, but he was compelled to retire when the Liberal Government resigned office in 1841. In consideration of the loss he thus sustained, and to mark the public appreciation of his services, he was in 1846 presented with the sum of £13,360. On the Liberals returning to office in the same year he was appointed secretary to the postmaster general, and in 1854 he was made chief secretary. In these positions, his ability as a practical administrator made itself felt in every department of the postal system, and enabled him to supplement his original discovery by practical expedients realizing its benefits in a degree commensurate with continually expanding facilities of communication, and in a manner best combining cheapness with efficiency. In 1860 his services were rewarded with the honour of knighthood;

and when failing health compelled him to resign his office in 1864, he received from parliament a grant of £20,000, and was also allowed to retain his full salary of £2000 a year as retiring pension. In 1864 the university of Oxford conferred on him the degree of D.C.L., and on the 6th June 1879 he was presented with the freedom of the city of London. The presentation, on account of his infirm health, took place at his residence at Hampstead, and he survived the ceremony only a few weeks, dying on the 27th August following. He was buried in Westminster Abbey.

HILL, VISCOUNT (1772-1842). Rowland Hill, nephew of the Rev. Rowland Hill, was born at Prees, Shropshire, 11th August 1772. After receiving his early education at Ightfield and Chester, he was gazetted to the 38th regiment, obtaining permission at the same time to improve himself in the knowledge of his profession in a military academy at Strasburg, where he continued after removing into the 53d regiment with the rank of lieutenant. In the beginning of 1793 he raised an independent company, and was promoted to the rank of captain. The same year he distinguished himself at the siege of Toulon; and after serving for some time on the Continent he in 1797 set out as colonel of the 90th regiment with Sir Ralph Abercromby's expedition to Egypt, where he acquired great distinction, and was wounded at the battle of Alexandria. Having in 1803 been gazetted brigadier-general, he in 1808 accompanied Sir Arthur Wellesley to Spain, and from Vimiera to Vittoria, in advance or retreat, he proved himself the most indefatigable coadjutor of the great captain. In 1809 he was gazetted lieutenant-general, and in the following year was appointed to the independent command of the second army corps of Wellington in Portugal; in 1811 he annihilated the French army under Girard at Arroyomolinos (Caceres), in recognition of which he received the order of the Bath; and for his capture of the forts of Almarez, which cut off the communication between the French armies on the north and south sides of the Tagus, he was in 1814 rewarded with the title of Baron Hill of Almarez. In 1813 he held temporarily the command of the English and Hanoverian troops in Belgium, and two years later crowned the glories of his noble career by his conduct at Waterloo, where he was at the head of the brigade which resisted and repulsed the last effort made in behalf of the French by the imperial guard. When Wellington became premier in 1828 Hill received the appointment of general commanding-in-chief, and on resigning this office in 1842 he was created a viscount. He died on the 10th December of the same year. Lord Hill was, next to Wellington, the most popular and able soldier of his time in the British service, and was so much beloved by the troops, especially those under his immediate command, that he gained from them the honourable title of "the soldier's friend." "With Hill," they used to say, "both victory and life may be ours." On the other hand, the strategic skill and military capacity he displayed in the Peninsula secured for him the not less honourable title of "the right arm of the duke of Wellington." From the first day he entered the army he displayed the germs of those qualities that afterwards secured for him fame, rank, and power—boldness that amounted to daring and was yet always under the control of calm judgment, skill equal to independent commands of the most difficult kind, and a regard for the moral and physical welfare of the army such as had never before been shown by any commander-in-chief.

The Life of Lord Hill, G.C.B., by Rev. Edwin Sidney, A.M., appeared in 1845.

HILLAH, a town of Asiatic Turkey in the pashalik of Baghdad, from which town it lies 60 miles to the south. It is picturesquely situated, in the midst of a very fertile district, on both banks of the Euphrates, which are connected there by a floating bridge 450 feet in length. The estimated population, which includes a large number of Jews, varies from 6000 to much above 10,000. The bazaars are large and well supplied; and tanning, dyeing, and silk manufacture are carried on to a considerable extent. The horse mart has recently declined in repute. Hillah occupies the site of the ancient Babylon, and is to a large extent built of bricks obtained from the ruins.

HILLARD, GEORGE STILLMAN (1808-1879), an American author, was born at Machias, State of Maine, September 22, 1808. After graduating at Harvard College in 1828, he became joint rector of the Round Hill Seminary at Northampton. In 1833 he was called to the Boston bar, where he soon obtained a good practice. He was chosen a member of the common council of Boston in 1845, and he was for six months its president. In 1849 he was elected a member of the State legislature. The engrossing character of his professional and other engagements did not, however, prevent him from devoting a large portion of his time to literature. Besides editing successively the *Christian Register* (a Unitarian paper), *The Jurist*, and the *Boston Courier*, he published an edition of Spenser's works (in 5 vols., 1839), and a selection from the works of Walter Savage Landor (1856), and wrote *Six Months in Italy* (2 vols., 1833), *Life and Campaigns of George B. M'Clellan* (1865), a series of school-books which have met with wide acceptance, and various articles in periodicals and encyclopædias. In addition to this he made frequent successful appearances as a public lecturer. From 1867 to 1878 he was United States district attorney for Massachusetts. He died 27th January 1879.

HILLEL, a famous Jewish rabbi, sometimes called for distinction's sake הזקן, "the elder" or "the old," flourished about the time of Herod the Great. According to the Talmudists he was born of a poor Davidic family, at Babylon, apparently about the year 75 B.C. In his zeal for the study of the law he went, when already of mature age, to Jerusalem, where Shemaiah and Abtalion were at that time the leading teachers. While supporting himself and his family there by working as a day labourer, he was not always able to earn the fee which the porter of the Beth-Midrash or house of instruction is said to have required; but such was his ardour for learning that on one occasion on a cold December morning, having failed to obtain admission, he climbed up to the window of the class-room, where some time afterwards he was found quite buried and half frozen to death under a heavy fall of snow. He was now made free of the schools, and so great were the attainments with which his diligence was ultimately rewarded that, according to the tradition, he understood all languages, including those of the hills and the valleys, the trees and the flowers, the beasts and the demons. In his later years he succeeded the "sons of Bethyras" in the presidency of the sanhedrin, and in this high position he became the author of several important rules of interpretation (the so-called seven "middoth"; see HERMENEUTICS), and also of some authoritative legal decisions. A contemporary, and perhaps a pupil of his, was Shammai, who became the head of a rival and at times bitterly hostile school. Dying about the year 10 A.D., Hillel was succeeded in his official position by his son Simeon, and afterwards by his grandson Gamaliel I.

There is evidently a good deal of what is incredible in the above Talmudic account; for example, it is now recognized on all hands that the Talmudic statement as to Hillel's presidency over the sanhedrin is absolutely irreconcilable with what we learn from the New Testament writers and from Josephus, and must be regarded as wholly unhistorical. But after every reasonable deduction has been duly made, we still have ample traces of a strong personality, characterized by unusual sweetness and light, bent on supporting the claims of a right-minded and ethical religion against those of mere superficial traditionalism. His "middoth," so far as they go (but they do not go far), are based on sound principles of logic and hermeneutics; the so-called "prosbul," by which he evaded the restrictions laid upon commerce through the law relating to the sabbatic year, showed that he possessed at least some power of adapting the institutions to the changing circumstances and wants of a progressive society; and if most of the questions which are alleged to have divided his school from that of Shammai cannot but strike the modern reader as having been infinitely small, the "golden rule" and some other sayings attributed to him show that he was not incapable of large and true views on the deepest problems of human life.

A remote descendant of the same name, who flourished about 350 A.D., is said to have sought to quiet his co-religionists, restive under foreign domination, with the novel doctrine that all the "Messianic" prophecies of the Old Testament had related to Hezekiah, and had been fulfilled in him.

Our only source of information with regard to Hillel "the old" is the Talmud, unless indeed the Pollion referred to once and again by Josephus be also Hillel under a Greek name. For the grounds on which this probable identification rests, and for a masterly sketch of Hillel and his place in the history of Israel, the great work of Ewald may be consulted (*Gesch. d. V. Israel*, vol. v.). See also Delitzsch, *Jesus u. Hillel* (3d ed., 1879), Derenbourg, *Histoire de la Palestine*, pp. 176-92, and Schürer, *Neutestamentliche Zeitgeschichte*, sec. 25. All the recent works dealing with the life of Christ also touch upon this subject, especially with reference to the question regarding the "originality" of the two teachers. Renan, Keim, and Farrar (vol. ii. appendix) may be specially named.

HILLER, JOHANN ADAM (1728-1804), musical composer, was born at Wendisch-Ossig near Görlitz in Silesia, December 25, 1728. By the death of his father in 1734 he was left dependent to a large extent on the charity of friends. Entering in 1747 the Kreuzschule in Dresden, the school frequented many years afterwards by Richard Wagner, he afterwards went to the university of Leipsic, where he studied jurisprudence, supporting himself by giving music lessons, and also by performing at concerts both on the flute and as a vocalist. Gradually he adopted music as his sole profession, and devoted himself more especially to the permanent establishment of a concert institute at Leipsic. It was indeed he who originated (in 1781) the celebrated Gewandhaus concerts which still flourish at Leipsic. In 1789 he became "cantor" of the Thomas school there, a position previously held by the great John Sebastian Bach. He died June 16, 1804. Two of his pupils placed a monument to his memory in front of the Thomas school. Hiller's compositions are numerous, and comprise almost every kind of church music, from the cantata to the simple chorale. But infinitely more important are his operettas, 14 in number, which for a long time retained their place on the boards, and had considerable influence on the development of light dramatic music in Germany. The *Jolly Cobbler*, *Love in the Country*, and the *Village Barber* were amongst the most popular of his works. Hiller also excelled in songs and ballads of the sentimental kind. With great simplicity of structure his music combines a considerable amount of genuine melodic invention. Although an admirer and imitator of the Italian school, Hiller fully appreciated the greatness of Handel, for the appreciation of whose music in Germany he did much. It was under his direction that the *Messiah* was for the first time given at Berlin, more than forty years after the composition of that great work. Hiller was also a writer on music, and for some years (1766-1770) edited a musical weekly periodical named *Wochentliche Nachrichten und Anmerkungen die Musik betreffend*.

HILL TIPPERAH, a native state adjoining the British district of Tipperah, Bengal, lying between 22° 59′ and 24° 31′ N. lat., and between 91° 12′ and 92° 24′ E. long., with an area of about 3867 square miles, and population (1878) 75,792. It is bounded on the N. by the Assam district of Sylhet, on the W. by the Bengal districts of Tipperah and Noakhali, on the S. by Noákhálí and Chittagong districts, and on the E. by the Lushai country and the Chittagong Hill Tracts. As its name implies the country is hilly. Five or six ranges of hills run parallel from north to south, at an average distance of about 12 miles from each other. The hills are covered for the most part with bamboo jungle, while the low ground abounds with trees of various kinds, canebrakes, and swamps. The principal ranges are, beginning from the east, the Jámpui, Sakkankhang, Langtarái, and Athâramurá. The chief rivers are the Gumti, Háorá, Khozai, Dulái, Manu, and Pheni. During the heavy rains the people in the plains use boats as almost the sole means of conveyance. The forests give shelter to numbers of wild elephants and other large game. Small game of various kinds are met with.

The history of the state relates to two distinct periods—the traditional period described in the *Rajmala*, or "Chronicles of the Kings of Tipperah," and the period since 1407 A.D. The *Rajmala* is a history in Bengali verse, compiled by the Brahmans of the court of Tripurá. In the early history of the state, the rajas were in a state of chronic feud with all the neighbouring countries. The worship of the All-destroyer was here, as elsewhere in India, associated with the practice of human sacrifice, and in no part of India were more victims offered up. It was not until the beginning of the 17th century that the Mughals obtained any footing in this country. By dint of constant invasions and continual intrigues, the Mahometans gradually established themselves, and Tipperah soon became a mere Mughal province under a Mussulman governor. The rájá still remained in possession of the hilly tracts, but subject to the nawáb of Murshidabad. When the East India Company obtained the *diwani* of Bengal in 1765, so much of Tipperah as had been placed on the rent-roll came under British rule. Since 1808, each successive ruler has received investiture from the British Government, and has been required to pay the usual *nazar* or tribute on accession. The state has a chronological era of its own, adopted by Rajá Bir-raj, from whom the present raja is 92d in descent. The year 1875 corresponded with 1285 of the Tipperah era.

Both as regards its constitution and its relations to the British Government, the state of Hill Tipperah differs alike from the independent native states of India and from those which are tributary and dependent. Besides being the ruler of Hill Tipperah, the rájá holds an estate in the British district of Tipperah, called *chaklá* Roshnábad, which is by far the most valuable of his possessions. The form of government is despotic and patriarchal. The rájá's word is law, without appeal. In 1871 an English officer was appointed as political agent to protect British interests and advise with the rájá. The most important hill tribe is that of the Tipperahs, who were estimated in 1874-75 to number 34,727. There are no towns in Hill Tipperah. Agartalá, the capital of the state and residence of the raja, is merely a moderate-sized village situated on the north bank of the Haura.

The principal crop and main food staple is rice. The other articles of produce are cotton, chillies, and vegetables. The chief exports are cotton, timber, *til*, bamboo canes, thatching-grass, and firewood. Occasionally small imports are required from the neighbouring districts. The total revenue in 1874-75 was £18,693. Besides this, the rájá's estates in Tipperah and Sylhet yield about £50,000 and £1400 respectively. His total annual income, therefore, is about £70,000. The police force (1874-75) consisted of 102 men, and the raja maintains a force of 277 officers and men. The state has only 2 schools, and only 103 boys are being educated. The climate of Hill Tipperah is generally pleasant, the annual rainfall is 60 inches. The chief endemic diseases are bowel complaints, remittent and intermittent fevers, and rheumatism; the principal epidemic is cholera.

HILTON, WILLIAM (1786-1839), English painter, was born in Lincoln on 3d June 1786, son of a portrait-painter, who was probably his first instructor. In 1800 he was placed with the engraver J. R. Smith, and about the same time began studying in the Royal Academy School. He first exhibited in this institution in 1803, sending a group of Banditti; and, though he could not be called a popular artist, he soon established a reputation for choice of subject, and qualities of design and colour superior to the great mass of his contemporaries. He made a tour in Italy along with Thomas Phillips, the portrait painter. In 1814, having exhibited Miranda and Ferdinand with the Logs of Wood, he was elected an associate of the Academy, and in 1820 a full academician, his diploma picture representing Ganymede. In 1823 he produced Christ crowned with Thorns, a large and important work, which has lately been bought by the Academy out of the Chantrey Fund; this may be regarded as his masterpiece, displaying all the qualities which go to make up pictorial propriety and efficiency, though it does not entitle Hilton to the praise of original genius. In 1825 he succeeded Fuseli as keeper of the Academy; and he died in London on 30th December 1839, a widower without children. Some of his best pictures remained on his hands at his decease,—such as the Angel releasing Peter from Prison (life-size), painted in 1831, Una with the Lion entering Corceca's Cave (1832), the Murder of the Innocents, his last exhibited work (1838), Comus, and Amphitrite. The National Gallery now contains Edith finding the Body of Harold (1834), Cupid Disarmed, Rebecca and Abraham's Servant (1829), and Sir Calepine rescuing Serena (from the *Faerie Queen*) (1831). Hilton's excellence as an artist is relative to the state of art in his country at the time. In a great school or period he would certainly not count as more than a respectable subordinate; but in the British school of the earlier part of this century he had sufficient elevation of aim and width of attainment to stand conspicuous and praiseworthy, and, comparatively speaking, above the level of mediocrity.

HILVERSUM, a village and commune in the Netherlands in the province of North Holland, about equally distant from Amsterdam, Utrecht, and Amersfoort, with all of which it is connected by railway. The village is well sheltered on the west and north-west by a range of hills, and since 1874 it has been the seat of a hospital, the Trompenberg, for convalescents. The public buildings comprise a town house and four churches and a synagogue, and there is a very handsome railway station. The weaving of floor-cloths, horse blankets, and Hilversum stripe is the principal industry. In 1423 Hilversum was separated from Laren. In 1505 it suffered at the hands of the people of Guelderland, in 1629 from the Croats, and in 1672 from the French. The population of the village in 1840 was 5160, and in 1870 5611; while that of the commune in the same years was 5314 and 6615. Of this last number 3463 were Roman Catholics, 2327 belonged to the Dutch Reformed Church, and 236 were Jews.

HIMALAYA

Plate XVI. Himalaya: signification of name.

HIMALAYA is the name given to the mountains which form the northern boundary of British India, between the 75th and 95th meridians east of Greenwich. The word is Sanskrit, and literally signifies "snow-abode," from *him*, snow, and *álaya*, abode, and is well translated "snowy-range," though that expression is perhaps more nearly the equivalent of *Himáchal*, another Sanskrit word, derived from *him*, snow, and *áchal*, mountain, which is practically synonymous with Himalaya, and probably as often used in conversation by natives of northern India. The letter *y* in the last syllable of Himalaya is purely a consonant, and the last two syllables should be pronounced *lā-yă*, the conversion of the *ay* into a diphthong being quite erroneous. The name, by transformations such as are common to all times and nations in the use of foreign words, was converted by the ancient Greeks into *Emodos* and *Imaos*.

How applied by geographers.

Although the term Himalaya is applied by the natives of India only to the ranges which they see covered with perpetual snow, it has been long used by European geographers to designate the whole mountain region for which the Indian has no other name than *pāhár*, *i.e.*, "the mountains," of which the snowy ranges constitute but a small portion. The first mere cursory examination of these mountains by the older geographers rightly convinced them of the general physical unity of the mountainous region to the north of India, which in length extends from about 72° to 95° E. long., that is, between the rivers Indus and Brahmaputra, and in breadth includes the ranges between the plains of Hindustan and the upper parts of the main branches of these two great rivers. To these ranges the designation of Himalaya has by degrees been specially attached; and there is a certain convenience in still restricting the name to that part of the mountains which is accessible from British India, for this is the practical signification of it now commonly accepted.

Though it is to the area thus limited that the present article is mainly designed to refer, it will be necessary, for the correct apprehension of some of its main characteristics, to understand aright the relation which the Himalaya bears to the great mountain region beyond it, and a general description of that region thus becomes requisite.

Extent of geographical formation.

Scientific investigation has clearly shown that, so far as the main characteristics of the mountains are concerned, the natural boundaries of the Himalayan system must be carried much farther than had at first been recognized. Considerable obscurity still involves the eastern portion of these mountains, and there is great want of precise knowledge as to their connexion with the ranges of western China, from which are thrown off the great rivers of China, Siam, and Burmah. On the west, however, it has been completely established that a continuous chain extends beyond the Indus along the north of the Oxus, and ends in that quarter about 68° E. long. In like manner it is found that no separation can be established, except a purely arbitrary one, between the Himalaya as commonly defined and the greatly elevated and rugged table-land of Tibet; nor between this last and the mountain ranges which form its northern border along the low-lying desert regions of Central Asia.

Relation of Himalaya to Tibetan and other mountains.

It thus appears that the Himalaya, with its prolongation west of the Indus, constitutes in reality the broad mountainous slope which descends from the southern border of the great Tibetan table-land to the lower levels of Hindustan and the plains of the Caspian; and that a somewhat similar mountain face, descending from the northern edge of the table-land, leads to another great plain on the north, extending far to the eastward, to the northern borders of China. Towards its north-west extremity this great system is connected with other mountains,—on the south, with those of Afghanistan, of which the Hindu-Kush is the crest, occupying a breadth of about 250 miles between Pesháwur and Kúndúz; and on the north, with the mountains that flank the Jaxartes or Sir on the north, and the Thian-shan or Celestial Mountains. The eastern margin of Tibet descends to western China, and the south-eastern termination of the Himalaya is fused into the ranges which run north and south between the 95th and 100th meridians, and separate the rivers of Burmah, Siam, and western China.

Connexion with Tibet.

Nor can any of the numerous mountain ranges which constitute this great elevated region be properly regarded as having special, definite, or separate existence apart from the general mass of which they are the component parts; and Tibet cannot be rightly described, as it has been, as lying in the interval between the two so-called chains of the Himalaya and the Kouenlun or Kara Koram. It is in truth the summit of a great protuberance above the general level of the earth's surface, of which these alleged chains are nothing more than the south and north borders, while the other ranges which traverse it are but corrugations of the mass more or less strongly marked and locally developed.

Extent of Tibeto-Himalayan system.

The average level of the Tibetan table-land may be taken at about 15,000 feet above the sea. The loftiest points known on the earth's surface are to be found along its southern or Himalayan boundary; one of them falls very little short of 30,000 feet in elevation, and peaks of 20,000 feet abound along the entire chain. The plains of India which skirt the Himalayan face of the table-land, for a length of rather more than 1500 miles, along the northern border of British India, nowhere rise so much as 1000 feet above the sea, the average being much less. The low lands on the north, about Kashgar and Yarkend, have an elevation of from 3000 to 4000 feet, and no part of the Central Asiatic desert seems to fall below 2000 feet, the lake of Lob nor being somewhat above that level. The greatest dimension of the Tibetan mountain area from east to west may be about 2000 miles, while its average breadth somewhat exceeds 500 miles; about 100 miles on either side constitute the sloping faces, the central table land having a width of about 200 miles on the west and probably 500 miles at its eastern border.

Drainage of its surface.

The southern portion of the Tibetan table-land throws off its waters to the north-west and south-east from a central line almost on 82° E. long., the Indus flowing in the former direction, and the Brahmaputra in the latter. These two rivers maintain their courses for a great distance in opposite ways, longitudinally, along the summit of the table-land; they receive as they proceed the drainage of a large portion of its surface; and their accumulated waters are at length discharged by two openings in the Himalayan slope across the plains of Hindustan into the Indian Ocean. With the one exception of the basin of the Sutlej, the Tibetan area that discharges itself southward at points intermediate between the debouchure of the Indus and that of the Brahmaputra is comparatively insignificant. No important part of the drainage of the table-land, so far as is yet known, passes in the opposite direction through the northern slope to join the rivers which flow from that slope to the Central-Asiatic plain. The waters of the southern slope, together with the drainage of the exceptional Tibetan area above referred to, traverse the Himalaya more or less directly, and constitute the main tributaries of the Indus, the Ganges, and the Brahmaputra.

Watershed lines.

Thus the northern border of the table-land, or the summit of its northern slope, so far as it is known, seems to form the real watershed between the rivers that flow to the Indian Ocean and those that lose themselves in the plains of Turkistan and Mongolia. The summit of the Himalayan slope forms a subordinate watershed, separating the rivers that fall into the Indian Ocean into two classes, those that pass directly through the Himalaya to the plains of India, and those that are collected on the summit of the table-land and discharged, also through the Himalaya, but by two concentrated streams at distant points towards the opposite ends of the chain. It has been proposed to call these dividing lines, respectively, the Turkish and the Indian watershed.

Himalayan rivers and their sources.

The waters that issue from the Himalaya to the west of the 77th meridian combine to form the Indus. Between the 77th and 88th meridians all the streams fall into the Ganges, and eastward of the 88th meridian into the Brahmaputra. Of the continuity of the Brahmaputra, beyond the point up to which it has been explored from Assam, with the Tibetan river called on the maps Sanpoo, Yaroo-dsangbo-tchoo, and so forth, there is no room for doubt. The correct Tibetan name for the river is Tachok-tsangpo, i.e., "Horse river," or simply "Tsangpo," i.e., "Great river," the word "tsangpo" being applied exactly like the corresponding Indian term "ganga," or the Chinese "kiang," as a general affix to the name of any large river. In the mountains on the border of Assam the river is called "Dihong," but on entering the plain it receives the waters of the second stream locally called "Lohit," which is also believed to have a Tibetan source, and this name the united river retains throughout the greater part of its course in Assam, Brahmaputra being a classical Sanskrit name not commonly used. In its course through Bengal local names are given to the various branches into which it there divides; and this is also the case with the Ganges, which unites with the Brahmaputra about 100 miles from the sea. That part of Tibet which lies north of the 30th parallel of latitude and between the 82d and 92d meridians east is believed to have no escape open for its waters, which are consequently collected in lakes occupying depressions on its surface. The region east of the 92d meridian, excluding the comparatively small tract which drains into the Brahmaputra, feeds the great rivers of western China, Siam, and Burmah.

Oxus and Jaxartes.

At the western extremity of the Tibetan table-land two transverse watershed lines are established in connexion with it, by mountain ranges nearly at right angles to what may be regarded as its general direction in this region,—first, on the south by the mountains which under the name of Hindu Kush form the north east angle of the high land of Afghanistan, and from the north-west of which the waters flow into the Oxus (the true Turki name of which is "Amu"), and thence to the Aral Sea, while those from its south-eastern face join the Indus through the Cabul river; and second, on the north by the Terek tagh, which unites the Tibetan system with the mountains of northern Turkistan, and separates the Jaxartes (in Turki "Sir.") from the basin of Yarkend. The Oxus and Jaxartes flow off to the Aral Sea in a north-westerly direction, having between them a range which probably represents the extremity of either the Tibetan or the Thian-shan mountains, and which falls away into hills of minor importance beyond the 70th meridian.

Article Asia referred to.

Some further particulars of the relations of the Tibeto-Himalayan region with the contiguous mountain systems, and of its influence both physical and political on the Asiatic continent in the heart of which it is situated, are contained in the article ASIA, to which reference may be made. A more detailed account of TIBET will be given under that heading, and the remainder of this notice will be confined to the description of the restricted Himalayan area, as already defined.

Geographical sketch. Plain of North India.

The northern provinces of British India occupy the great plain which flanks the Himalaya on the south, along its whole extent from the issue of the Brahmaputra on the east to the ranges that lie along the Indus. The whole tract, excepting Assam, *i.e.*, the valley of the Brahmaputra, is highly cultivated and populous; and with the same exception the population throughout is of the race known as Aryan, being almost exclusively Hindu in religion on the east, but passing into Mahometan on the west.

Eastern Himalaya: Bhotán; Sikkim

The most eastern portion of the Himalayan mountain slope, as far as the 92d meridian, is occupied by wild tribes of which, or of the country they occupy, little is known. They are in small communities under petty chiefs, and their languages, which vary considerably in detail, are to some extent allied to Tibetan and monosyllabic. Between the 92d and 89th meridians is the small state of Bhotán, the local name of which is "Lhopato." It approximates in language, customs, and religion to Tibet proper, and its government is carried on by two separate chiefs, temporal and spiritual. Its northern border, where it is met by Tibet, lies along the 28th degree of north latitude. The small British district of Sikkim succeeds, occupying the lower part of the basin of the Tista river, and having Darjeeling as its chief settlement. The native state of Sikkim, in Tibetan called "Demojong," extends north of British Sikkim to Tibet; it is almost as Tibetan as Bhotán, and still less important. Its western border falls nearly on the 88th meridian.

Nepál.

From the 88th nearly to the 81st meridian the whole southern slope is occupied by the kingdom of Nepál, which since the wars with the British in 1814-16 has retained complete independence. The jealousy with which its government has excluded Europeans from most parts of the country leaves us with little precise knowledge of any part of it except its eastern border and the neighbourhood of the capital, Kathmandu. The people pass from the Tibetan and Buddhist type, which prevails on the east, into almost pure Hindus, speaking a Hindi dialect, on the west. The rivers Kosi, Gandak, Rapti, and Karnali are the principal streams that issue from this part of the mountains. The northern border of Nepál follows the main watershed, and its western angle reaches the 30th parallel of north latitude in the vicinity of the well known Tibetan lakes Rakas-tal and Manasarowar, where the general direction of the mountains has, from east and west, become nearly south-east and north-west.

Kumaon, Kashmir, to Indus. The Káli or Sarda river forms the boundary between Nepál and the British provinces of Kumaon and Garhwal, the chief town in which is Almora, and which occupy the entire mountain face, from the watershed to the plains, as far as the main stream of the Ganges, for a distance from east to west of about 100 miles. Thence, an equal distance brings us to the Sutlej, the intermediate tract being occupied by many small principalities, independent in their civil government, but entirely under the political control of the British. In this region is situated Simla, the summer capital of the government of British India, on one of the outer ranges overlooking the Sutlej. Other small districts and principalities, partly British, occupy the Himalayan slope as far as the 76th meridian, beyond which we reach the territories of Jamu and Kashmir, which extend to within 50 miles of the Indus, a narrow band bordering on which river is mainly in the possession of Afghan tribes but partly under British rule. From the portion of the mountains west of the 79th meridian issue the rivers Ganges and Jumna; also the five rivers of the Punjáb,—the Sutlej, the Ravi, the Chenáb, the Jhelum, and the Indus, besides the Byás which unites with the Sutlej. The valley of Kashmir is the upper part of the basin of the Jhelum.

People of Western Himalaya. The population of the whole of the mountain districts west of Nepál maintains to a great extent its Hindu type, though the Mahometan religion gradually becomes more prevalent as we approach the Indus, where it is found to have superseded Hinduism. In the more remote and elevated valleys an infusion of Tibetan race, religion, and language is found, diminishing as we pass to the west; but otherwise the dialects spoken are everywhere Prakritic, and closely allied to Hindi. As a rule the people are short in stature, muscular, as is common among mountaineers, fairer than the inhabitants of the plains, and in the western regions, where the Hindu or Aryan stock prevails, women of remarkable beauty are often seen. At the lower altitudes cotton clothing is usual, at the greater elevations hempen and woollen materials prevail, but an utter disregard of personal cleanliness is universal. Goitre is frequent in both sexes, and cretinism seems to occur much in the European form.

General climate. The eastern ranges are wetter, the climate generally warmer and more equable, and the vegetation more rank and of a more tropical character; the mountains are more copiously covered with forest, and the extent of cultivation is less, and the population probably less also. To the west, with a drier atmosphere and greater variations of temperature, the climate above 5000 or 6000 feet becomes more like that of southern Europe, and the main features of the scenery become more conspicuously similar to those of European mountains.

Customs. On the east the customs of the people differ little from those of the neighbouring Tibetan or semi-Tibetan provinces. On the west there is no great distinction between the people of the hills and of the plains in their customs, agriculture, or other occupations.

Tibet. The summit of the table land from the borders of China to the 75th meridian, where the Indus suddenly turns off to the south, is comprised in Tibet, or as it is called in the language of its inhabitants "Bod" or "Bodyul," the latter word being equivalent to "Bod land." Of the eastern half of Tibet very little is known, and that little chiefly relates to the most southern portion which borders on the Himalaya, and the most eastern which abuts on China. The table-land here has its greatest development, and is perhaps as much as 500 miles from north to south. At its north-western end its breadth is reduced to something under 200 miles. The physical features of Tibet, from its great elevation, are so peculiar, and it is so cut off by nature from communication with its neighbours, that it is not surprising to find in it a distinct race with a language of their own, and habits widely different from the surrounding nations. The extreme cold and drought make Tibet essentially poor; and the character of its inhabitants approaches that of the denizens of the Arctic regions, who live under somewhat similar physical conditions. The people are broadly built, with a strongly marked Mongolian physiognomy, dark hair, little or no beard, oblique eyes, and prominent cheek bones. In the warmer valleys they are mainly agricultural, and live in houses; in the higher regions they are shepherds, living in tents, thinly scattered over a large area. They are clothed in woollens or sheep skins. The practice of polyandry prevails, a woman marrying a whole family of brothers. The government at Lhassa is nominally administered by the Tibetans themselves, but in reality is altogether under the control of a Chinese resident. The authority of the Lhassan Government extends to about 78° E. long.; west of this as far as the Indus, the country was conquered some forty years ago by the sovereign of Kashmir and remains under him. In the most western province of Tibet, called "Balti," the Buddhist religion ceases to prevail; the population is exclusively Mahometan, and that religion only is known beyond the Indus.

Pamir. To the west of Tibet the mountains are prolonged to the 70th meridian at an elevation not greatly less than that which prevails eastward, and the table-land there ends in the region known as Pamir, which has all the characteristics of the higher parts of Tibet. Beyond this we pass into Turkistan and reach the limits by which the scope of the present article is restricted.

Physical features. Uniformity of structure. The difficulty of accomplishing with any approach to success such a task as that of giving a sufficient account of the chief physical and other characteristics of mountains like the Himalaya is much diminished by the remarkable uniformity in many points of structure and other important peculiarities, which prevails along the whole length of the chain. The perception of such general characteristics among mountains so vast is, indeed, too often overshadowed and obscured by the magnitude of their parts, the multitude of their details, and the variety of their forms; yet when the idea of the subordination of all these elements to common laws has once been duly conceived, it obtains constantly growing confirmation from what at first only produced impressions of hopeless confusion.

The great northern plain. The great plain of northern India stretches with an almost unbroken surface along the foot of the Himalaya from the upper Indus to the head of the delta of the Ganges, and thence has a narrow prolongation along the Brahmaputra up the valley of Assam. Including its extensions to the sea, along the Indus on the west, and along the Ganges on the east, its area is about 500,000 square miles. It nowhere rises to more than 1000 feet above the sea level, and to the unassisted eye it appears a perfectly dead flat. That part of the plain which lies along the foot of the mountains, and more particularly the central and eastern portion, is well watered, being intersected by the numerous streams that flow from the mountains, and under the full influence of the periodical rains, and it comprises the best cultivated, the richest, the most populous, and most civilized districts of India.

The Tarai.

The snowy peaks of the Himalaya are, under favourable conditions, visible from the plains at a distance of about 200 miles. It is not, however, till the traveller is within 30 or 40 miles of the foot of the mountains that the outlines of the great peaks become well defined and their grandeur appreciable. At about the same distance, too, the lower ranges begin for the first time to attract attention. At about 20 or 25 miles from the outer hills the cultivation of the plain commonly becomes less complete, and the villages more sparse; an open grassy tract is entered, often traversed by shallow, sluggish streams, along which are formed morasses, or fringes of gigantic reeds and grasses, frequently occupying very large areas. This tract is known as the "Tarai," or "Tariyáni." Where most strongly developed it has a width of 10 or 15 miles, but its existence is manifestly greatly dependent on the local conditions of drainage and of rainfall, and to the west of the point where the Ganges leaves the mountains the Tarai is not formed. It has been erroneously described as a depression along the foot of the mountains, but there is no foundation for such a view, and the causes that lead to the formation are not far to seek.

The Bhábar.

To explain these it is necessary to take a further step towards the mountains. Just as the Tarai somewhat suddenly appears along a certain definite line, so it as suddenly ceases, and is replaced by a band of forest of about equal breadth, known as the "Bhábar." This tract is almost waterless, and the soil is seen to be chiefly sand or shingle, more or less filled with boulders. The streams that issue from the outer hills on entering the Bhábar are for the most part rapidly absorbed, and finally disappear in their sandy or shingle beds, the water they pour into the soil being again discharged along the outer and lower border of the tract, and collecting once more in the streams which characterize the Tarai.

The [illegible]

The Bhábar and Tarai slope continuously from the foot of the mountains to the cultivated plain. The inclination is so uniform as to be hardly perceptible, but becomes gradually less as the distance from the mountains becomes greater. Observation leads us to suppose that the upper part of this talus, lying along the foot of the outer hills, is composed of coarser matter, and the lower part, which comes into view at a greater distance, of a finer and less permeable silt; and that, the latter having a smaller inclination and extending further than the former, the water absorbed by the upper beds will naturally be brought to the surface at their termination, where the finer materials forming clayey strata make their appearance. That the swampy Tarai is not developed in the western part of the range is doubtless due to the smaller rainfall in that region; while its more marked occurrence to the east of the Ganges at irregular intervals arises from the local peculiarities of the surface drainage, which at some places is carried off directly into the larger rivers without check, and in others is forced to follow a line nearly parallel to that of the mountains for considerable distances, through a tract from which there is no free escape for the water; and which, thus becoming water-logged and covered with a rank development of vegetation, acquires its peculiarities, among which has to be reckoned a climate in which fevers of a deadly character are frequently induced, rendering its permanent occupation and cultivation difficult or impossible.

Siwáliks or sub-Himalaya.

The transition from the plains to the mountains is sudden and well defined along a line that is almost continuous. The ranges to which geologists have given the name of "Siwálik," and "sub-Himalayan," rise abruptly, and without any intermediate undulating ground from the apparently level surface of the plain. These hills, which from recent geological investigation we learn to be formed of deposits of various periods of the Tertiary epoch, attain elevations from a few hundred to 3000 or 4000 feet. The dip of the strata composing them is usually at a low angle towards the mass of the mountains, so that they present a steep face to the plains, while a comparatively easy declivity slopes inwards, and frequently, by meeting a corresponding but longer and more gradual talus descending from the foot of the internal line of mountains, forms a shallow, narrow valley which runs generally parallel to the outer range.

The Dúns or Máris.

These valleys, which are very characteristic of the outer border of the mountains, have by some writers been erroneously confounded with the Tarai. They are termed "Dun" in the western regions; in Nepál they are known by the name of "Mári." Their floors consist of deposits of gravel and boulders, having a maximum elevation of about 2000 or 2500 feet above the sea. Their continuity is broken at intervals by low, transverse, watershed lines, from which the drainage is thrown off along their longitudinal axis, and falls into some of the larger streams which cross them from the inner ranges, though less frequently it finds an independent exit into the plains by a sudden bend to the south through a rupture in the line of outer hills. At intervals these valleys are entirely wanting, and the outer hills which form them elsewhere are undistinguishable from the general mass of mountain within, except through the aid of their geological character. From the considerable elevation of the dúns above the plains, down to the level of which the streams which drain them descend in a very short distance, the unconsolidated strata which form the floors of these valleys are often deeply cut into by the watercourses, and present a surface worn into terraces descending in steps of various heights. These conditions lead to a peculiarity which characterizes large parts of the duns, the almost complete impossibility of getting water from wells, due no doubt to the thorough desiccation of the subsoil.

Extent of sub-Himalaya.

The sub-Himalayan ranges have a well-defined distinct geographical existence along the greater part of the chain, and their geological continuity is established where no valley is formed between them and the inner ranges, and where they cannot be otherwise distinguished from the general mass of mountains. To the west of the Sutlej river these ranges and the valleys connected with them have an unusual development, the width over which they extend increasing from 10 or 15 miles to as much as 50 miles, with a series of two or three dún-like valleys one within another. West of the river Jhelum, again, the aspect of the outer Himalaya is entirely modified by a small tableland, which is formed to the north of the line of elevation known as the Salt range, and extends to the Indus. Its general surface lies at about 1000 feet above the general level of the plain, having a maximum elevation of about 1800 feet, and being remarkable for the extraordinary manner in which it is broken up by ravines, the number, gigantic dimensions, and intricacy of which are alike perplexing and astonishing—the extremely dry climate leading to an almost total want of vegetation, and the absence of any such concealment exhibiting a picture of confusion and desolation not often seen.

Outer ranges of main chain

The ranges which lie immediately within the external band of the Siwáliks, or sub-Himalaya, rise abruptly above it to much greater elevations, and constitute the first masses which in such a region we can with propriety dignify with the name of mountains. Their ordinary elevation is about 7000 feet, and the highest summits on them reach 8000

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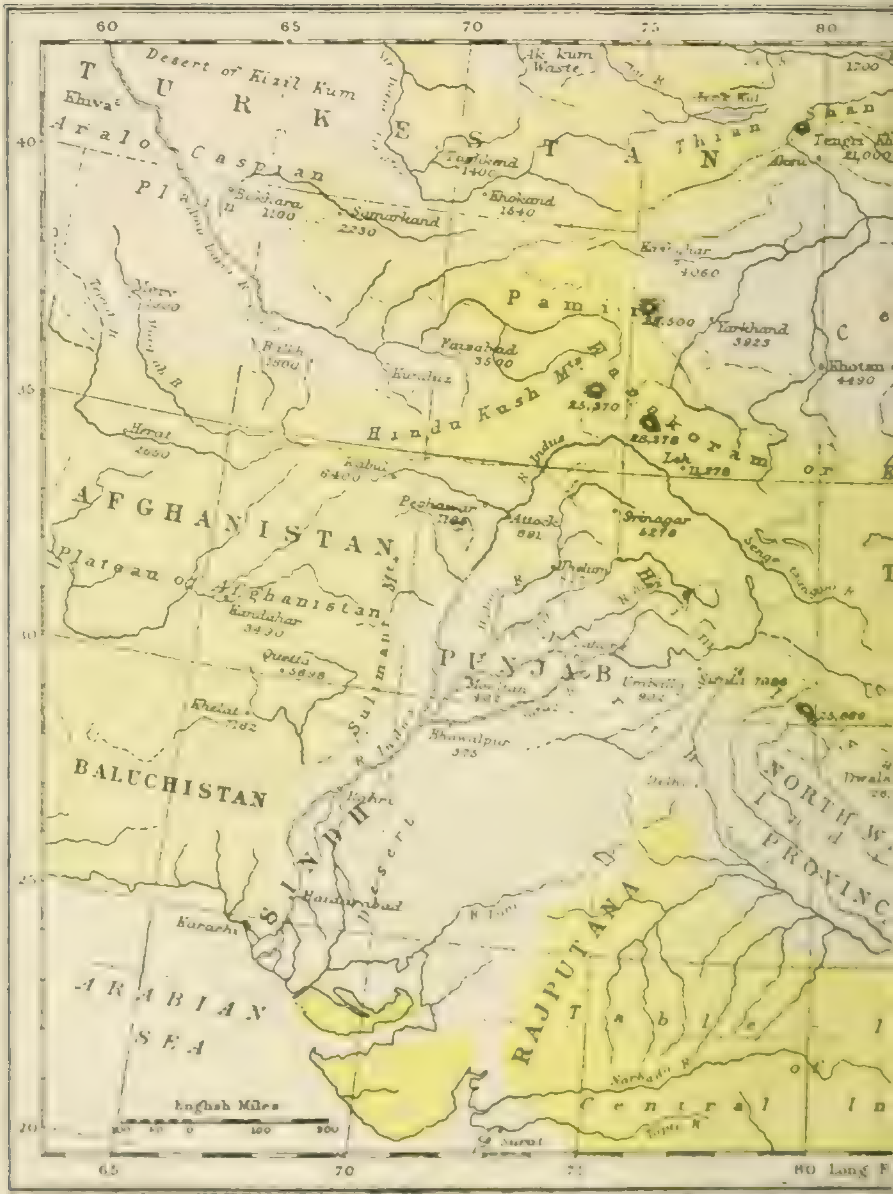
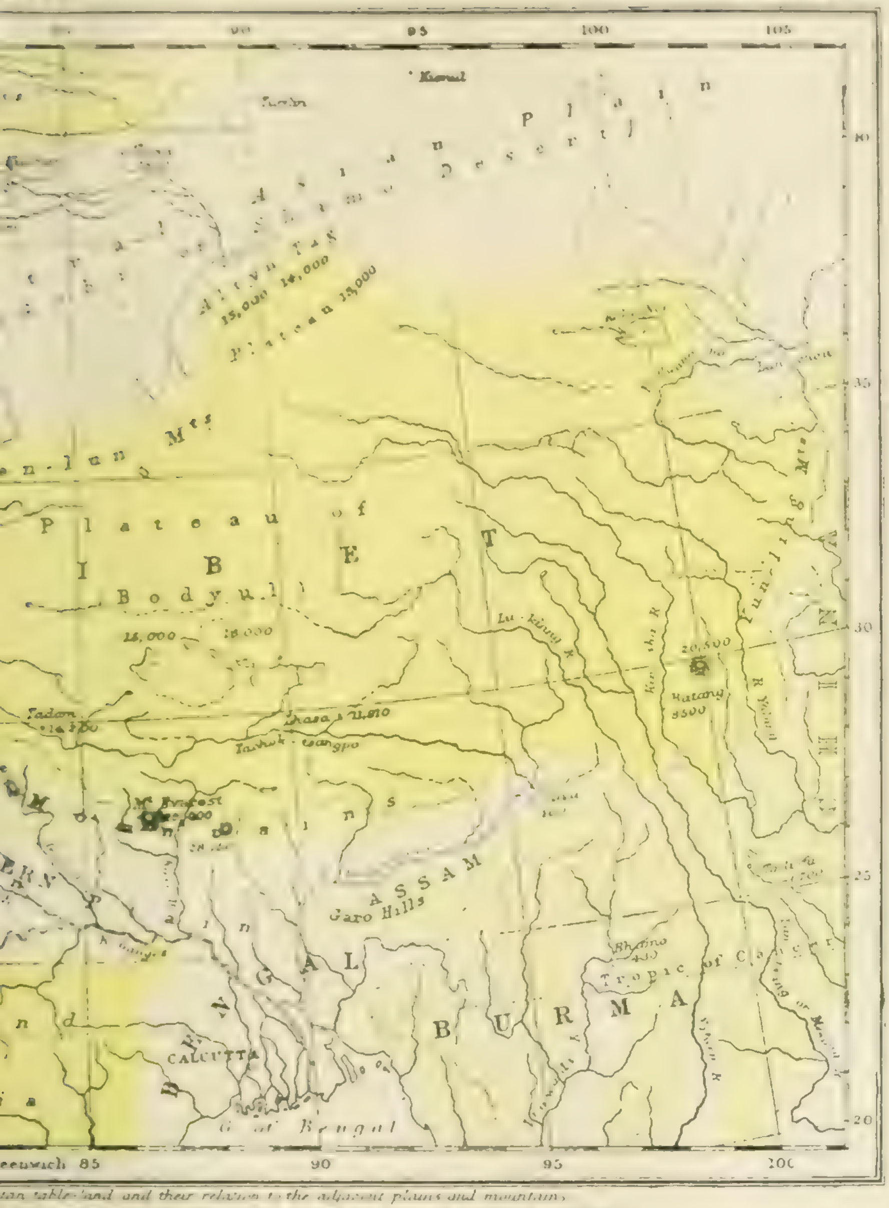


Sketch Map showing the connexion between the Himalaya Mountains and t

The darkest shade indicates the area the mean elevation of which exceeds [illegible] feet, the lighter

AYA. PLATE XVI



tan table-land and their relation to the adjacent plains and mountains

o show mountain areas of greater elevation. The space left uncoloured represents the great plains

or 9000 feet above the sea. It is on them that sanitary stations have been established for the convenience of the European residents in the neighbouring provinces of India, as affording the nearest sites to the plains at which a temperate climate can be reached. These ranges cover a breadth of about 60 or 70 miles, within which the magnitude of the mountains does not very greatly vary, their crests rarely going above 10,000 feet or falling below 5000 feet. Beyond this again another great change is observed, and the mountains rise rapidly and attain those surpassing heights which place the snow-clad summits of the Himalaya in the foremost rank of all the mountains of the earth.

Character west of Satlej. A remarkable deviation from the normal character of this zone of the mountains is observed to the west of the Satlej, where, combined with the exceptional extension of the sub-Himalayan ranges already noticed, is found what may perhaps be best described as an outlier of the great central axis of snowy mountains. With a marked change in respect to elevation, as well as in respect to its mineral constituents, the range locally known as the "Dhaoladhar," or White Mountain, rises directly from the dun of Kangra, the elevation of which is about 2500 feet, into the regions of perpetual snow, its highest points reaching an elevation of 16,000 to 17,000 feet. The same features are prolonged still further to the west beyond the Ravi, and this line of elevation forms the great snow-clad range that shuts in the valley of Kashmir on the south, there known as the Pir-panjál, the general elevation of which is from 14,000 to 15,000 feet, and the passes over it not lower than 10,000 feet.

Snowy ranges general position. With this exception the ranges covered with perpetual snow are first met with on the southern slope of the great Indo-Tibetan table-land, along a line between 80 and 90 miles from the foot of the outer mountains, and 20 or 30 miles south of the Indian watershed, and from this line northward snowy peaks abound everywhere over the summit of the table-land. The highest yet measured are near the Indian watershed, but as it is only in this region of the western Himalaya, and in northern Ladák, that any complete survey has been made, it is necessary to be cautious in making statements as to absolute maximum elevation, for the known in these mountains still bears far too small a proportion to the unknown to afford sufficient ground for safe speculation on such a subject.

Line of highest peaks. On the Himalayan slope the loftiest peaks are usually met on the first ranges that enter the limits of perpetual snow, advanced some 20 or 30 miles south of the Indian watershed, and not on a continuous ridge, but grouped in masses separated from one another by deep depressions, through which is discharged the drainage of the tract lying between them and the watershed.

Heights of peaks. The highest known peak in the Himalaya, and indeed in the world, is that in Nepál known as Mount Everest, which rises to 29,002 feet. Kinchinjinga, in Sikim, on the east, reaches 28,156 feet, and another peak more recently measured, in the extreme west, reaches 28,278 feet. Dhawalagiri, in Nepál, is stated to be 26,826 feet, and Nanda-devi, in Kumaon, to be 25,700 feet above the sea. But many other points have been measured exceeding 25,000 feet in elevation, two of which are to the north of Kumaon; and the enumeration of all known peaks over 20,000 feet would be wearisome. These statements have reference to the particular zone along the Indian watershed above described, beyond which, as was before said, few measurements have been made (excepting in Ladák), but there is every reason to believe, from such scanty facts as are available for forming an opinion, that mountains rising considerably above 20,000 feet are of frequent occurrence throughout Tibet.

Numbers of great peaks. To give a more precise idea of the character of the snowy zone, it will be worth while to state somewhat in detail the distribution of the great peaks which lie between the 78th and 81st meridians, in the provinces of Kumaon and Garhwal, which have been far better surveyed that any other part of the range. On a line of something less than 150 miles in length are found six great snowy groups, with five great rivers passing between them:—(1) on the east is the cluster of Api in Nepal, with a peak of 22,700 feet; (2) Yirnajang, between the Dárma river and the Káli, rising to 21,300 feet; (3) the Panch-chuli group, between the Darma river and the Gori, with a maximum of 22,700 feet; (4) the great compound mass which lies between the Gori and the Dhaoli rivers, consisting of Nanda-devi, Nanda-kot, Dunagiri, and Trisul, the first reaching 25,700 feet, the second 22,600 feet, the third 23,200 feet, and the last, having a length of more than 10 miles, no part of which is under 20,000 feet, its central point reaching 23,400 feet above the sea; (5) the peaks between the Dhaoli and Vishnuganga rivers, three of which lie between 22,300 and 22,600 feet; (6) the great group of Badarináth, Kedárnáth, and Gangotri, between the Alaknanda and Bhágirathi, the chief feeders of the Ganges, the first mass rising to 22,400 feet and the second to 22,900 feet, while the third has five points varying in height between these. All these masses are connected with the main watershed by ridges more or less covered with perpetual snow, on which have been measured two other peaks rising above 25,000 feet, several others reaching 23,000 feet, and many more between 19,000 and 20,000 feet. There is no reason for thinking that this gives an exaggerated idea of the vast scale on which these mountains are developed. There can be little doubt that as precise knowledge is advanced the number of peaks between 25,000 and 30,000 feet will be found to be very much extended; nor will it be surprising if points are eventually discovered exceeding 30,000 feet in altitude.

Elevation of Indian watershed. The average elevation of the crest of the Indian watershed, between the points where the Indus and Brahmaputra cross it, a distance of some 1500 miles, most probably exceeds 18,000 feet. At a comparatively few points only its continuity is broken, and it allows the passage of rivers that rise on its northern flank; but at all other parts its summit must be crossed to enter Tibet from the south. The passes over it, in ordinary use for men and animals, are frequently more than 18,000 feet above the sea, and except where it is broken through as just mentioned, one point only is believed to exist at which it can be surmounted under 16,400 feet. This pass, which leads directly from Kashmir into the Tibetan district of Drás, is only 11,300 feet, and is quite anomalous; such a depression elsewhere would have been sufficiently deep to open a passage for the drainage of the table-land, but the great depth of the valley further north, in which the Indus flows, here gives the waters a more favourable escape in that direction.

Valleys. The valleys which traverse the mountains between the plains and the great watershed are for the most part little more than gigantic ravines, at the bottom of which flows the river each contains, in a very contracted bed which at rare intervals opens out into a narrow alluvial flat capable of cultivation. The level of the river beds is necessarily very various. Valleys only 2000 or 3000 feet above the sea are often opened up into the very heart of the mountains, and carry with them the heat and vegetation of the tropics among ranges the summits of which are capped with eternal snow. In tracing up the larger streams it is usually found that on arriving within 10 miles of the line of the great peaks the rivers are flowing at an elevation of little more than 4000 or 5000 feet, but on crossing that line the acclivity suddenly and rapidly increases, and the river-beds in a very few miles are found to be at an altitude of 9000 or 10,000 feet, indicating that the sudden increase to the height of the mountains along this line is not confined to the peaks alone, but consists of a general elevation of the whole surface. Having once crossed the line of great peaks, the inclination of the valleys again becomes much less, and they thus continue for some miles, those that are fed from the larger glaciers frequently emerging from the ice at a level no more than 12,000 feet above the sea in the western mountains, 1000 or 2000 feet higher on the east.

Their slope.

The slope of the larger Himalayan rivers may be estimated to range from 20 feet per mile near the plains to between 100 and 200 feet per mile where they approach the snowy mountains. In their passage through these the inclination increases to as much as 700 or 800 feet in the mile, but to the north it is again reduced to 150 or 200 feet. Like all Indian rivers, they vary greatly in volume at different seasons of the year, and among the higher mountains are liable to special fluctuations from the more or less rapid melting of the snow from which they are fed. In the summer their waters increase and decrease with the varying temperature of the day or power of the sun, and in the winter they contract to a small fraction of their summer volume as the permanent frosts set in. In the lower parts of their courses the rivers commonly present an alternation of sparkling rapids with long reaches of deep, clear, tranquil water, in which the action of the current is often hardly visible; as we ascend, the rapids become by degrees more frequent and more impetuous, till in passing among the snowy mountains we find only the most furious torrents, pouring their turbid glacier waters over boulders of gigantic dimensions among which they are at times almost lost to view, and filling the valleys with their incessant roar.

Kashmir and Nepal

The valleys of Kashmir and Kathmándu, by their exceptionally large extent and comparatively level character, offer such remarkable deviations from the normal characters of Himalayan valleys as to require some comment. But the differences are after all rather in degree than in kind, and it would not be difficult to find somewhat similar areas, though on a much smaller scale of development. In Kashmir, too, is found one of the very few lakes which occur in the Himalaya. The almost complete absence of such collections of water is among the circumstances which serve to give a special character to the scenery of the Himalaya, and to distinguish it from that of European mountains.

Table-land of Tibet.

On crossing the Indian watershed into Tibet, the general character of the country completely changes. The summit of the table-land, though deeply corrugated with valleys and mountains in detail, is in its general relief laid out horizontally at a mean height little inferior to that of the watershed itself. The valleys of central Tibet are commonly long, flat, and open, of no great breadth, perhaps 1 to 3 miles, with a bottom of alluvial soil laid out nearly horizontally, from which the mountains rise abruptly on either side. The plateau of Gugé, immediately to the north of Kumaon, the average elevation of which is not less than 15,500 feet above the sea, and at the extremity of which lie the two lakes of Rákas-tál and Mánsarowar, the waters of which are also nearly at that level, is a remarkable expansion of the ordinary Tibetan valley, and calls for special notice. It varies in breadth from 15 to 60 miles, and its extreme length is 120 miles, lying along the upper course of the Sutlej, which runs through it at the bottom of a stupendous ravine furrowed out of the alluvial matter of which the plateau is formed, to a depth of 2000 or 3000 feet. Into this run, across the western part of the plain, numerous other similar ravines in every gradation of size, often for miles together as even and straight as a railway cutting; and so extraordinary is their magnitude in some cases that, in his account of a journey across the plateau, Moorcroft, a traveller of great accuracy in general, describes these slopes as those of mountains.

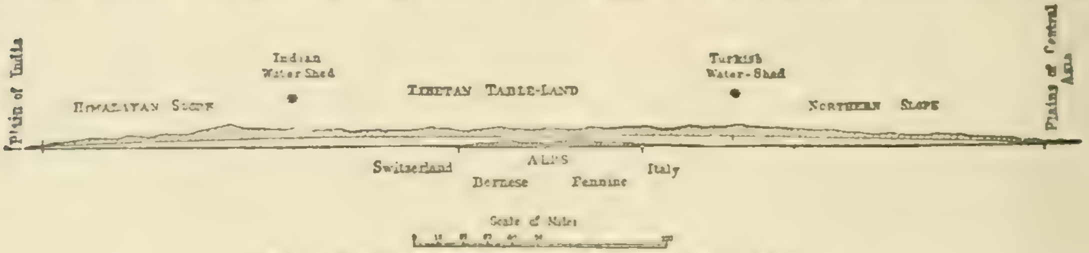


FIG. 1.—Sections of the Alps and of the Himalaya on the same scale.

Tibetan rivers and lakes

The main valleys are everywhere remarkable for their gentle slope, and in the central parts of the table-land the inclination at length frequently becomes so small as to give rise to the accumulation of the drainage in lakes, invariably salt when there is no efflux, and as invariably fresh when there is. The upper Indus has a slope as little as 3 feet per mile. Further to the west, as it approaches its great bend to the south, the inclination becomes greater, averaging about 24 feet per mile, and the width of its valley there is reduced. It descends to a level of little above 4000 feet before it finally leaves Tibet.

Comparison of Himalaya with Alps

It may aid in conveying a clear conception of the magnitude of these Himalayan masses, to compare them with the Swiss Alps, which will be familiar to many English readers. The above diagram represents on the same scale sections of the Alps and of the Himalaya, the curved line from which the latter are shown to rise representing the curvature of the earth. The Alps, measured across from the Lake of Thun to the plains of Lombardy, have a width of about 75 miles, the Tibeto-Himalayan mountains on a line drawn through Simla being about 400 miles across. To complete the comparison a few further explanations may be offered. The range that has already been noticed as the Dhaoladhar, which rises from the Kangra dún, if measured in breadth from Kangra to the upper Rávi, and in length between that river and the Byás in Kullu, is about equal to the whole of the Bernese Alps comprised between Altdorf and Martigny in length, and laterally between lines drawn along the Rhone and Reuss on one side, and through the Lakes of Lucerne and Thun to the Lake of Geneva at Vevay on the other. The area covered in both cases is rather less than 100 miles in length by 20 or 25 in breadth, the highest peaks being in the Alps the Finsteraarhorn, 14,100 feet, and in the Dhaoladhar a point 17,100 feet above the sea. The prolongation of the Himalayan ridge just spoken of, which bounds Kashmir on the south, known as the Pir panjál, would in like manner compare with the Pennine Alps and their continuation as far as St Gothard. Here the peak of Mont Blanc, 15,750 feet, slightly exceeds the highest point of the Pir panjal, which is but little over 15,500 feet, though, with this single exception, the Kashmir range certainly much exceeds in general mass that of the portion of the Alps compared with it. To obliterate these two ranges from the Himalaya would make no very sensible inroad on it, though they surpass in bulk the whole of the Swiss Alps; and it is no exaggeration to say that, along the entire range of the Himalaya, valleys are to be found among the higher mountains into which the whole Alps might be cast without producing any result that would be discernible at a distance of ten or fifteen miles. And it is important to bear in mind these relations of magnitude, for the terms at our disposal in the description of mountains are so limited that it is necessary to employ the words chain, range, ridge, spur, &c., rather with reference to relative than to absolute importance, so that the scale of our nomenclature changes with the extent and altitude of the mountains of which we speak.

[illegible]

An examination of the maps of the Himalaya indicates that throughout their whole extent a constant tendency is discernible for the rivers to flow either parallel to the general direction of the part of the chain through which they run, or perpendicular to it,—many or perhaps most of them combining both tendencies, and running first in the one direction and then in the other. The conclusion is hence suggested that the system of surface drainage is determined by a series of longitudinal and transverse lines of rupture along and across the mountains. The study of the rivers and mountains themselves confirms this view. In many cases an apparent diagonal direction is found to be really due to a succession of short abrupt bends, though no doubt the rivers at times actually take an oblique course across the mountains. Frequently, too, where a river changes from a longitudinal to a transverse direction, another longitudinal stream meeting the first flows down from an exactly opposite direction. The same disposition is otherwise often exhibited by the occurrence of both transverse and longitudinal lines of drainage, or valleys, starting in opposite directions from the same point on the main ranges, while a depression occurs in the ridge at the point whence such valleys take their departure.

Arrangement of mountain features.

As the rivers and ridges that separate them must be laid out on the same general plan, it is natural to find in these last the same tendency to follow lines perpendicular, or parallel, to the general direction of the chain. There is no part of the mountains in which these peculiarities may not be traced, the longitudinal character prevailing on the summit of the table-land, and the transverse being dominant on the Himalayan slope. By the combination of these tendencies the rivers flow to the plains along a line generally oblique to the component parts of their actual course; and the watershed ridges that separate them follow corresponding directions. But such watershed lines rarely have any true structural continuity, however strongly they may be marked on our maps, and great caution must be exercised in inferring physical relations among such features of the mountains without obtaining some knowledge of their geological structure.

Geology. Imperfection of data.

Considering the vast extent of these mountains, and the material and political difficulties in the way of the traveller who visits them, it is not surprising that the knowledge of their geological structure is still very imperfect. From causes which are not very obvious, important parts of the deposits of which they consist have till now not yielded any fossil remains by which their age can be determined; the visits of qualified geologists to the more remote parts of the chain have been very rare; and it is only within the last few months that any connected memoir on the subject has been published. Much that has been written on it is of too speculative a nature to find place in such an account as the present, and all that can be attempted is a brief outline of the main conclusions that seem established.

The great plain.

Of the great Indian plain nothing very definite can be said. It is an alluvial deposit of sandy clay, on the surface of which nothing in the shape of a pebble can be found excepting in the immediate vicinity of the hills that rise from it. In one place alone, in the north west, on the Jumna river, have fossil remains been found imbedded in it, at some depth below the surface. They belonged to terrestrial mammals, with fish and crocodiles, which seem to be of the post-Tertiary epoch. A few borings have been made to depths of some hundreds of feet, but they throw no great light on the subject of the origin of the plain. There is no direct evidence either for or against its having been laid out by the sea; on the one side it seems difficult to understand how so even a surface could have been produced otherwise than under the sea, while on the other there is a complete want of marine remains both in the alluvium itself and in the most recent deposits which form the hills that rise from it. It seems to be admitted that some parts of the alluvial plain of the Indus have been submerged, and in any case, if it was produced by river action, it must have been by rivers having a very small inclination, and in a delta, or at a low elevation.

The outer Siwáliks.

The outermost ranges of the sub-Himalaya are also geologically the most recent. They are composed of grey micaceous sandstones, generally very soft and often quite unconsolidated, with beds of red and blue clays and marls interspersed, and boulder and gravel beds, at times hardly to be distinguished from those formed in the existing rivers, and often cemented by carbonate of lime into conglomerates. Though these formations are most strongly developed to the west, they have been observed in Nepál and also in Bhotán. It is from the ranges in the vicinity of the Jumna river that the characteristic Siwálik fossils have chiefly been obtained. They consist of numerous species of mammals and reptiles, with a few fish, birds, and mollusca,—all, however, remains of land or fresh-water animals, with no certain trace of marine creatures. Lignite occurs in thin isolated beds in small quantities. It had been commonly supposed that the Siwálik fauna was of Miocene age. The later views rather point to its being Pliocene. Sixteen genera among the fossil remains have not been found in any beds older than Pliocene, and of the many genera which continue to the present time, some of the forms preserved in these fossils are remarkably similar to existing species, all of which indicates a closer relation to the more recent than to the older Tertiaries.

The inner sub-Himalaya.

In close juxtaposition with this external band, but connected geologically in a manner that has not been very clearly established, is an older series of beds, the lowest of which is nummulitic and of the oldest Tertiary epoch. The fossils found in these beds are as markedly marine as those of the other series are terrestrial. The junction of the newer with this more ancient series is concealed by disturbances, and the former has not been found overlying the latter, but only abutting upon it. This older section of the Tertiary beds of the sub-Himalaya has only been properly made out to the west of the Jumna, though it is likely that it is also represented in the central and eastern parts of the chain by certain sandstones which occur there at the foot of the higher mountains. It may be surmised also that the nummulitic beds of these ranges are connected on the one side with those which are found to the west of the Indus extending to Sindh, and on the other with the nummulitic rocks of the hills south of Assam.

A complete change of geological character occurs on

The outer part of the chain.

passing from these outer and lower ranges to those higher mountains which extend to the line of snowy peaks. On the west of the chain the first of these ranges consists of argillaceous shales and schists, grits and limestones, intersected by several lines of igneous action, and all devoid of fossil remains. True slates also occur. The stratification is everywhere well marked, the dip being usually towards the interior of the chain at an angle of from 10° to 20°. Portions of the mountains are found in which the dip is quite reversed, or towards the plains, a result no doubt of absolute rupture and partial dislocation. The lines of igneous action follow generally the line of strike, the type of the rock being greenstone, and conglomerates or breccias being often associated with it.

Probable age and relations.

How far these beds extend to the eastward is somewhat in doubt. Suggestions have been made that they are the representatives of the Silurian or other fossiliferous beds found to the north of the great snowy mountains, but the evidence for this is hardly conclusive. The occurrence at the foot of the mountains in Sikim and Bhotan of a deposit containing fossil coal-plants, which are apparently identical with those of the Bengal coal-field, renders it probable that the rocks there are of the age of that coal, that is to say, of the lower Trias, a conclusion which somewhat serves to corroborate the speculation as to the age of the western beds just referred to.

Lines of granite and other igneous rocks.

In certain parts of this outer region of the mountains granite also occurs, accompanied by gneiss and mica-schist, the latter often abounding in garnets. In mineralogical character this granite and its accompanying schists differ greatly from those of the great peaks, which are also formed of granite and schists; this has suggested a possible difference of age, and it remains uncertain whether any or what connexion exists between them.

The snowy mountains.

As we approach the line of great peaks the rocks pass into highly crystalline gneiss or mica schist, and another more continuous line of granite intrusion occurs, divided into several branches, but distributed generally on the line of strike, that is, along the principal direction of the chain itself. It is chiefly in veins, though it expands at times into masses of considerable size, and more rarely into outbursts large enough to constitute whole mountains. The general dip of the strata continues throughout this area to be directed inwards, its angle being increased to as much as 45°, though seldom to more than that. Beds of highly crystalline limestone, some pure, and some not easily distinguished from the gneiss or mica schist among which they occur, are common along a band following the direction of the strike. The vein granite is usually large-grained; hornblende at times replaces the mica; the felspar is invariably white, and crystals of schorl and kyanite are frequently seen in it.

Great peaks.

The great peaks are, with few exceptions, composed of schistose rock, though granite veins may be seen in the mountain faces to very great elevations; one of these exceptions is the great peak of Kámet in Kumaon, which rises to about 25,000 feet in what appears to be a mass of grey granite.

Fossiliferous rocks on Tibetan border.

Passing to the north of the line of great peaks the metamorphosed schists are suddenly replaced by slates and limestones, which are in many places highly fossiliferous, exhibiting what appears to constitute in the aggregate a fairly continuous series from the Lower Silurian to the Cretaceous formations, though the complete sequence has not been observed in any one locality. The western region of the Himalaya alone has been sufficiently explored to admit of any positive statements, but the indications gathered from such imperfect materials and other data as exist relative to the eastern parts of the mountains leave little doubt that the characters observed in the west on approaching and entering Tibet holds good on the east also, and that the general physical features of the whole tract are much alike, though doubtless with many differences in detail.

Eocene? Tertiary.

The fossiliferous strata of western Tibet are continued, though perhaps with some breaks, to the Tertiary period. In certain localities nummulitic rocks, probably Eocene, have been observed, and from the great alluvial deposit which forms the plain of Gugé, already noticed, the remains of mammals, apparently of Siwálik age, have also been obtained. Among these were bones of the elephant and the rhinoceros, the existence of which, in the present condition of these regions, would be wholly impossible; so that there is no room to doubt that these deposits have been raised from a comparatively low level to their existing great elevation of upwards of 15,000 feet, since they were laid out. As in the case of the plain of India, we here, too, have no complete proof of the origin of these great nearly horizontal deposits, but it seems clear from the materials of which they are formed, that they must have been laid out by water, either by the sea or some great inland lake. They are largely composed of boulder deposits, and large boulders are strewed over the surface imbedded in the ground in a manner that seems only explicable as the result of the action of a considerable body of water.

Eruptive rocks in Tibet.

Several lines of granitic and eruptive rock occur in western Tibet, of which all that need here be said is that they appear all to be older than the Tertiary alluvium, but some of them are possibly contemporaneous with the nummulitic and older formations.

Epoch of elevation.

The general conclusion that may be drawn from the facts of structure thus briefly indicated is that the elevation of the Himalaya to its present great height is of comparatively recent occurrence. An area of land must have existed where the main line of snowy peaks now stands, which has not been submerged since the Palæozoic period, and which then had its northern boundary somewhere along what has been termed the Indian watershed. Evidence of a similar ancient sea on the south also exists, but in a less definite shape; and whether it was united with the northern sea or not is still a matter of conjecture, though the distinctive character of the fossils rather indicates that there was no direct union. The possible connexion of this ancient Himalayan land area with the pre-Tertiary land of the peninsula of India is also only a matter for speculation.

Ancient pre-Tertiary land.

There is further reason to infer that the existence of the great line of peaks is rather due to some previous line of elevation on the ancient land, which has continued to retain its relative superiority while the whole area has been raised, rather than to any special line of energy of upheaval of recent date; and that the fundamental features of its former configuration of surface in mountain and valley have been preserved throughout. There is evidence for the conclusion that the chief rivers of the pre-Tertiary land issued from the mountains where the present main streams are found, and this embryo Himalaya may have been of such moderate height as to have permitted the passage across it of the Siwálik mammals, the remains of which appear both on the border of the Indian plain and in Tibet. It is after the middle Tertiary epoch that the principal elevation of these mountains must have taken place, and about the same time also took place the movements which raised the table-lands of Afghanistan and Persia, and gave southern Asia its existing outlines.

Forces to which elevation is due; their mode of action.

The best answer that can be given to an inquiry as to how changes of level could have arisen, such as those which are observed in the Himalaya, is that they should be regarded as due rather to secondary actions consequent on the general contraction of the cooling terrestrial sphere than to direct elevating forces, for which no known origin can be assigned. The contraction of the cooling but now solid crust of the earth must have set up great horizontal strains, partly of tension and partly of compression, which would necessarily have been followed by rupture or crushing along lines of least resistance, and the movements on such lines are marked by the great mountain ranges that traverse the surface. A dislocation of the solid crust of the earth once having taken place, it would probably continue to be a line of least resistance ever after, and a succession of movements during past geological periods may thus be reasonably expected along such lines. Somewhat in proportion as the disturbing forces are intense, and the thickness of the crust on which they act is great, will be the tendency for the lines of rupture to be continuous for a considerable distance; and as the disturbed area is extended in its dimensions, the probability will increase of a repetition of a series of similar dislocations on lines approximately parallel to, or at right angles to, one another, and to the line on which the greatest compression and consequent tension take place. In a disturbed area, one transverse dimension of which is sensibly greater than the rest, the longitudinal ruptures will predominate in the interior and the transverse towards the borders. Almost all mountains give indications of having been shaped by forces thus related, and to the action of such forces may the main characteristics of the structure of the Himalaya, and the arrangement of its ranges and valleys, be attributed. Whatever may be the power of rivers in general as instruments of erosion, and whatever effect the Himalayan rivers have had in removing the fragments of the rocks over and among which they took their courses, it is hardly possible to doubt that their main directions were determined by the anterior lines of dislocation which opened up hollows down which they could flow, and which must invariably have been accompanied by a destructive and crushing action on the rocks along them, which has enabled the waters the more readily to sweep away the obstacles in their path. The parallelism of many of the great Tibetan and Himalayan rivers for hundreds of miles together, amid such mountains, seems wholly inexplicable in any other manner.

Meteoro- [illegible] atmo-sphere

Although the loftiest mountains when compared to the earth's diameter are insignificant in their dimensions, and the irregularities of the surface would hardly be perceptible on any sphere, however large, that could be made to represent the earth, yet in relation to the depth of the atmosphere even moderate elevations become of great importance, and such heights as those reached by the Himalaya introduce modifications of climate in ascending over its slopes that are not surpassed by those observed in moving from the equator to the poles. One half of the total mass of the atmosphere and three-fourths of the water suspended in it in the form of vapour lie below the average elevation of the Himalaya, and of the residue one half of the air and virtually almost all the vapour come within the influence of the highest peaks.

Barometric pressure and vapour.

The general changes of pressure of the atmosphere indicated by the barometer extend in a modified but well-marked manner to the greatest elevations to which observation has been carried, and the annual and diurnal oscillations are not less regular in Tibet than in the plains of India, though somewhat reduced in amount. With the increase of elevation the diminution of the quantity of vapour held in suspension is very marked, and at the greatest heights reached there is found not more than one-sixth or one seventh part of that observed at the foot of the mountains, and the proportion is sometimes as low as a tenth, or less. As is well known, the maximum quantity of water that can be suspended in the air in a state of vapour depends on the temperature of the air, and observation has established that the actual quantity at all elevations is approximately proportionate to this maximum, and is thus determined by the temperature, which in turn is regulated by the elevation. The theoretical view once held that watery vapour was distributed in the atmosphere in accordance with the laws of pressure of elastic fluids is manifestly inconsistent with observed facts, which indicate that the diffusion of vapour is powerfully obstructed by the air particles, and that it by no means behaves as an independent elastic fluid, but rather as though it were merely mixed up with or entangled among the air particles.

Temperature of Himalaya.

The great elevations to which the Himalaya ascends, and the broad zone which it covers in respect to latitude, and its varying distance from the sea necessarily lead to correspondingly great variations of climate in its different parts, including the temperature and the degree of humidity in the atmosphere, and the amount of rainfall. The general position of the whole tract between the 25th and 35th degrees of north latitude renders it subject to high summer temperatures. The heat of the great plain of northern India is not surpassed at any other part of the earth, the air temperature rising in the hottest months to more than 110° Fahr.; the fall of temperature in the winter is considerable, the thermometer receding at times to the freezing point, or even a little below it; the mean temperature varies from 78° Fahr. in the east or southern portion to 75° in the west or north. On the mountains every altitude has its corresponding temperature, an elevation of 1000 feet producing a fall of about 3⅓°, or 1° Fahr. to 300 feet. The mean winter temperature at 7000 feet is about 44° Fahr., with a mean minimum of 32° Fahr., and the summer mean about 65° Fahr. At 9000 feet the mean temperature of the coldest month is 32° Fahr., at 12,000 feet the thermometer ceases to fall below freezing point from the end of May to the middle of October, and at 15,000 feet it is seldom above that point at the coldest part of the day in the height of summer. There seems to be less variation of temperature at equal altitudes on the mountains in passing from east to west than might have been expected from the greater winter cold of the western part of the plains. This is probably due to the greater relative humidity and heavier rainfall of the eastern regions, and the denser vegetation which covers them. These influences tend to keep down the day temperature on the eastern mountains, while the clearer skies and more open character of the west operate in the opposite direction. On the more woody and rainy mountains in the outer parts of the chain the mean summer temperature will be 60° at 10,000 or 11,000 feet, but it will still be as much as that up to 12,000 feet, or even to a greater elevation, in the bare and sunny valleys near the Indian watershed.

Of Tibet.

In Tibet the thermometrical conditions vary considerably from those of the Himalayan slope. At 12,000 feet the maximum temperature is perhaps 70° Fahr. and the absolute minimum 5° Fahr. The ordinary winter temperature is from 0° Fahr. to 30° Fahr., with a mean of the coldest month of 10°. The mean of the hottest month is about 60°, and of the year 35° At 15,000 feet the frost is permanent from the end of October to the end of April, and the lakes are usually frozen over for nearly five months in the year. Between 15,000 and 16,000 feet the thermometer will fall below the freezing point every night of the year. At heights of 17,000 or 18,000 feet it rises considerably above that point in the summer months. From 18,000 to 19,000 feet it thaws only in the afternoons of July and August, and at 20,000 feet there is probably perpetual frost in the shade, though in the sun the air no doubt rises above the freezing point to much greater elevations.

Freezing of rivers. All the rivers in Ladák are frozen over every winter down to 8000 feet, a phenomenon that has been nowhere seen in the Himalaya, the rivers that are accessible during winter being at too small an elevation to be ever frozen, and the main streams probably everywhere too rapid.

Diurnal and other ranges of temperature. The diurnal range of temperature is directly dependent on the condition of the surface and the state of the sky. On all well-wooded ranges it is very small, particularly in the cloudy and rainy months, when it will not exceed 5° or 6°. In the dry months of April or May, before the summer rains begin, and in the autumn when clear skies again prevail, the variation is greatest. In Tibet it is greatest in summer and least in winter, which is the most cloudy season. The annual variation follows a similar law, 20° being about the minimum mean monthly range on the wooded outer mountains while in Tibet it amounts to as much as 50°.

Comparison of eastern and western parts of chain. The difference of temperature between ranges densely clad with forest and the Indian plains may be twice as much in April and May as in December or January; and the differences between the temperatures of a well-wooded hill-top and an open valley below have been observed to vary as much as from 9° in the coldest to 24° in the hottest hour. Precisely the converse may be found to hold good in comparing greater altitudes in Tibet with lesser in the Himalaya, where the humidity is greater.

General relation of temperature to altitude. It is generally true here as elsewhere—(1) that the decrement of temperature with altitude is most rapid in summer; (2) that the annual range diminishes with elevation; and (3) that the diurnal range also diminishes with elevation. But the greater quantity of cloud and the more dense covering of forest between 9000 and 10,500 feet render comparisons between this zone and the more open and less cloudy regions above and below anomalous, for reasons that will be apparent after the above remarks.

Rainfall: periodicity, how caused. The chief rainfall on the Himalaya, like that of India generally, occurs in the summer months between May and October, the remainder of the year being comparatively dry. The physical causes which give rise to the south-west monsoon, under which name is known the season of summer rain as well as the south-westerly winds which accompany it, have been sufficiently explained in the article on Asia, to which the reader is referred for further details.

General distribution. The fall of rain over the great plain of northern India gradually diminishes in quantity, and begins later, as we pass from east to west. At the same time the rain is heavier as we approach the Himalaya, and the greatest falls are measured on its outer ranges; but the quantity is again much diminished as we pass onward across the chain, and on arriving at the border of Tibet, behind the great line of snowy peaks, the rain falls in such small quantities as to be hardly susceptible of measurement.

Mountain winds, their causes. An important agent in distributing the rain which falls over the Himalaya, if indeed it be not the essential one, is found in the diurnal currents of wind which are established from the plains towards the mountains, and *vice versa*, blowing up the valleys towards the main watershed from about 8 A.M. to 8 P.M., and in the opposite direction during the corresponding hours of the night. These diurnal winds, which are a very striking phenomenon, and blow in the afternoon with great force along the Himalayan and Turkish water-shed and the neighbouring parts of the plain of Tibet, are common to all mountains, and are no doubt due to the disturbances of the planes of equal atmospheric pressure in a direction transverse to the mountains, caused by the unequal diurnal expansion and contraction of the columns of air respectively over the plains and mountains, the former being considerably longer than the latter, so that the planes of equal pressure are lifted by expansion higher over the plains during the day, and depressed by contraction during the night, thereby setting up currents to and from the highest region of the mountains, as these alternating actions take place.

Their effects in relation to rain. The condensation of vapour from the ascending currents thus set up across the Himalaya from the Indian plain, and their gradual exhaustion by repeated precipitations as they cross successive ranges, is manifested to the traveller on the face of the mountains themselves, by the changes observed in the vegetation on passing to leeward of any important range, and more especially the line of great snow peaks. In the rainy months in the higher parts of the chain the southern face of each ridge is clothed by the day upwind with a crest of cloud, which hangs upon it, the northern face being often left entirely free, thus showing how large a portion of the vapour is arrested, and showing also that it is only up the deeper gorges that a small supply of moisture finds its way to the Tibetan table-land.

Quantity of rain measured. The yearly rainfall, which amounts to between 60 and 70 inches in the delta of the Ganges, is reduced to about 40 inches where that river issues from the mountains on the 78th meridian, and is no more than 30 inches near the foot of the mountains at the issue of the Indus. At Darjeling, at about 7000 feet on the east, on the outer border of the mountains, it amounts to about 120 inches; at Naini-tal, at about the same elevation and similarly situated in 79½° E. long., it is about 90 inches; and further west it is still more reduced in quantity. In passing from the exterior to the interior of the chain the quantity greatly diminishes. In Kumaon, while in three months 49 inches was registered at Naini-tal on the outer range, only 19 inches fell at Almora, at 5600 feet, 30 miles further in. At Joshimath, 50 miles onward and close under great snowy peaks, at 6500 feet, 22 inches were measured in the same period; while at Niti, 11,500 feet behind the snowy peaks, the fall did not exceed 5½ inches. In a week of rainy weather, when 1½ inches fell at Joshimath, half an inch was measured at Niti; while beyond the Tibetan watershed during the same period the rain fell in a very faint drizzle which could not be measured at all. Similar facts might be quoted from the eastern mountains.

Snow-fall. In the eastern Himalaya the ordinary winter limit of snow is 6000 feet, and it is rare for even 3 inches to remain as many days on the ground on a southern exposure at 7000 feet. In Kumaon, on the west, it is pretty certain that snow will fall every year at about 6500 feet, and at 5000 feet it will not fail one year out of ten; the lowest level to which sporadic snowfalls are known to descend is about 2500 feet, of which two or three instances have occurred in the present century. At Peshawar, at an elevation of a little above 1000 feet, snow occasionally falls, but very rarely. At Lé, in western Tibet, the results of two years observations indicate that the depth of snow that falls is less than 2 feet, the heaviest continued fall measuring 8 inches and lasting three days, at an elevation of 12,500 feet. Depths of 3 feet have been measured on passes between 17,000 feet and 19,000 feet above the sea. On the Indian watershed the falls are much heavier, and even in September the passes are sometimes quite blocked by the falls which commonly occur after the equinox, and they are not usually open again till the middle of June.

The snow line. It is now satisfactorily established that the snow line, or the level to which snow recedes in the course of the year, ranges from 15,000 to 16,000 feet on the southern exposures of the Himalaya that carry perpetual snow, along all that part of the chain that lies between Sikim and the Indus. It is probably not till December that the snow begins to descend for the winter, though after September light falls occur which cover the higher mountains down to 12,000 feet, but these soon disappear. On the Indian watershed the snow line is not lower than 18,500 feet, and on the summit of the table land it reaches a height of about 20,000 feet. On all the higher passes into Tibet the vegetation reaches to about 17,500 feet, and in August they may all be crossed in ordinary years, even up to 18,400 feet, without finding any snow upon them; and it is as impossible to find snow in the summer on the great plain of Guge in western Tibet, at 15,500 feet above the sea, as on the plains of India.

Cause of [illegible]

There was at one time much discussion as to the true cause of the level of the snow line being higher in Tibet than on the outer ranges of the Himalaya. But the reason is obvious, namely, the greater quantity of snow that falls on the exterior ranges. The snow line marks the limit beyond which some snow always remains unmelted, that is, the point where on the average of years the summer heat will destroy the winter's snow. The main element in determining such a point will evidently be the quantity of winter snow that falls, the summer heat being not very different over the whole area. That the fall of snow on the outer ranges is greater than it is nearer the watershed at the same elevation is beyond doubt, and the smaller quantity of snow is more easily and earlier melted.

Glaciers.

It was long affirmed that there were no true glaciers in the Himalaya, and ingenious arguments were adduced to account for their absence. But, in fact, they abound along all the higher ranges precisely in those circumstances under which they are found elsewhere, and all the phenomena observed elsewhere in connexion with them are reproduced in these mountains.

Elevations at which found.

The level to which the Himalayan glaciers descend is very various, being greatly dependent on local conditions, principally the extent and elevation of the snow basins which feed them, and the slope and position of the mountain on which they are formed. A glacier formed on the southern face of the Himalaya may readily be in a position in which it might, with a length of 10 miles, descend from 18,000 feet to 11,500 feet. But in Tibet, or in the highest valleys, it might as readily happen that in 10 miles no lower level than 16,000 feet could be reached. With a larger snow basin on the south the greater waste in reaching the lower level might easily be compensated, while no conceivable supply would enable the Tibetan glacier to reach 11,500 feet, to do which it must extend perhaps 100 miles. These considerations will sufficiently explain the fact that the glaciers on the outer slopes of the Himalaya descend much lower than is commonly the case in Tibet, or in the most elevated valleys near the watershed. The glaciers of Sikim and the eastern mountains are believed not to reach a lower level than 13,500 or 14,000 feet. In Kumaon many of them descend to between 11,500 and 12,500 feet. In the higher valleys and Tibet 15,000 and 16,000 feet is the ordinary level at which they end, but there are exceptions which descend far lower. In Europe the glaciers descend between 3000 and 5000 feet below the snow line, and in the Himalaya and Tibet about the same holds good. The summer temperatures of the points where the glaciers end on the Himalaya also correspond fairly with those of the corresponding positions in European glaciers, viz., for July a little below 60° Fahr., August 58°, and September 55°.

Their movement.

Measurements of the movement of Himalayan glaciers have been made which also give results according closely with those obtained under analogous conditions in the Alps, viz., rates from 9½ to 14¼ inches in twenty-four hours. The motion of one glacier from the middle of May to the middle of October averaged 8 inches in the twenty-four hours. The average yearly motion of the glacier of the Aar is said to be 7½ inches in twenty-four hours. The dimensions of the glaciers on the outer Himalaya, where as before remarked, the valleys descend rapidly to lower levels, are fairly comparable with those of Alpine glaciers, though frequently much exceeding them in length—8 or 10 miles not being unusual. In the elevated valleys of northern Tibet, where the destructive action of the summer heat is far less, the development of the glaciers is enormous. At one locality in north western Ladak there is a continuous mass of snow and ice extending across a snowy ridge, measuring no less than 64 miles between the extremities of the two glaciers at its opposite ends. Another single glacier has been surveyed 36 miles long.

Former extension beyond present limits.

In connexion with almost all the Himalayan glaciers of which precise accounts are forthcoming are found ancient moraines indicating some previous condition in which their extent was much larger than now. In the east these moraines are very remarkable, extending 8 or 10 miles. In the west they seem not to go beyond 2 or 3 miles, and they have been observed on the summit of the table land as well as on the Himalayan slope. The explanation suggested to account for the former great extension of glaciers in Norway would seem applicable here. Any modification of the coast-line which should submerge the area now occupied by the North-Indian plain, or any considerable part of it, would be accompanied by a much wetter and more equable climate on the Himalaya; more snow would fall on the highest ranges, and less summer heat would be brought to bear on the destruction of the glaciers, which would receive larger supplies and descend lower. Such an explanation is not inconsistent with what is known of the geological formation of the mountains, and appears to be otherwise supported by the evidence of a greater former extension of the lakes of Tibet, and of the former existence of rivers flowing from the Himalaya between the Jumna and the Sutlej, the dry beds of which are now to be traced, in which water is never seen. Till now no geological evidence has been adduced to indicate in this region anything corresponding to the glacial epochs of northern Europe, to which these former extensions of the glaciers could be attributed.

Botany. General characteristics of flora.

Speaking broadly, the general type of the flora of the lower, hotter, and wetter regions, which extend along the great plain at the foot of the Himalaya, and include the valleys of the larger rivers which penetrate far into the mountains, does not differ from that of the contiguous Malayan peninsula and islands, though the tropical and insular character gradually becomes less marked as we pass from east to west, where, with a greater elevation and distance from the sea and higher latitude, the rainfall and humidity diminish and the winter cold increases. The vegetation of the western part of the plain and of the hot test zone of the western mountains thus becomes closely allied to, or almost identical with, that of the drier parts of the Indian peninsula, more especially of its hilly portions; and, while a general tropical character is preserved, forms are observed which indicate the addition of an Afghan as well as of an African element, of which last the gay lily *Gloriosa superba* is an example, pointing to some previous connexion with Africa.

Relation to neighbouring areas.

The European flora, which is diffused from the Mediterranean along the high lands of Asia, extends to the Himalaya; many European species reach the central parts of the chain, though few reach its eastern end, while genera common to Europe and the Himalaya are abundant throughout and at all elevations. From the opposite quarter an influx of Japanese and Chinese forms, such as the rhododendrons, the tea plant, *Aucuba*, *Helwingia*, *Skimmia*, *Adamia*, *Goughia*, and others, has taken place, these being more numerous in the east and gradually disappearing in the west. On the higher and therefore cooler and less rainy ranges of the Himalaya the conditions of temperature requisite for the preservation of the various species are readily found by ascending or descending the mountain slopes, and therefore a greater uniformity of character in the vegetation is maintained along the whole chain. At the greater elevations the species which are identical with those of Europe become more frequent, and in the alpine regions many plants are found identical with species of the Arctic zone. On the Tibetan plateau, with the increased dryness, a Siberian type is established, with many true Siberian species and more genera; and some of the Siberian forms are further disseminated, even to the plains of Upper India. The total absence of a few of the more common forms of northern Europe and Asia should also be noticed, among which may be named *Tilia*, *Fagus*, *Arbutus*, *Erica*, *Azalea*, and *Cistaceæ*.

Eastern mountains.

In the more humid regions of the east the mountains are almost everywhere covered with a dense forest which reaches up to 12,000 or 13,000 feet. Many tropical types here ascend to 7000 feet or more. To the west the upper limit of forest is somewhat lower, from 11,500 to 12,000 feet, and the tropical forms usually cease at 5000 feet.

The outer ranges.

In Sikim the mountains are covered with dense forest of tall umbrageous trees, commonly accompanied by a luxuriant growth of under shrubs, and adorned with climbing and epiphytal plants in wonderful profusion. In the tropical zone large figs abound, *Terminalia*, *Shorea* (sál), laurels, many *Leguminosæ*, *Bombax*, *Artocarpus*, bamboos, and several palms, among which species of *Calamus* are remarkable, climbing over the largest trees; and this is the western limit of *Cycas* and *Myristica* (nutmeg). Plantains ascend to 7000 feet. *Pandanus* and tree-ferns abound. Other ferns, *Scitamineæ*, orchids, and climbing *Aroideæ* are very numerous, the last-named profusely adorning the forests with their splendid dark-green foliage. Various oaks descend within a few hundred feet of the sea-level, increasing in numbers at greater altitudes, and becoming very frequent at 4000 feet, at which elevation also appear [illegible], *Magnolia*, cherries, *Pyrus*, maple, alder, and birch, with many *Araliaceæ*, *Hollbollea*, *Skimmia*, *Daphne*, *Myrsine*, *Symplocos*, and *Rubus*. Rhododendrons begin at about 6000 feet and become abundant at 8000 feet, from 10,000 to 14,000 feet forming in many places the mass of the shrubby vegetation which extends some 2000 feet above the forest. Epiphytal orchids are extremely numerous between 6000 and 8000 feet. Of the Coniferæ, *Podocarpus* and *Pinus longifolia* alone descend to the tropical zone; *Abies Brunoniana* and *Smithiana* and the larch (a genus not seen in the western mountains) are found at 8000, and the yew and *Picea Webbiana* at 10,000 feet. *Pinus excelsa*, which occurs in Bhotán, is absent in the wetter climate of Sikim.

Inner ranges.

On the drier and higher mountains of the interior of the chain, the forests become more open, and are spread less uniformly over the hill-sides, a luxuriant herbaceous vegetation appears, and the number of shrubby *Leguminosæ*, such as *Desmodium* and *Indigofera*, increases, as well as *Ranunculaceæ*, *Rosaceæ*, *Umbelliferæ*, *Labiatæ*, *Gramineæ*, *Cyperaceæ*, and other European genera.

Alpine and Tibetan regions.

The alpine flora of Sikim closely resembles that of the western Himalaya, and so far as generic forms are concerned, that of the alpine regions of Europe and western Asia. The vegetation of the Tibetan region appears on rising above 11,000 feet, and its last representatives reach even to 18,000 feet.

Flora of central region.

Passing to the westward, and viewing the flora of Kumaon, which province holds a central position on the chain, on the 80th meridian, we find that the gradual decrease of moisture and increase of high summer heat are accompanied by a marked change of the vegetation. The tropical forest is characterized by the trees of the hotter and drier parts of southern India, combined with a few of European type. Among them are *Moringa*, *Bombax*, *Butea*, *Anogeissus*, *Erythrina*, *Acacia*, *Bauhinia*, *Nauclea*, and *Ulmus integrifolia*. *Pinus longifolia* descends almost to the level of the plains. Among the more common shrubs are *Zizyphus*, *Adhatoda*, *Calotropis*, *Carissa*. Ferns are more rare, and the tree-ferns have disappeared. The species of palm are also reduced to two or three, and bamboos, though abundant, are confined to a few species.

The outer ranges' forests.

The outer ranges of mountains are mainly covered with forests of *Pinus longifolia*, rhododendron, oak, and *Pieris*. At Naini-tal cypress is abundant. The shrubby vegetation comprises *Rosa*, *Rubus*, *Indigofera*, *Desmodium*, *Berberis*, *Bœhmeria*, *Viburnum*, *Clematis*, with an *Arundinaria*. Of herbaceous plants species of *Ranunculus*, *Potentilla*, *Geranium*, *Thalictrum*, *Primula*, *Gentiana*, and many other European forms are common. In the less exposed localities, on northern slopes and sheltered valleys, the European forms become more numerous, and we find species of alder, birch, ash, elm, maple, holly, hornbeam, *Pyrus*, &c. At greater elevations in the interior, besides the above are met *Corylus*, the common walnut, found wild throughout the range, horse chestnut, yew, also *Picea Webbiana*, *Pinus excelsa*, *Abies Smithiana*, *Cedrus Deodara* (which tree does not grow spontaneously east of Kumaon), and several junipers. The denser forests are commonly found on the northern faces of the higher ranges, or in the deeper valleys, between 8000 and 10,500 feet. The woods on the outer ranges from 3000 up to 7000 feet are more open, and consist mainly of evergreen trees.

Herbaceous vegetation.

The herbaceous vegetation does not differ greatly, generically, from that of the east, and many species of *Primulaceæ*, *Ranunculaceæ*, *Cruciferæ*, *Labiatæ*, and *Scrophulariaceæ* occur; balsams abound, also beautiful forms of *Campanulaceæ*, *Gentiana*, *Meconopsis*, *Saxifraga*, and many others.

Cultivation.

Cultivation hardly extends above 7000 feet, except in the valleys behind the great snowy peaks, where a few fields of buckwheat and Tibetan barley are sown up to 11,000 or 12,000 feet. At the lower elevations rice, maize, and millets are common, wheat and barley at a somewhat higher level, and buckwheat and amaranth usually on the poorer lands, or those recently reclaimed from forest. Besides these, most of the ordinary vegetables of the plains are reared, and potatoes have been introduced in the neighbourhood of all the English stations.

Flora of most western area.

As we pass to the west the species of rhododendron, oak, and *Magnolia* are much reduced in number as compared to the eastern region, and both the Malayan and Japanese forms are much less common. The herbaceous tropical and semi-tropical vegetation likewise by degrees disappears, the *Scitamineæ*, epiphytal and terrestrial *Orchideæ*, *Araceæ*, *Cyrtandraceæ*, and *Begoniæ* only occur in small numbers in Kumaon, and scarcely extend west of the Sutlej. In like manner several of the western forms suited to drier climates find their eastern limit in Kumaon. In Kashmir the plane and Lombardy poplar flourish, though hardly seen further east, the cherry is cultivated in orchards, and the vegetation presents an eminently European cast. The alpine flora is slower in changing its character as we pass from east to west, but in Kashmir the vegetation of the higher mountains hardly differs from that of the mountains of Afghanistan, Persia, and Siberia, even in species.

Of western Tibet

The flora of western Tibet is essentially European in its character. The juniper and poplar are the only trees that are seen, excepting fruit-trees, which include apricot, peach, and grape. The shrubby plants include small forms of willow, elm, *Lonicera*, rose, *Myricaria*, *Ephedra*, and

Hippophae. The ordinary firewood of the more elevated tracts is supplied by bushes of *Caragana*, the furze of travellers, and dwarf *Lonicera* and willow. Species of *Astragalus*, *Oxytropis*, *Allium*, small *Compositae* and saxifrages, *Sedum*, and *Rheum* are common. *Artemisiae* and many salt plants, with *Chenopodiaceae* and *Tamariscineae*, are found, especially on the borders of the salt lakes. Mosses and ferns are very rare. Many European grasses and *Carices* occur in the pastures. The herbaceous vegetation ascends freely to 16,000 feet, and isolated plants may be found as high as 19,000 feet; but excepting in the close neighbourhood of small streams the growth is very scanty, and not one-twentieth of the surface is commonly clothed with vegetation. Barley is cultivated up to 15,000 feet, wheat, millet, and rape, with buckwheat, being common up to 12,000 feet. Apples and apricots grow up to 11,000 and 12,000 feet, and grapes to 9000 feet.

[illegible]

The total number of flowering plants inhabiting the range amounts probably to 5000 or 6000 species, among which may be reckoned several hundred common English plants chiefly from the temperate and alpine regions; and the characteristic of the flora as a whole is that it contains a general and tolerably complete illustration of almost all the chief natural families of all parts of the world, and has comparatively few distinctive features of its own.

Timber trees.

The timber trees of the Himalaya are very numerous, but few of them are known to be of much value, and the difficulties of transport are so great as to render their removal to a distance in many cases impracticable. The "Sal" is one of the most valuable of the trees; with the "Toon" and "Sissoo," it grows in the outer ranges most accessible from the plains. The "Deodar" is also much used, but the other pines produce timber that is not durable. Bamboos grow everywhere along the outer ranges, and ratans to the eastward, and are largely exported for use in the plains of India. Other vegetable products of economical value, excluding the ordinary cereals and esculent plants, are not numerous; and the primitive condition of the people and the difficulties and expense of carriage are so great as to render the trade in such articles very insignificant.

Tea.

Though one species of coffee is indigenous in the hotter Himalayan forests, the climate does not appear suitable for the growth of the plant which supplies the coffee of commerce. The cultivation of tea, however, is now carried on successfully on a large scale, both in the east and west of the mountains, and has already become an important item of the export trade of India. In the western Himalaya the cultivated variety of the tea plant of China has been introduced, and succeeds well; on the east the indigenous tea of Assam, which is not specifically different, and is perhaps the original parent of the Chinese variety, is now almost everywhere preferred. The produce of the Chinese variety in the hot and wet climate of the eastern Himalaya, Assam, and eastern Bengal is neither so abundant nor so highly flavoured as that of the indigenous plant, and therefore not so commercially valuable.

Cinchona.

The cultivation of the cinchona, several species of which have been introduced from South America and naturalized in the Sikim Himalaya, is still in its infancy, but promises to yield at a comparatively small cost an ample supply of the precious febrifuge that is extracted from its bark. At present the manufacture is almost wholly in the hands of the Government, and the drug prepared is all disposed of in India. The progress of cinchona cultivation on the Nilgiri hills is not less promising than on the Himalaya.

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The general distribution of animal life on these mountains is manifestly determined by much the same conditions that have controlled the vegetation. The connexion with Europe on the north-west, with China on the north-east, with Africa on the south-west, and with the Malayan region on the south-east is manifest; and the greater or less prevalence of the European and Eastern forms varies according to more western or eastern position on the chain. So far as is known these remarks will apply to the extinct as well as to the existing fauna. The Palæozoic forms found in the Himalaya are very close to those of Europe, and in some cases identical. The Triassic fossils are still more closely allied, more than a third of the species being identical. Among the Jurassic Mollusca, also, are many species that are common in Europe. The Siwalik fossils contain 84 species of mammals of 45 genera, the whole bearing a marked resemblance to the Miocene fauna of Europe, but containing a larger number of genera still existing, especially of ruminants, and as before stated now held to be of Pliocene age.

Fauna of Tibetan region.

The fauna of the Tibetan Himalaya is essentially European, or rather that of the northern half of the old continent, which region has by zoologists been termed Palæarctic. Among the characteristic animals may be named the yák, from which is reared a cross breed with the ordinary horned cattle of India locally called "zobu," many wild sheep, and two antelopes, as well as the musk-deer; several hares and some burrowing animals, including pikas (*Lagomys*) and two or three species of marmot; certain arctic forms of carnivora—fox, wolf, lynx, ounce, marten, and ermine; also wild asses. Among birds are found bustard and species of sand-grouse and partridge; water-fowl in great variety, which breed on the lakes in summer and migrate to the plains of India in winter; the raven, hawks, eagles and owls, a magpie, and two kinds of chough; and many smaller birds of the passerine order, amongst which are several finches. Reptiles, as might be anticipated, are far from numerous, but a few lizards are found, belonging for the most part to types, such as *Phrynocephalus*, characteristic of the Central-Asiatic area. The fishes from the head waters of the Indus also belong, for the most part, to Central-Asiatic types, with a small admixture of purely Himalayan forms. Amongst the former are several peculiar small-scaled carps, belonging to the genus *Schizothorax* and its allies.

Of Himalaya generally.

The ranges of the Himalaya, from the border of Tibet to the plains, form a zoological region which is one of the richest of the world, particularly in respect to birds, to which the forest-clad mountains offer almost every range of temperature.

Mammals.

Only two or three forms of monkey enter the mountains, the langúr, a species of *Semnopithecus*, ranging up to 8000 or 9000 feet. No lemurs occur, although a species is found in Assam, and another in southern India. Bats are numerous, but the species are for the most part not peculiar to the area; several European forms are found at the higher elevations. Moles, which are unknown in the Indian peninsula, abound in the forest regions of the eastern Himalayas at a moderate altitude, and shrews of several species are found almost everywhere; amongst them are two very remarkable forms of water-shrew, one of which, however, *Nectogale*, recently discovered, is probably Tibetan rather than Himalayan. Bears are common, and so are a marten, several weasels and otters, and cats of various kinds and sizes, from the little spotted *Felis bengalensis*, smaller than a domestic cat, to animals like the clouded leopard rivalling a leopard in size. Leopards are common, and the tiger wanders to a considerable elevation, but can hardly be considered a permanent inhabitant, except in the lower valleys. Civets, the mungoose (*Ichneumon*), and tree-cats (*Paradoxurus*) are only found at the smaller elevations. Wild dogs (*Cuon*) are common, but neither foxes nor wolves occur in the forest area. Besides these carnivora some very peculiar forms are found, the most remarkable of which is *Ælurus*, sometimes called the cat-bear, a type peculiar to the Himalaya. Two other genera, *Helictis*, an aberrant badger, and *Prionodon*, an aberrant civet, are representatives of Malayan types. Amongst the rodents squirrels abound, and the so-called flying squirrels with a membranous expansion or parachute between their fore and hind legs are represented by several species. Rats and mice swarm, both kinds and individuals being numerous, but few present much peculiarity, a bamboo rat (*Rhizomys*) from the base of the eastern Himalaya being perhaps most worthy of notice. Two or three species of vole (*Arvicola*) have been detected, and porcupines are common. The elephant is found in the outer forests as far as the Jumna, and the rhinoceros as far as the Sarda; the spread of both of these animals as far as the Indus and into the plains of India, far beyond their present limits, is authenticated by historical records; they have probably retreated before the advance of cultivation and fire-arms. Wild pigs are common in the lower ranges, and one peculiar genus of pigmy hog (*Porcula*) of very small size inhabits the forests at the base of the mountains in Nepal and Sikim. Deer of several kinds are met with, but do not ascend very high on the hill sides, and belong exclusively to Indian forms. The musk deer keeps to the greater elevations. The chevrotains of India and the Malay countries are unrepresented. The gaur or wild ox is found at the base of the hills. Three very characteristic ruminants, having some affinities with goats, inhabit the Himalaya; these are the "serraw," "goral," and "tahr," the last named ranging to rather high elevations. Lastly, the pangolin or manis is represented by two species in the eastern Himalaya. A dolphin living on the Ganges ascends that river and its affluents to their issue from the mountains.

Birds. Almost all the orders of birds are well represented, and the marvellous variety of forms found in the eastern Himalaya is only rivalled in Central and South America. Eagles, vultures, and other birds of prey are seen soaring high over the highest of the forest-clad ranges. Owls are numerous, and a small species, *Glaucidium*, is conspicuous, breaking the stillness of the night by its monotonous though musical cry of two notes. Several kinds of swifts and nightjars are found, and gorgeously-coloured trogons, bee-eaters, rollers, and beautiful kingfishers and barbets are common. Several large hornbills inhabit the highest trees in the forest. The parrots are restricted to parrakeets, of which there are several species, and a single small lory. The number of woodpeckers is very great, and the variety of plumage remarkable, and the voice of the cuckow, of which there are numerous species, resounds in the spring as in Europe. It is impossible to do more than indicate some of the chief passerine birds; their number is immense. Amongst them the sun birds resemble in appearance and almost rival in beauty the humming birds of the New Continent. Creepers, nuthatches, shrikes, and their allied forms, flycatchers and swallows, thrushes, dippers and babblers (about fifty species), bulbuls and orioles, peculiar types of redstart, various sylviads, wrens, tits, crows, jays, and magpies, weaver-birds, avadavats, sparrows, crossbills, and many finches, including the exquisitely coloured rose finches, may also be mentioned. The pigeons are represented by several wood pigeons, doves, and green pigeons. The gallinaceous birds include the peacock, which everywhere adorns the forest bordering on the plains, jungle fowl, and several pheasants; partridges, of which the chukor may be named as most abundant; and snow pheasants and partridges, found only at the greatest elevations. Waders and waterfowl are far less abundant, and those occurring are nearly all migratory forms which visit the peninsula of India,—the only important exceptions being two kinds of solitary snipe, and the red billed curlew.

Reptiles. Of the reptiles found in these mountains many are peculiar. Some of the snakes of India are to be seen in the hotter regions, including the python and some of the venomous species, the cobra being found as high up as 8000 or 9000 feet, though not common. Lizards are numerous, and as well as frogs are found at all elevations from the plains to the upper Himalayan valleys, and even extend to Tibet.

Fishes. The fishes found in the rivers of the Himalaya show the same general connexion with the three neighbouring regions, the Palæarctic, the African, and the Malayan. Of the principal families, the *Acanthopterygii*, which are abundant in the hotter parts of India, hardly enter the mountains, two genera only being found, of which one is the peculiar amphibious genus *Ophiocephalus*. None of these fishes are found in Tibet. The *Siluridæ* or scaleless fishes, and the *Cyprinidæ*, or carp and loach, form the bulk of the mountain fish, and the genera and species appear to be organized for a mountain-torrent life, being almost all furnished with suckers to enable them to maintain their positions in the rapid streams which they inhabit. A few *Siluridæ* have been found in Tibet, but the carps constitute the larger part of the species. Many of the Himalayan forms are Indian fish which appear to go up to the higher streams to deposit their ova, and the Tibetan species as a rule are confined to the rivers on the table-land or to the streams at the greatest elevations, the characteristics of which are Tibetan rather than Himalayan. The *Salmonidæ* are entirely absent from the waters of the Himalaya proper, of Tibet, and of Turkistan east of the Terektag. On crossing the watershed that leads from the streams flowing into the Indus to those falling into the Oxus, a trout is reported to have been found, though it is said not to live in the Jaxartes or its affluents.

Other orders of animal kingdom. No such general or connected account of the Mollusca, insects, or other lower forms of life, of these mountains exists as will admit of anything but very vague statements regarding them. It is, however, understood that the same relations with the neighbouring European, Asiatic, and African regions are found to exist as have been noticed as characterizing the other forms of life.

Mollusca. Of the land Mollusca, one-half appear to belong to the genera *Helix* and *Bulimus*, and about one-third to the family of *Cyclostomidæ*; the species appear to be for the most part very local, and of about 120 species in all, only about one-tenth are recorded as being found in Tibet or the highest Himalayan valleys.

Insects. The Himalayan butterflies are very numerous and brilliant, for the most part belonging to groups that extend both into the Malayan and European regions, while African forms also appear. There are large and gorgeous species of *Papilio*, *Nymphalidæ*, *Morphidæ*, and *Danaidæ*, and the more favoured localities are described as being only second to South America in the display of this form of beauty and variety in insect life. Moths, also, of strange forms and of great size are common. The cicada's song resounds among the woods in the autumn; flights of locusts frequently appear after the summer, and they are met far within the mountains carried by the prevailing winds even among the glaciers and eternal snows. Ants, bees, and wasps of many species, and flies and gnats in great variety of form, and possessed of equal variety of powers of annoyance, abound, particularly during the summer rainy season, and at all elevations.

Apart from the connexion which subsists between the Himalaya and the earliest developments of the Hindu religion, there is little in these mountains that is of interest as throwing light on the earlier history of our race. The mythical geography of the Hindus represents the peak of Kailas, the snowy mountain north of the Tibetan lake

[illegible]

of Manasarowar, as the centre of the world, around which its visionary kingdoms are spread out. The sanctity of the Himalaya, in Hindu mythology, is known to all, and thousands of pilgrims from all parts of India still continue to seek salvation in the holy waters of the Ganges, and at its sacred sources in the snowy Himalaya. "He who thinks on Himachal," says the Manas khanda, one of the Puranas or holy books of the Hindus, "though he should not behold him, is greater than he who performs all worship at Kashi (Benares). In a hundred ages of the gods I could not tell of the glories of Himachal. As the dew is dried up by the morning sun, so are the sins of mankind by the sight of Himachal." And to those who have performed such a pilgrimage the wondrous snow-clad peaks of the Himalaya, though seen through the atmosphere of the 19th century, seem still to be surrounded with the same halo of glory as of old.

[illegible] and [illegible] the Ganges.

The Ganges, which issues from the mountains at Hardwar, is fed by two principal tributaries which unite about 40 miles higher up, the Alaknanda, far the larger, and the Bhaghirati, the more sacred. The source of the last-named river is in the glacier above the temple at Gangotri, which lies to the north of a great cluster of snowy peaks, on the south of which is found the temple of Kedarnáth, and on the east that of Badarináth. Large glaciers exist near both of these temples, that near Kedarnáth feeding the Mandakni, and that near Badarináth feeding the Vishnuganga, which river gives the main supply of water to the Alaknanda. Both the valley above Gangotri and that above Badarináth lead to Tibet, passing through a region of snowy peaks of first-class magnitude. To the west of Gangotri and the Bhaghirati lies the hardly less sacred source of the Jumna and the temples of Jamnotri.

Badarináth and Kedarnáth.

The temple at Badarináth, on the Vishnuganga, as the latter name suggests, is dedicated to Vishnu, and is served by priests of the Vaishnava sect, presided over by a "Ráwal" or abbot, who is invariably a Brahman from South India. The temple at Kedarnáth is dedicated to Shiva, symbolized by the Lingam, and is more especially venerated by the Saiva sect; and the chief priest here, too, is a Brahman from Malabar in the same part of India. The origin of this connexion of the holy places in the Himalaya with southern India is very obscure; possibly, however, it dates back to the 8th or 9th century, to the time of Sankara Acháraya, a native of Malabar, the chief expositor of the Saiva doctrines, who is said to have died at Kedarnáth. That the Himalaya and the sources of the Ganges, however, were regarded as holy, and had become places of pilgrimage for Hindus long before this event, or before the development of the two sects that have been here specially named, there can be no reasonable doubt; but how or when the Aryan races of India first developed for themselves a system of mythology so intimately bound up with these mountains must ever remain a subiect of mere speculation.

Buddhist and Greek remains in western [illegible]

Remains of Buddhist monasteries and temples on a great scale, the majority of which are believed from inscriptions found on them to date back to about the commencement of the Christian era, are met with along the foot of the western end of the Himalaya, in the Yusafzai country bordering on the Indus, and similar ruins are seen as far west as Jellalabad in Afghanistan. Some of the buildings are doubtless of much greater age, and may go back to the earliest days of Buddhism, about six centuries before our era; and the discovery in this locality of what is probably a contemporaneous copy of Asoka's well known inscription, cut into the face of a great rock, testifies to the development of a great centre of Buddhism in his days, that is, about 250 B.C. Among these ruins are found fragments of sculpture bearing the impress of the Greek art introduced by the successors of Alexander; and other relics of the Greco-Scythic kings, in the form of numerous coins, have been obtained from the same quarter. The exact point at which Alexander entered India is still a subject of discussion among antiquaries, but it probably was on the line following the skirt of the north-west Himalaya along which the road now runs, and which is known to have been the chief line of traffic for centuries. How the influence of Greek architecture was carried forward both in time and place is illustrated by the curious temple of the sun, or "Marttand," in the valley of Kashmir, the date of which is about 400 A.D.

Comparison of Himalayan with other mountain scenery

It would be a task, certainly fruitless, and probably impossible, to endeavour to estimate aright the conflicting claims to admiration of the scenery of the Himalaya and other great mountain ranges. If some elements of the picturesque be better found elsewhere, and if the softer features of hill, valley, and lake be absent, yet nowhere can the Himalaya be surpassed in the magnificence and variety of its forests, or in the wealth and beauty of its alpine flora, which offer to the traveller ever-changing and ever-renewed pictures, combining the charm of former memories with fresh conceptions of the wonderful never-failing profusion of nature; and to the student of natural phenomena of every description surely no grander field will ever be open than that presented by these mountains.

Grandeur of the views it affords.

In many circumstances mere magnitude may not be effectual in adding to the apparent grandeur or sublimity of mountain scenery, for everywhere the features nearest to the eye, though absolutely smaller, may cut off from view those of far greater importance which are further removed. And this is often conspicuously true in the valleys of the Himalaya. But the extraordinary scale on which every part of the mountains is developed, the actual vast dimensions of the main features, the apparently endless succession of range after range, of ascent and descent, of valley and mountain top, of river, torrent, and brook, of precipitous rock and grassy slope, of forest and cultivated land, cannot fail to produce impressions of wonder, which are not likely to be equalled and certainly will not be exceeded on any other chain. Upon these mountains alone, of all on the earth, can the traveller, as he climbs their slopes, obtain at a glance a range of vision extending 5 miles in vertical height, from 2000 or 3000 feet to 29,000 feet above the sea, and see spread out before him a compendium of the entire vegetation of the globe from the tropics to the poles. Here may the eye as it sweeps along the horizon embrace a line of snow-clad mountains, such as exist in no other part of the world, stretching over one-third of the entire circle, at a distance of 40 or 50 miles, their peaks towering over a sea of intervening ranges piled one behind another, whose extent on either hand is lost in the remote distance, and of which the nearest rises from a gulf far down beneath the spectator's feet, where may be seen the silver line that marks a river's course, or crimson fields of amaranth and the dwellings of man. Sole representative of animal life, some great eagle floats high overhead in the pure dark-blue sky, or, unused to man, fearlessly sweeps down within a few yards to gaze at the stranger who intrudes among these solitudes of nature. As the sun sinks the cold grey shadow of the summit where we stand is thrown forward, slowly stealing over the distant hills, and, veiling their glowing purples as it goes, carries the night up to the feet of the great snowy peaks, which still rise radiant in rosy light above the now darkening world. From east to west in succession the splendour fades away from one point after another, and the vast shadow of the earth is rapidly drawn across the whole vault of heaven. One more departing day is added to the countless series which has silently witnessed the death-like change that comes over the eternal snows as they are left raising their cold pale fronts against the now leaden sky; till slowly with the deepening night the world of mountains rise again, as it were to a new life, under the changed light of the thousand stars which stud the firmament and shine with a brilliancy unknown except in the clear rarefied air of these sublime heights (R. S.)

HIMERA, a city on the north coast of Sicily. It was founded in 648 B.C. by the Chalcidian inhabitants of Zancle, but with them were many Syracusan exiles who gave to the language of the city a Doric character. Early in the 5th century the tyrant Terillus, being expelled by Theron of Agrigentum, invoked the aid of the Carthaginians. They gladly availed themselves of the pretext, but their general Hamilcar was defeated at Himera by the Greeks under Gelon of Syracuse (480 B.C.). Thrasydæus, son of Theron, brought a large body of Doric immigrants to the city in 476; but was not long after expelled by Hiero. It seems to have enjoyed great prosperity during the rest of the 5th century. In 415 it refused to admit the Athenian fleet, and was a zealous ally of Syracuse. In 408 the Carthaginians sent another great army under Hannibal, grandson of Hamilcar, who razed the city to the ground. A new city called Thermæ Himerenses was founded in 407 close to the former site. This name was derived from the famous hot springs, in which Hercules was said to have bathed. The new city was in Carthaginian hands till it was annexed by the Romans in the Second Punic War. It was treated with peculiar favour by them, and was left a free city under its own laws. In the time of Cicero it was a flourishing town, though not very large. Under Augustus it became a "colonia." We hear little of it from that time, though the site was never deserted, and the town still exists under the name of Termini. Ergotetes, an Olympian victor celebrated by Pindar (*Ol.* xii.), was a citizen of Himera. Stesichorus the poet was a native of the city; and his statue was preserved at Thermæ in the time of Cicero. Agathocles also was a native of Thermæ.

HIMMEL, FREDERICK HENRY (1765-1814), a German composer of mark, was born November 20, 1765, at Treuenbrietzen in Brandenburg, Prussia, and originally studied theology at Halle. During a temporary stay at Potsdam he had an opportunity of showing his self-acquired skill as a pianist before King Frederick William II., who thereupon made him a yearly allowance in order to enable him to complete his musical studies. This he did under Naumann, a German composer of the Italian school, and the style of that school Himmel himself adopted in his serious operas. The first of these, a pastoral opera *Il Primo Navigatore*, was produced at Venice in 1794 with great success. After his return to Berlin in 1795 Himmel became court chapel master to the king of Prussia, and in that capacity wrote a great deal of official music, such as cantatas, a coronation Te Deum, and the like, now justly forgotten. The same fate is shared by his Italian operas, successively composed for Stockholm, St Petersburg, and Berlin, and all received with great applause in their day. Infinitely more important than these is an operetta to German words called *Fanchon*, the popularity of which has seldom been surpassed. Although antiquated it still remains an admirable specimen of the primitive form of the musical drama known in Germany as the "Singspiel." Himmel's gift of writing genuine simple melody, to which the operetta owed its success, is also observable in his songs, amongst which one called "To Alexis" is the best. It may be found in the first volume of the *Musical* [illegible]. Himmel died at Berlin, June 8, 1814.

HINCKLEY, a market-town of England, county of Leicester, is situated 13 miles S.W. of Leicester, on a branch line between that town and Nuneaton, which connects the London and North-Western and the Midland railways.[1] The principal buildings are the church of St Mary, a Gothic structure lately restored, with tower and spire 120 feet high; the town hall; the priestshouse and Roman Catholic academy named St Peter's Priory; and the union poorhouse, erected in 1838, with accommodation for 400 inmates. There are a grammar school, a national school, and board schools. Hinckley is the centre of the stocking-weaving district, and its speciality is circular hose. It also possesses breweries, brick and tile works, and lime works. There are several mineral springs in the neighbourhood, and at one of these baths have been erected. The population in 1871 was 6902.

HINCMAR (*c.* 806–882), archbishop of Rheims from 845 to 882, a prominent figure in most of the theological and ecclesiastical struggles of his day, and perhaps the most vigorous and influential prelate France has ever produced, belonged to a noble West Frankish family, and was born about the year 806. Other forms of the name are Ingumar, Ingmar, and Igmar. His early education was received at the abbey of St Denis under Hilduin (the author of *Areopagitica*), whom he followed to Corvey, Westphalia, when banished by Louis the Pious in 830 for having joined the party of Lothair. Returning about two years afterwards along with his superior to St Denis, of which he had become a canon, he resided partly there and partly at court, where he rapidly rose high in the royal favour. He was with Louis at the "Field of Falsehood" (Campus mendacii) in Alsace, and was one of the few who remained faithful when the majority of the prelates and nobles went over to the other side. After the death of Louis (840), he equally gained the confidence of Charles the Bald, through whose influence, after he had successively held the abbacies of St Mary's, of Compiègne, and of St Germer, he was in 845 elected to succeed the deposed Ebbo or Ebo in the archiepiscopal see of Rheims. Having exacted from Charles a full restitution of all the church property which had belonged to the diocese, and a further promise that it should never again be alienated, he at once entered on the duties of his office, and took a leading part in the council of Meaux (C. Meldense), the reforming decrees of which so strongly roused the opposition of the king. Some attempt having been made to revive the claims of Ebo, Hincmar's title to the archbishopric was confirmed by a synod of French bishops at Paris, and ultimately settled by Leo IV.'s transmission of the pallium in 847. Apart from the ordinary affairs of his diocese, which included the completion and adornment of the cathedral begun by his predecessor, he now became deeply involved in the discussions which arose out of the predestinarianism of Gottschalk (see GOTTSCHALK), whom Hrabanus Maurus at the synod of Mainz (848) had caused to be relegated to Hincmar as his metropolitan. At a synod held at Quierzy on the Oise (Carisiacum), in the diocese of Soissons, in 849, Hincmar had concurred with Wenilo of Sens and other prelates in condemning the refractory monk to degradation, scourging, and imprisonment; but in a short refutation of the "predestinarian heresy," which he himself shortly afterwards wrote and circulated, he so failed to do justice to the orthodox faith as to elicit the censure of Ratramnus of Corvey, who was afterwards supported by Prudentius of Troyes, Lupus of Ferrières, and a large Augustinian party (850). Hincmar now summoned the dialectic skill of John Scotus Erigena to his aid, and the controversy became general. Another synod held at Quierzy in 853 passed the four "Capitula Carisiaca," which in substance taught that there is but one divine predestination; that free will, lost by the fall, is restored by the preventing and assisting grace of Christ; that God wills generally that all men should be saved; and that the blood of Christ was shed for all. These were answered by the six canons of the (Lotharingian) synod of Valence, which elicited from Hincmar, two years afterwards, the *De Prædestinatione Dei et Libero Arbitrio Libri tres*, of which all that is now extant is the prefatory letter to the king. By the synod of Langres (S. Lingonensis, 859), however, the articles of Valence were confirmed,—a decision which was afterwards supported by the general synod held at Savona or Savonnieres, otherwise known as the Concilium Tullense (859). Hincmar now published the *Posterior de Prædestinatione Dei et Libero Arbitrio Dissertatio*, but without influencing the voice of the church; nor was he more successful in his controversy with Gottschalk on the Trinity, his *Collectio ex Sanctis Scripturis et Orthodoxorum Dictis* against the phrase "Trina Deitas" having been totally disregarded; he had, however, the satisfaction of preventing the release of Gottschalk, who died in prison in 868. While these speculative controversies were doubtfully raging, Hincmar found scope for his greater practical talent in the events which followed the death of the emperor Lothair in 855, and which chiefly resulted in the strengthening of clerical ascendency. Having saved Charles from the hands of his own nobles and of the Germans, the great metropolitan was in a position at last to say, "If kings rule after God's will, they are subject to none; if they be great sinners then is their judgment in the hands of the bishops." In 860 began the divorce suit in which the interests of Thietberga, the oppressed queen of Lothair II., were involved; and here, undoubtedly, the whole weight of Hincmar's influence was thrown into the scale of morality and right. His contribution to the discussion is still extant in the treatise *De Divortio Lotarii et Teutbergæ Reginæ* (860). While this controversy still remained unsettled, Hincmar became involved in a struggle with the pope (Nicholas I.), which is of very considerable historical importance from the part which was played in it by the newly introduced "Isidorian" decretals, and from the effect which it had in limiting the rights of metropolitans. Rothad, bishop of Soissons, having been deposed for acts of insubordination and violations of duty at a synod of Soissons presided over by Hincmar in 863, had appealed to Rome; the appeal had been sustained; and ultimately in 865 orders were given that the judgment of Hincmar should be reversed, and that his suffragan should be restored to his office. The decision, which, though not without murmuring and contentions, was acquiesced in by Hincmar, was an important step in the development of the hierarchical monarchy of Rome. Hincmar was somewhat more successful when he found himself in opposition to the successor of Nicholas, Adrian II. This pope, who highly disapproved of the action of the archbishop in crowning Charles as the successor of King Lothair of Lorraine in 869, had fulminated threats of excommunication against all who had been concerned in that action; Hincmar replied that the Roman see had no right to interfere in such a matter, and that the impending ban would have no validity; and the actual result was that, notwithstanding alike the protest of the emperor and the prohibition of the pope, Charles the Bald and Louis the German quietly divided the dominions of their nephew. Again, when Hincmar of Laon, his nephew and suffragan, had defied his authority and appealed to the pope, a long controversy resulted in the appellant's being imprisoned, degraded, and sentenced to the loss of his eyes (871). Of the remaining years of Hincmar's life few incidents are recorded; in 882 he was compelled by Norman invasion to transfer his see to Epernay, where in the same year he died

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[1] Hinckley was created a barony soon after the Conquest, when it was held by Hugh de Grentesmenil, who erected a castle, the ditch of which is still traceable, and also founded a priory of Benedictine monks. Originally the town had the privileges of a borough, but these were annulled by Edward IV. Mention is made of "Hinckley Fair" in the second part of *Henry IV.*, act v. sc. 1.

The works of Hincmar, which include, besides these already mentioned, a variety of capitula and other occasional pieces, were first edited by Sirmond in 2 vols. fol. (1645). They are reprinted in Migne's *Cursus Patr. Comp.* The *Annales Bertiniani* from 861 to 882 are also by Hincmar. See Gess, *Merkwurdigkeiten aus dem Leben und Schriften Hincmars* (1806); Prichard, *The Life and Times of Hincmar* (1849); and Noorden, *Hincmar, Erzbischof von Rheims* (1863).

HINDLEY, a manufacturing town of Lancashire, is situated on the Lancashire and Yorkshire railway, 3 miles south-east of Wigan. Cotton-spinning and the manufacture of cotton goods are the principal industries, and there are extensive coal-mines in the neighbourhood. Hindley possesses a grammar school, and among its places of worship may be mentioned the old parish church, and St Peter's church, erected in 1864 in the First Pointed style. In the time of the Puritan revolution Hindley church was entered by the Cavaliers, who played at cards in the pews, pulled down the pulpit, and tore the bible in pieces. The population in 1871 was 10,627.

HINDOL, one of the tributary states of Orissa, India, situated between 20° 29′ 30″ and 20° 49′ 30″ N. lat., and between 85° 8′ 35″ and 85° 31′ 15″ E. long. It is surrounded on all sides by native states, being bounded on the N. and E. by Dhenkánal, on the S. by Barambá and Narsinhpur, and on the W. by Angul. Area, 312 square miles; population (1872), 28,025 (Hindus, 23,345; Mahometans, 122; and "others," 4558). The Cuttack and Sambalpur highroad runs through the state. Only five villages contain upwards of 100 houses. Hindol consisted originally of three or four petty states, completely buried in jungle, and ruled by separate chiefs, till two Marhattá brothers, belonging to the family of the Kimidi Rájá in Madras, drove them out, and formed their territories into one principality. The present chief maintains a military force of 83 men, and a police force 133 strong. His estimated annual revenue is returned at £2082; tribute, £55.

HINDÚ KUSH is a title applied to the line of alpine watershed stretching W.S.W. from the southern margin of Pamir, the Caucasus of Alexander's historians, which divides Afghanistan in a general sense from Afghan Turkestan, and the basin of the Cabul river from the basin of the Oxus. Looking towards the heart of a map of Asia, the eye is caught by that remarkable point where the great highland seems clenched as it were to a knot, whence expand in different directions (1) to east and south-east the great Tibetan plateau, (2) to north that of Pamir, and (3) to west that of Khorasan and Persia. Between the diverging masses run up the great basins of the Indus, the Yarkand river, and the Oxus. Some dim memory of these great features perhaps, transformed and transplanted further east, appears in the cosmography of the Puranas, in which the mythical Ganges falling on Mount Meru divides into four great rivers flowing to the cardinal points

This is the first impression. But, imperfectly as we yet know the mountain structure, the more we learn the more evanescent becomes this idea of triplicity as typifying the true skeleton. This node is in fact the place of contact or intersection of two great elevations:—(1) of the Himalaya, of which the axial lines approach in a direction from S.E. to N.W.; and (2) of the Thian-Shan and allied ranges, of which the axial lines run from E.N.E. to W.S.W. The parallelism of Hindu Kush seems to attach it to the latter system.

The definition of geographical features must often be in part arbitrary, but that of Hindú Kúsh fairly coincides with natural limits. On the east we take it as commencing at the Baroghil Pass, leading from the high valley of Little Pamir south into the valley of Kashgár or Chitral. Just east of this is a cluster of peaks of great altitude, but their alignment attaches them to the great Gilgit range of the Himalaya (Muztagh of some maps, *Dy sang* of Richthofen). On the west we regard Hindu Kush as including and terminating at the Hajjigak Passes, those most commonly used between Cabul and Turkestan. West of this the range continues as a watershed of considerable altitude, but with a partial change of direction and loss of true alpine character. In maps this prolongation is styled Koh-i-Baba. Properly Koh-i-Baba is the name of a conspicuous three-peaked mountain rising over the Hajjigak Pass, to a height of at least 16,500 feet, which we regard as the terminal prominence of Hindú Kúsh, though it is in truth also isolated from the higher summits to the eastward, which especially claim that name, by a considerable interval of tamer mountain, rounded and naked.

The total length of Hindú Kúsh as thus defined is 365 miles. Towards the eastern extremity the watershed perhaps emerges little from the table-land, for the Baroghil Pass is of singularly easy acclivity on both sides, and no prominent summits adjoin it on the west. But for the rest of its extent the mountain tract of Hindú Kúsh realizes the popular idea of an alpine chain, *i.e.*, of an unpierced mountain barrier whose passes are never far below the line of perpetual snow, and whose highest peaks are never very far from the watershed.

The general altitude of the "cols" or passes runs from 12,000 to 13,000 feet. We give those that have been calculated (besides which some 20 or 22 are known more vaguely), beginning from the east :—

			Long.	Feet.
1.	Baroghil Pass		73°26′	12,000
2.	Nuksán	,,	71°37′	17,000
3.	Dora	,,	71°24′	16,000–16,500
4.	Khawak	,,	69°49′	13,200
5.	Sar-ulang	,,	68°47′	12,000
6.	Kushán	,,	68°40′	15,000
7.	Irak	,,	67°52′	12,900
8.	Kalu	,, (on Hajjigak Road)	67°45′	12,480

The three highest (2, 3, 6) do not rest upon any observations of barometer or boiling point, but on other and looser data. Of the height of the peaks we have nothing definite. Captain Burslem, who ascended Koh-i-Baba with Lieutenant Sturt in 1840, speaks of seeing the lofty peaks to the eastward "many thousand feet" above, and Burnes uses similar language. The great peak near the Kúshán Pass, sometimes specially called Hindu Kush, which is seen at once from Cabul on the south and from Kunduz on the north, is probably not less than 20,000 feet high. Much further east the estimated heights of passes 2 and 3 indicate probable summits of as great altitude. A great mountain due north of Chitral, called Tirach Mir, and said to be visible from a great part of Kafiristan and from Zebák in Badakhshan, is estimated by Major Biddulph, who alone has seen it, at the enormous height of 27,000 feet, but General Walker reduces this to 23,000 with a (?).

Apart from this exceptional peak we shall form a just conception of the calibre of Hindu Kush among the ranges of the world if we class it with the French and Swiss Alps in extent and mass, but with greater average altitude. We have only one report of a glacier, viz., on the Nuksan Pass, No. 2 in the list of heights above.

The idea of a distinct southern range running parallel to Hindú Kúsh, north of the Cabul river, which Wood calls "the Himalaya," is founded on misconception. But peaks have been measured on the spurs which run south on both sides of the Kunar river. They rise to near 19,000 feet on the left bank, east of Chitral, descending to 11,800 near the Afghan boundary. In Kafiristan there are peaks on these spurs of 16,600 and 16,800 feet, and even within 25 miles of the Cabul river are some as high as 14,000 feet.

On the south side of Hindú Kúsh the earliest sources of the Helmand are in the gorges up which the Koh-i-Baba passes mount. All the rest of the range drains on that side to the Cabul river, and so to the Indus. On the north all the drainage reaches the Oxus.

Both hydrographic features and the limits of our knowledge conveniently divide the Hindú Kúsh into three sections.

(1.) Beginning from the east, in the first section, drainage southward is into the Chitral valley, and forms the great, perhaps greatest, contributary to the Cabul river, known as the Kunar or Batlám (probably *Choaspes* and *Malamantus* of the ancients). The highest part of this basin is known as Chitral *Bálá* (upper), and is politically united to Yasin in the Gilgit basin (see GILGIT). It consists of two or three confluent valleys, some of them thick with villages, whose continuous cultivation, supported by copious springs, extends far up the hill-sides. Mastúj, the chief place, stands 7500 feet high, in 36° 10′ N. lat. Twenty miles farther down is the boundary of Lower Chitrál or Káshgár. This forms a state of which the chief or king (he is styled "Badshah") resides at Chitrál town (height 5200 feet, 35° 53′ N. lat.). The people are Moslem, apparently a converted section of the neighbouring Kafirs, and speaking a kindred dialect of Sanskritic affinity. Fruit is good, including fine grapes, and the wine was once famous. Chitrál is the Bolor of Chinese geography, the misplacement of which so long perplexed and vitiated the geography of the Pamir highlands. The name *Balúr* mediævally covered a larger tract, probably the whole of the then pagan country from Khawak Pass to the Indus. Below Chitrál the valley narrows, and is shut in by Kafir villages in nominal subjection to the small state of Asmar (35° 4′ N. lat.). Afghan territory begins at Maraora, 20 miles farther down. On the north of this section most part of the drainage flows directly into the Little Pamir stream of the Oxus, or into the Panja, the union of the streams from Little and Great Pamir. We have accounts of no passes immediately west of Baroghil, though certainly they exist. From Avi, near the boundary of Upper and Lower Káshgár, a pass crosses (about 72° E. long.) to Ishtrágh on the Panja. At the western limit of the section are the lofty passes of Nuksán, Khartaza, Agram, and Dora, which lead through the Badakhshan canton of Zebák to the Vardoj branch of the Kokcha or river of Badakhshan. On the "Nuksán" (quasi *Har Mein*) in descending towards Chitral the traveller is girt with a leathern belt, and slides down the snow. Ponies, with feet tied, are rolled down. "By these processes," says the native authority, "both men and beasts generally reach the bottom in safety."

(2.) The next section is that of which we know least. It embraces on the south Kafiristan, never yet penetrated by European traveller. There is a pass south to Kafiristan from Zebák and Sanglich, and one from Kuran, probably several more. The chief streams southward are that of Pech, joining the Kunar river at Chigar Serai (the residence of Sultan Bahram), and the Alingar and Alishang, which unite in Laghman, formerly Lamghan (Lambatae of Ptolemy), and join the Cabul river at Chaharbagh above Jalálábád. West of Kafiristan are the Afghanized valleys of Panjshir and Nijrao, hardly better known, and occupied largely by Tajiks, a people seemingly akin to the Kafirs. On the north side the valleys form [illegible] among the [illegible] of petty states owing allegiance to Badakhshan, and several of them having their peculiar [illegible] Persian dialects. One of these valleys is Kuran, down which flows the Jerm branch of the Kokcha. It is a wild glen near the borders of Kafiristan, compared in a local rhyme with the jaws of hell, but which in the 8th century was of sufficient importance as a state to send a mission of homage to the Chinese court,—such disproportionate pretensions being probably due to its containing the mines of lazuli, famous for ages, commemorated by Marco Polo, and visited by Lieutenant Wood in 1838. Adjoining this are Munjan and Anjuman, high valleys [illegible] of which we barely know the names. Their streams chiefly flow north-west, and join the river of Talikan, which carries them to the river of Kunduz, and so join the Oxus about 68° 18′ E. long.

(3.) The last section extends from the borders of Kafiristan to the [illegible] Four of [illegible] passes descend on the lower Andarab valley, two [illegible] the Surkhab river, coming from the valley west of Bamian. [illegible] the pass of Shibr, which from the top of Ghorband valley descends on that of Bamian near the [illegible] of [illegible]. This was crossed by Hwen-Tsang in approaching India [illegible] and by Timur on his return [illegible], and was commonly used [illegible] who calls it Shibrtu. [illegible] between the Koh-i-Baba [illegible] of Irak, Hajjigak, and Pushti-Hajjigak. These are all [illegible] from Cabul by the upper valley of the Cabul river and headwaters of the Helmand. The last Brigadier Dennie's [illegible] to Bamian in 1840, before fighting Dost Mahommed on that famous site; Burnes (1832), Wood and Lord (1837), [illegible], and others at that time crossed the Hajjigak, the best known of all the passes. North of the mountains the Andarab river and the Surkhab form confluents like Panjhir and Ghorband rivers on the south. Uniting near Ghori they form the river of Kunduz or Aksarai (called by Baber *Doghaba*) flowing north to the Oxus. Hazaras (see vol. i. p. 235) are the chief occupants of this section in its western portion. Further east on the north side the higher valleys are occupied by tribes of old Tajik lineage, mixed more and more with Uzbeks and other Turki people as the Kokcha is approached (see also vol. i. p. 241 *sq.*).

Geology.—Information is most scanty, and applies only to the western extremities of Hindú Kúsh. On the Kushán Pass Lord speaks of the lower parts as consisting of micaceous schist, black slate with occasional bursts of granite, then mica slate and gneiss, and the summits of the pass and range of a granite core shooting up in precipitous peaks. On the Koh-i-Baba, also, Griffith speaks of the lower mass as predominantly of slaty formations; the summits of coarse quartzose grey granite, and of very compact brown quartzose rock. In the Irák Pass, and at Zohák, are masses of conglomerate. Limestone occurs in the upper part of the valley of Parwan, exhibiting large cavities, in one of which the stream is engulfed for two miles; also higher up the Ghorband valley, where a magnificent natural cavern occurs. Limestone occurs also on the Hajjigak Pass; and we hear of another great cavern near Doab, north of Bamian. Eruptive deposits occur in Ghorband valley towards Chár-dih, and there near at Bamian. Richthofen has supposed, from Chinese analogies, that the multitude of artificial caves and cave dwellings about Bamian indicate a loess deposit; such details as we have seem hardly to corroborate this.

The region is rich in minerals. Iron is abundant and widely diffused. Villages called *Ahangirán* (of the "iron-smiths") are numerous. There is a rich black ore on the Hajjigak Pass, but fuel is entirely absent. Iron is also made at several places in Badakhshán, and of excellent quality in Bajaur east of the Kunar river. The districts adjoining the Jerm and Vardoj rivers are called Yamghán, which is popularly interpreted as *Hamah-Kán* ("All-Mines") from its various mineral wealth. Copper mines (not worked) exist here and also in Chitral. Antimony is found in Ghorband, and accurate Griffith speaks of ore of antimony forming boulders and even "a large mountain" on the top of Hajjigak. Lead is found in Ghorband and in Yamghán. Sulphate of zinc occurs in Ghorband, silver, as above mentioned, at the head of Panjhir; rock-salt on the borders of Badakhshan and Kulab (mentioned by Marco Polo); sulphur in Yamghán and Sanglich (north of the Dora Pass), sal-ammoniac in Kunar. Orpiment is exported from Chitral, a fact mentioned also by Hwen Tsang. The lead of Kunar has been spoken of.

Zoology.—Of this we have not space to speak, nor accurate material. Afghanistan lies on the borders of the Oriental and Palæarctic regions (vol. vii. p. 269), and partakes in degree of both; but the Hindu Kush is to a certain extent a boundary between them. Thus it limits the genus *Salmo*, which is found in no Indian or Persian stream, but immediately on crossing the passes. The late estimable Russian traveller Fedchenko thought he had first discovered trout in Turkestan, but they were frequently caught by English officers at Bamian in 1840, and Marco Polo mentions them in Badakhshan.

Vegetation.—The only basis for a view of this would be Griffith's collections near Koh-i-Baba and in the Kunar valley, but they have not been analysed in such a sense. These general remarks by Hooker and Thomson are, however, apposite:—"The collections of Griffith, besides containing an immense number of Persian and European plants which find their eastern limits within the British territory, are rich in Himalayan forms which advance no farther west; and, what is of still greater importance, they contain many species common both to Europe and the Himalaya, but which, from mere differences induced by local causes in these two distant countries, might not be imagined to have a common origin, did not the Afghanistan specimens blend their characters or show the transition between them."—*Flora Indica*, i. 85, 86.

Historical Notices.—We have said that Hindú Kúsh is the Caucasus of Alexander's historians. It is also included in the Paropamisus, though the latter term embraces more, Caucasus being apparently used only when the alpine barrier is in question. Whether the name was given in mere vanity to the barrier which Alexander passed (as Arrian and others repeatedly allege), or was founded also on some verbal confusion, we cannot say. It was no doubt regarded (and perhaps not altogether untruly) as a part of a great alpine zone believed to traverse Asia from west to east, whether called Taurus, Caucasus, or Imaus. Arrian himself applies Caucasus distinctly to the Himalaya also. The application of the name Tanais to the Sir seems to indicate a real confusion with Colchian Caucasus. Alexander, after building an Alexandria at its foot (probably at Hupián near Charikár), crossed into Bactria, first reaching Drapsaca, or Adrapsa. This has been interpreted as Andarab, in which case he probably crossed the Khawak Pass, but the identity is uncertain. The ancient Zend name is, according to Rawlinson, *Paresina*, the essential part of Paropamisus; this accounts for the great Asiatic *Parnassus* of Aristotle, and the *Pho-lo-si-n-a* of Hwen Tsang.

The name Hindu Kush does not appear, so far as we can ascertain, in any of the earlier Arab geographers. But it is used by Ibn Batuta, who crossed (*c.* 1332) from Andarab, and he gives the explanation of the name which, however doubtful, is still popular, as (Pers.) Hindu-Killer, "because of the number of Indian slaves who perished in passing" its snows. Baber always calls the range Hindú Kúsh, and the way in which he speaks of it shows clearly that it was a range that was meant, not a solitary pass or peak (according to modern local use, as alleged by Elphinstone and Burnes). Probably, however, the title was confined to the section from Khawak to Koh-i-Baba (see Baber, pp. 136, 139). The name has by some later Oriental writers been modified into Hindú *Koh* (mountain), but this is factitious, and throws no more light on the origin of the title. The name seems to have become known to European geographers by the Oriental translations of the two Petis de la Croix, and was taken up by Delisle and D'Anville. Rennell and Elphinstone familiarized it, and Wilford wilfordized about it. Burnes first crossed the range (1832). A British force was stationed at Bamian beyond it in 1840, with an outpost at Saighán.

The Hindu Kúsh, formidable as it seems, and often as it has been the limit between petty states, has hardly ever been the boundary of a considerable power. Greeks, White Huns, Samanidæ of Bokhara, Ghaznevides, Mongols, Timur and Timuridæ, down to Sadozais and Barakzais, have ruled both sides of this great alpine chain. (H. Y.)

HINDUR, also called NALAGARH, one of the Punjab hill states, under the government of the Punjab, India, lying between 30° 54′ 30″ and 31° 14′ 15″ N. lat., and between 76° 39′ and 76° 56′ 45″ E. long. Area, 256 square miles. The country was overrun by the Ghoorkas for some years prior to 1815, when they were driven out by the British, and the rájá was confirmed in possession of the territories. The estimated population in 1875 was 70,000; the estimated revenue £9000, and tribute £500. The principal products are opium and the usual grains.

HINDUSTAN. See INDIA.

HINDŪSTĀNĪ,[1] or URDŪ, is a dialect of the Hindī, one of the seven languages of Aryan stock spoken at the present day in North India, the others being the Panjābī, Sindhī, Gujarātī, Marāthī, Bangālī, and Oriyā. The area over which it is spoken in North India may be said to be co-extensive with that of the Hindī, which is estimated at about 250,000 square miles, extending from the river Gandak in the east to the Sutlej in the west, and from the Himalaya in the north to the Vindhiyā mountains in the south. It is also extensively used, though in a somewhat different phase, in a great part of the Deccan, and is moreover the *lingua franca* of most parts of India.

As the Hindī language consists of many dialects, it is necessary to state that it is the Braj Bhāshā, or the dialect that is spoken in the districts of Agra and Mathura, and in the neighbourhood of Dehlī, the ancient capital of the Mahometan empire, which is generally regarded as the parent of Hindūstānī. The grammatical structure and also a vast number of the commonest vocables of the Braj were incorporated in the new dialect, and to these were added a vast number of Persian, Arabic, and even Turkish words. "Such words, however, in no wise altered or influenced the language itself, which, as regards its inflexional or phonetic elements, remains still a pure Aryan dialect, just as pure in the pages of Walī or Saudā, as it is in those of Tulsī Dās or Bihārī Lāl."[2] Peculiarities of composition, such as reversing the positions of the governing and the governed word (*e.g.*, *bāp merā* for *merā bāp*), or of the adjective and the substantive it qualifies, or such as the use of Persian phrases with the preposition *ba* instead of the Hindī postposition of the ablative case (*e.g.*, *ba-khushī* instead of *khushī se*, or *ba-hukm sarkār ke*, instead of *sarkār ke hukm se*), are no doubt to be met with in many writings, and these, perhaps, combined with the too free indulgence on the part of some authors in the use of high-flown and pedantic Persian and Arabic words in place of common and yet chaste Hindī words, and the general use of the Persian instead of the Nāgarī character, have induced some to regard Hindūstānī or Urdū as a language distinct from Hindī. But such a view betrays a radical misunderstanding of the whole question.

As regards the introduction of foreign words into the various dialects of Hindī, it seems highly probable that it had its origin at an early period, perhaps as early as the 8th or 9th century of our era. But there is good ground for the opinion that, although the Hindī area was overrun as early as the 12th century, the Hindūstānī was not formed till the 16th century. "For many generations after the victories of Kutbu'd-dīn Aibak, the first Musalmān sovereign of Dehlī, the conquerors retained their own Persian, and the conquered their Hindī. The Musalmāns had long been accustomed to speak pure Hindī, and it was not they who introduced Persian words into the language, but the Hindūs themselves, who at the epoch above mentioned were compelled by Todar Mal's new revenue system to learn Persian."[3] And we learn from Mīr Amman of Dehlī (whose brief account of the origin of Urdū in the preface to his well-known *Bāgh-o-Bahār* bears on the face of it every convincing mark of probability, and, scanty as it is, is remarkable as, perhaps, the only attempt at a critical disquisition in the whole range of Hindūstānī literature) that at the date of the composition of his work (1802) the Musalmān dynasties had endured for a thousand years, and that as intercourse increased the languages of the Hindūs and Musalmāns became to a certain extent mixed. By the arrival and stay of the Amīr Tīmūr the camp or bāzār of the army was introduced into the city, whence the city bāzār was called Urdū, a Tartar word signifying "camp." . . . . "When Akbar ascended the throne, various races from all quarters, on hearing the kind patronage and bounty of that incomparable house, came and assembled in the royal presence, but the speech and dialect of each was different. From their being collected together, and owing to the trade, traffic, and intercourse which they carried on with one another, a single language, that of the Urdū (or Hindūstānī), was established."

The epoch of Akbar, which first saw a regular revenue system established, with toleration and the free use of their religion granted to the Hindūs, was, there can be little doubt, the period of the formation of the language. But its final consolidation did not take place till the reign of Shah Jahan. After the date of this monarch the changes are comparatively immaterial until we come to the time when European sources began to mingle with those of the East. Of the contributions from these sources there is little to say. Like the greater part of those from the Arabic and Persian, they are chiefly nouns, and may be regarded rather as excrescences which have sprung up casually and have attached themselves to the original trunk than ingredients duly incorporated in the body. In the case of the Persian and Arabic element, indeed, we do find not a few instances in which nouns have been furnished with a Hindī termination, *e.g.*, *kharīdnā*, *badalnā*, *guzarnā*, *dāghnā*, *bakhshnā*, *kamīnapan*, &c. But the European element cannot be said to have at all woven itself into the grammar of the language. It consists, as has been observed, solely of nouns, principally substantive nouns, which on their admission into the language are spelt phonetically, or according to the corrupt pronunciation they receive in the mouths of the natives, and are declined like the indigenous nouns by means of the usual postpositions or case-affixes.[4] A few examples will suffice. The Portuguese, the first in order of seniority, contributes a few words, as *kamarā* or *kamrā* (camera), "a room;" *martol*, "a hammer," *nilām*, "auction" (often corrupted

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[1] Hindūstānī (*lit.* "Of or belonging to Hindūstān") is the English name for the language. The natives generally call it *Urdū* or *Urdū Zabān*, "the camp language" (the word *Urdū* meaning in Turkish, "a camp"), and the poets, *Rekhta*, "mixed," while the phase of [illegible] peculiar to southern India is termed *Dakhanī*, or "southern." The term *Hindī*, on the other hand, is derived from the Persian *Hind*, "India," and, strictly speaking, is applicable only to the modern language of the Hindūs. The old language, prior to the inroads of the Musalmans, is termed *Hindwī*, and is derived from Hindū. It [illegible] that the present article has reference only to [illegible] [illegible]

[2] [illegible] *Comparative Grammar of the Modern Aryan Languages*, vol. i. p. 42.

[3] Beames, *Ibid.*, vol. i. p. [illegible], note.

[4] It is supposed, however, that the strange dialect in which the Lascars, or "native seamen," and the [illegible], or "boatmen," hold converse, and in which orders are given to a native crew regarding the [illegible] of a ship, is composed of Portuguese words assimilated to [illegible]. Of this there is no [illegible] and until the matter has been properly and satisfactorily investigated it would be injudicious to pronounce a decided opinion

[illegible] *peru*, "a turkey," &c. &c. Of French and Dutch influence scarcely a trace exists. English has contributed a number of words, some of which have even found a place in the literature of the language, e.g., [illegible] or [illegible] (commissioner); [illegible] (judge); [illegible] (assistant); *daktar* (doctor); [illegible], "the science of medicine," or "the profession of physicians," [illegible] (inspector); [illegible] (society); [illegible] (appeal); *apil karna*, "to appeal;" [illegible] or [illegible] (decree); [illegible] (degree); [illegible] (inch); *fut* (foot); and many more, are words now commonly used. How far the free use of Anglicisms will be adopted as the language progresses is a question upon which it would be hazardous to pronounce an opinion.

The grammatical structure of the Hindūstānī differs in no essential particular from that of the Hindī from which it is sprung. It is therefore of the rise and formation of this language, and of the stage to which it had attained when the new phase of the Hindūstānī was developed from it that we shall now speak.

Of the history and development of the Hindī or Hindūī language previous to the 11th century of our era little or nothing is known. It is accepted as a fact by most scholars that Sanskrit ceased to be a vernacular in the 6th century B.C., when the Buddhist religion was founded, which for ten centuries drove Brāhmanism into obscurity. From that time the Aryan people of India spoke popular dialects called Prākrits,[1] and it is from these that the modern Aryan tongues are mainly derived. These Prākrit dialects are generally grouped under five heads, viz., the Mahārāshtrī, Sauraseni, Māgadhi, Paisāchī, and Apabhransa. Of these the Sauraseni, or dialect of Saurasena, the modern tract of Mathurā and the surrounding country, is taken to be the parent of the Hindī, or at any rate of that phase of it with which we have to do. These Prākrits were, like the Sanskrit, synthetical and inflexional in their structure, and certainly continued to be so up to the 1st century of our era, the lowest stage to which in point of development scholars have been able to reach. At what precise period the synthetical structure of the Prākrit began to break up and to give place to the analytical formations of the modern speech it is impossible to tell. The gap of nine centuries has yet to be filled up. And unless future discoveries of Buddhistic literature should shed light on the subject, it is to be feared that the history of this period will ever remain unknown.

The dawn of modern Hindī may be dated from the 11th century. The earliest known writer in the language was Chand Bardāī (c.1200), whose epic is in a dialect rude and half-formed, but as decidedly analytical as the Hindī of the present day.[2] Much of the old synthetical structure no doubt is still to be found in the work; the particles and the auxiliary verbs are in a very crude and unformed state (as, for example, the use of an obscure *ka* for the modern genitive affix *kā*, which *ka* does not vary with the governed noun, and is frequently left out altogether; the total absence of the ordinary substantive verb *hai*, &c.); but these crudities and remnants of old Prākrit forms do not affect the general structure. Indeed, they are to be found in writings of a much later period, in works belonging to the 14th and 15th centuries, *e.g.*, in the *Ādi Granth*, the language of which exhibits, according to Trumpp, "grammatical forms not firmly fixed, but rather in a state of transition." And although the forms assume greater fixity, and marked progress is observable in the works of later writers in the Braj Bhakha dialect, *e.g.*, in those of Kabir, Sur Das, Nabha Ji, Kesava Dās, and Bihari Lal (whose poems are, as a rule, composed in very pure and elegant Hindi), we still find certain crudities and traces of Prākrit forms and organic structure, and these continue even in the language of the present day.

To give a minute account of the grammatical formation, to indicate the various phonetic or glottic laws by the operation of which the vocables and grammatical forms of the Hindī are derived from those of the Prākrit or Sanskrit, is beyond the scope of the present article. We can but notice a few general laws, and exhibit results, so far as they have been ascertained. For closer acquaintance with the subject we must refer the reader to the *Prākrit-Prakāsa* of Vararuchi, edited by Professor E. B. Cowell; the *Prākrit Grammar* of Hemachandra, edited by Professor Pischel; the *Comparative Grammar of the Modern Aryan Languages of India*, by John Beames, B.C.S.; and *Essays on the Gaurian Languages*, by Professor Rudolf Hoernle.

Prākrit tolerates no compound consonant in the beginning and no dissimilar consonant in the middle of a word. Two dissimilar consonants in a Sanskrit word are changed in Prākrit to two similar consonants, and occasionally one of these is elided and the preceding vowel lengthened. In the modern dialects this elision of one consonant and compensatory lengthening of the preceding vowel is the rule. Prākrit either changes a medial surd mute consonant to the corresponding sonant one, or elides it altogether; and it generally changes an aspirate mute consonant to the simple aspirate *h*. In fact the modern Aryan tongues stand to the Prākrit and the Sanskrit in a relation very similar to that existing between the Italian, &c., and the Romance and Latin languages. Hindī "is not the daughter of Sanskrit, as we find it in the Vedas, or in the later literature of the Brāhmans, it is a branch of the living speech of India, springing from the same stem from which Sanskrit sprang when it first assumed its literary independence."[3]

Vocables.—The vocables may be classed under three heads:—1. Words which are pure Sanskrit, as *rājā*, "a king"; *pitā*, "father"; *kavi*, "a poet"; *nāgari*, "of or belonging to a city"; *karma*, *kārya*, "work"; *krodha* (vulg. *krodh*), "anger." Not a few of this class of words have existed in the language for some centuries; some are to be found even in the oldest specimens of the literature; but by far the larger number have passed into the language during the present century, and the introduction is still progressing. The form in which they appear is that of the Sanskrit nominative singular.

2. Words which are derived from the Prākrit, and have been considerably changed in the process, though not so much as to obscure their origin, *e.g.*, *kām*, "work," Prk. *kamma*, S. *karma*; *kān*, "ear," Prk. *kaṇṇa*, S. *karṇa*; *āṭh*, "eight," Prk. *aṭṭha*, S. *ashṭha*; *hāth*, "hand," Prk. *hattha*, S. *hasta*; *āp*, "self," Prk. *appā*, S. *ātmā*; *bāt*, "word," Prk. *vattā*, S. *vārttā*; *āj*, "to-day," Prk. *ajja*, S. *adya*; *āge*, "before," Prk. *agge*, S. *agre*; *āg*, "fire," Prk. *aggi*, S. *agni*; *dūdh*, "milk," Prk. *duddha*, S. *dugdha*; *phāgun*, "Feb.-March," Prk. *phaggun*, S. *phālgun*; *buḍḍhā*, "old," Prk. *vuḍḍho*, S. *vriddhah*; *kahā*, "said," (Braj *kahyau*), Prk. *kahido*, *kahio*, S. *kathitah*; *rahā*, "remained," (Braj *rahyau*), Prk. *rahido*, *rahio*, S. *rahitah*; *thā*, "was," Prk. *thio*, S. *sthitah*. This is by far the largest class of words in the Hindī. And, as in the case of the first class, they are adopted in the form of the nominative singular of the Prākrit. They are divisible into two classes, the first comprising such as have in their declension preserved traces of the old organic inflexion of the Prākrit declension, and the second those which have preserved no such traces. As regards these it may be observed that the terminations *ā*, *e*, *ī*, *o*, *ū*, of the Prākrit are regularly reduced in the Hindī to their inherent simple vowels, viz., *a* to *a*, *e* and *ī* to *i*, and *o* and *ū* to *u*; and these short vowels are, as a rule, made quiescent, so that a word ending in reality in a short vowel virtually terminates in a consonant; and, not being pronounced, the final short vowel is frequently suppressed in writing also.

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[1] Prākrit is derived from the Sanskrit *prakriti*, "nature," and signifies "natural," "not accomplished," "vulgar." It is the collective name of those dialects which are immediately derived from, or which stand in an immediate relation to, Sanskrit, or "the polished or accomplished language" of the Hindus.

[2] It is this striking change from the synthetical structure of the Prākrit to the analytical of the Hindī, coupled with an accidental resemblance in certain of the case-affixes to those of the Dravidian tongues, that has led some Oriental scholars to claim for Hindī a non-Aryan descent. But this view is ably combated by Mr Beames in his *Comparative Grammar of the Aryan Languages of India*, and by Professor Rudolf Hoernle, in his *Essays on the Gaurian Languages*.

[3] Max Muller, *Lectures on the Science of Language*, lect. ii.

3. Words which cannot apparently be traced to any Sanskrit original, and are therefore considered by some scholars as words of non-Aryan origin; *e.g.*, *pagri*, "turban"; [illegible], Prk [illegible], "[illegible]." Such words form but a small proportion, and it is probable that further research and a better acquaintance with the laws of development of the modern Aryan tongues will ultimately enable scholars to very much diminish their number.

Gender.—The three genders of the Prākrit and Sanskrit are, in Hindi and Hindūstāni, reduced to two, the neuters and masculines of the old tongues generally becoming masculines in the modern languages. Instances, however, are not a few in which they are changed to feminines. A striking feature in the modern tongues is the preponderance of [illegible] ending in *ā*, with the corresponding feminines in *ī*. Now in the Sanskrit *ā* is a typical feminine ending, and *ī* is as often a masculine as a feminine termination. Many feminine words ending in *ā* are no doubt to be found in the Hindi, as [illegible], "[illegible]," = S. [illegible]; and [illegible] many masculine words which in the Prākrit and Sanskrit [illegible] in *ī* are also to be met with, as *pānī*, "water," = S. [illegible]; *hāthī*, "elephant," = S. *hastī* [illegible]. But *ā* is typically a masculine and *ī* a feminine termination in the Hindi and Hindūstāni, and this is probably due to the number of sources from which the termination springs; thus we have—(1) *ā* = Prk *o*, = S. *as* or *aḥ*, *e.g.*, [illegible], "like what," "what manner," "how," Prk. [illegible], S. [illegible]; (2) *ā* = Prk. *ao*, = S. [illegible], *e.g.*, *ghorā*, "horse," Prk. [illegible], S. [illegible]; (3) *ā* = Prk. [illegible], = S. [illegible], [illegible], "[illegible]," Prk. [illegible], S. [illegible]. Again, the masculine ending [illegible] of the old languages has a corresponding feminine in [illegible]; and as the Prākrit commonly employs the pleonastic increment *k* to raise bases to the form [illegible], so it employs the same affix to form the feminine [illegible] of these masculines; [illegible] becomes *iyī*, and more commonly *ī* in the modern tongues. The form *iyī* is that which is generally used in feminine diminutives; *e.g.*, *ḍibiyī*, "a tiny box"; but it is also used like *ī* for a simple feminine; *e.g.*, *kuttā*, "dog," [illegible], "bitch"; [illegible], "old man," *burhiyā*, "old woman." If to the above class of feminines ending in *ī* be added the large class which in Prākrit and Sanskrit form the feminine in *ī* (*i.e.*, the Prākrit masculines in *o*, = S. *as*), the preponderance of nouns ending in *ī* [illegible] sufficiently accounted for. It may be added that *ā* and *ī* are so universally regarded as masculine and feminine terminations respectively that the natives employ them freely in forming feminines from masculines and [illegible], *e.g.*, *bālā*, *bālī*, from the Arabic [illegible]. There are [illegible] other feminine terminations which are worthy of notice, not so much on account of their origin (which presents no difficulty), as on account of the free use which is made of them; these are—(1) [illegible], [illegible], *ani*, *ni*, = S. [illegible] (fem. of *in*, *i*); (2) [illegible], [illegible], = S. [illegible]. These are not only found in words derived from the Prākrit, but are added to Persian and even Arabic words; *e.g.*, [illegible], [illegible], [illegible], "female elephant," (= S. [illegible]); [illegible], [illegible], "a goldsmith's wife," fem. of *sunār*, "goldsmith," = S. [illegible], [illegible], "tigress," from the Persian *sher*, "tiger"; [illegible], a proper name, from the Arabic *nasib*; [illegible], "the wife of a [illegible]"; [illegible], "the wife of a [illegible] or headman"; [illegible], "the wife of a sweeper, a sweeper-woman," from the Persian [illegible], "a sweeper."

Declension.—It is here that the most striking contrast between the old and the new languages is found. The synthetical method of the Prākrit and the Sanskrit is, as a whole, rejected, only certain half-effaced traces of declension being retained. The number of cases, as in the Sanskrit, is seven, the nominative, accusative, instrumental, dative, [illegible], [illegible], [illegible], and vocative; but the inflexions of the Prākrit have given place to case-affixes or postpositions. For example, where the Sanskrit has [illegible] and [illegible], the Hindi has [illegible], and [illegible].

The case-affixes or postpositions are as follows:—

Ins[illegible]	[illegible] "by"
D[illegible]	[illegible] "for"
A[illegible]	[illegible] "from"
G[illegible]	[illegible] "of"
L[illegible]	[illegible] "in"

The [illegible] [illegible]

[illegible]

the instrumental as late as the time of Shāh Jahān, in whose reign, as has been shown above, Urdū or Hindūstāni was consolidated. Beames shows that the postposition is not used in the old Hindi, and is not to be found in most of the dialects, except as a dative; but he does not, we believe, trace it to any particular original. It is clear, however, that whether this affix is derived from the instrumental [illegible] ending of the Sanskrit or not, it bears a striking resemblance to the latter in its use and the construction it requires; *e.g.* the Sanskrit [illegible] is marvellously like the Hindi *us-na* [illegible], "by him it was said," or freely "he said."

The dative postposition *ko* is derived by Dr Trumpp from the Prākrit [illegible], = S. [illegible]. Dr Hoernle,[1] however, would seem to connect it with the Bangali [illegible] "near," and the S. [illegible] and Beames (*Comp. Gram.*, vol. ii. p. 257), accepting this as a right clue, traces the affix to the Prākrit [illegible], = S. [illegible], "armpit," "side," the locative of which, *kakkhe*, he believes to be the source of the Bangali [illegible].

The postposition *se* of the ablative is traced by Beames (*Comp. Gram.*, vol. ii. p. 274) to the Sanskrit [illegible], "with," through an old form [illegible] still used in the rustic dialects.

The genitive case-affix *kā* (fem. *kī*, oblique *ke*) is derived by Trumpp and others from the Sanskrit affix [illegible]. But Hoernle[2] shows conclusively (and his derivation is accepted by Beames) that the affix is derived from the Prākrit [illegible] (= S. [illegible]), which becomes [illegible], [illegible], and then [illegible]; [illegible] is then shortened to *karā* whence the modern form *kā*.

Of the locative case-affixes, [illegible], "in," is derived by scholars from the Sanskrit [illegible], the locative of [illegible], "the middle" while *par* (*pari*, or *pai*) is obviously traceable to the Sanskrit *upari* "upon."

The declensions are two in number. In the one the nominative or base is inflected before the case-affixes are added, in the other no change takes place in the nominative form. The first consists solely of masculine nouns ending in *ā* = Prk [illegible] = S. [illegible]; *e.g.*, *ghorā*, "horse," = Prk. *ghorāō*, = S. [illegible], the second comprises all other nouns, whether they end in vowels or consonants. The base of the first declension is inflected by changing final *ā* to *e*; *e.g.*, nom *ghorā*, inflect. base *ghore*, gen. [illegible], dat. [illegible]. But in the second declension we find, nom. [illegible], "king," gen. *rājā-kā*, "of a king," &c. Dr Hoernle connects the *e* of the inflected base with the *yā* of the oblique form in Marathi, and so traces it to a Prākrit genitive in [illegible]. The correctness of this derivation would seem to be established by the analogy of the oblique or inflected base of the plural of nouns, and especially by the inflected base of the pronouns, both these bases being indisputably traceable to the Prākrit genitive. Mr Beames, however, is of opinion that "it is not correct to derive the oblique form from any special case of the Sanskrit;" he thinks that "it rather results from a general fusion of all the cases" (*Comp. Gram.*, vol ii. p. [illegible]). This is the more remarkable as he accepts without demur the fact that the plural oblique base is a corruption of the Prākrit genitive plural.

The terminations of the nominative plural of nouns (when a plural form is used) are clearly traceable to the Prākrit. Nouns which fall under the first of the declensions noticed above terminate in *e* in the nom. plur. *e.g.*, *ghorā*, "horse," nom. plur. *ghore* "horses," which is identical in form with the inflected base of the singular. The termination *e* = Prk. [illegible], = S. *āḥ*. Feminines ending in a consonant and also fem. Arabic words ending in *ā*, as [illegible], form the nom. plur. by [illegible] to the sing. nom. This ending, *eṉ* = Prk. neuter [illegible], = S. neut. [illegible]. The plur. termination [illegible] of the nom. of feminines ending in *ī* (as *beṭī*, "daughter") is also to be referred to the Prākrit [illegible] = S. [illegible]. The oblique form of the plural of all nouns ends in [illegible], [illegible]; gen. [illegible]; *rājā*-[illegible], dat. [illegible]. The termination *oṉ* is derived from the Prākrit [illegible] (= S. [illegible]), the termination of the genitive plural.

Pronouns.—The pronouns stand in marked contrast to the nouns in respect of the fidelity with which they have preserved the Prākrit forms. Those of the first and second persons run parallel to one another, and have four [illegible] forms, namely, the nominative and the oblique [illegible]. The genitive is a possessive pronoun [illegible] in form. [illegible], "I," is derived by Trumpp from the Prākrit [illegible], the [illegible] of [illegible] [illegible] the instrumental [illegible] = S. [illegible]. In the genitive [illegible] [illegible] [illegible], and [illegible] the genitive [illegible] [illegible], which [illegible] of the [illegible] of Hindi. [illegible] [illegible]. The dative [illegible] of the modern Hindi is formed by adding *e* to [illegible] [illegible]. [illegible], "we," = [illegible]. [illegible] as the [illegible] of the plural [illegible]; but the [illegible] to be met with.

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[1] [illegible]

[2] [illegible], p. 176

The genitive plural *hamārā* is probably from Prk. *amha + kāro*, by elision of *k*.

The pronoun *tū*, "thou," = Prk. *tumam*, *tuvam*, = S. *tvam*. A form *tain*, parallel to *main*, and similarly derived, is also in use. The oblique *tujh* is from the Prākrit *tujjha*, one of the forms of the genitive. The second form and the processes by which the remaining forms are derived are precisely parallel to those employed in the pronoun of the first person.

The pronouns of the third person are identical with the demonstrative pronouns *yih* or *yeh*, "this," and *wuh* or *woh*, "that," of which the older forms are *ih* and *uh*. The origin of these forms has not yet been discovered. All that can be gathered respecting them is that they are probably connected with one or other of the Prākrit forms *ayam*, *esa*, *eso*, *iu*, &c. = S. *ayam*, m., *iyam*, f., *idam*, n., &c., and are to be referred to primitive bases *i* and *a* or *u*. The oblique forms of these pronouns, however, point clearly to the Prākrit genitive, *e.g.*, *is* = Prk. *assa*, S. *asya*.

The relative pronoun *jo*, "he who" = Prk. *jo*, base *ja* = S. *yas*. The other form in use, *jaun*, = Prk. *jo puna* (= S. *yah punah*). The singular oblique form *jis* = Prk. *jissa* (the fem. base *ji* being used in place of the masc. *ja*), = S. *yasya*. The oblique form of the plural, *i.e.*, *jin* = Prk. *jāṇam* (by weakening of the vowel), = S. *yeshām*.

The correlative *so* = Prk. *so* = S. *sah*. Its remaining forms may be made on the model of *jo* by substituting *t* for *j*.

The interrogative pronoun has *k* for its typical letter, just as the relative has *j*, and is in all respects as uniform as the relative and correlative. *Kaun*, "who" = *ko + puna* (= S. *punah*); the oblique form *kis* = Prk. gen. *kissa* (with change of base from masc. *ka* to fem. *ki*), = S. *kasya*.

The indefinite pronoun *koī*, "some one," = Prk. *kobi*, = S *ko + api*. "The oblique form *kisī* shows the oblique of the interrogative with the *i*, whose origin has been forgotten, so that it is regarded as a mere emphatic particle" (see Beames, *Comp. Gram.*). *Kuchh*, "something" = Prk. *kimchi* = S. *kimchit*.

The reflexive pronoun *āp*, "self" = Prk. *appā*, *āpā*, = S. *ātmā*.

Verbs and Tenses.—The verbal stems are, generally speaking, derived from the Prākrit present tense of Sanskrit neuter verbs, or from the Prākrit passive past participle. In the formation of the tenses, as in the declension of nouns, the synthetical or inflexional system of the Prākrit and the Sanskrit has given place to the analytical. Still wrecks of the old inflexions remain.

The tenses of the modern verb may be naturally classed under three heads—(1) the simple tenses, which are the exact modern equivalents of corresponding tenses in the Prākrit verb, and in which traces of the old synthetic method still linger; (2) tenses formed of a participle, either the imperfect or the perfect participle; (3) tenses formed of a participle and an auxiliary verb.

The tenses of the first class are two in number,—the aorist (which corresponds to the present indicative of the old languages), and the imperative, which is derived from the Prākrit imperative.

The terminations of the aorist are :—

Singular.	*Plural.*
1. *ūn* = Prk. *āmi* = S. *āmi*.	1. *en* = Prk. *āma*, *ama* = S. *āmah*.
2. *e* = Prk. *asi* = S. *asi*.	2. *o* = Prk. *aha* = S. *a-tha*.
3. *e* = Prk. *ai*, *aï* = S. *ati*.	3. *en* = Prk. *anti* = S. *anti*.

The imperative closely resembles the aorist or old present. The second person sing. is the bare verbal stem, and the second person plur. is identical with that of the aorist.

From the aorist the Hindūstānī and the Hindī form the simple future by the addition of *gā* (= Prk. *gaö*, *gado*, = S. *gatah*, perf. part. of the root *gam*, "to go"), *e.g.*, *kahūn-gā*, "I will tell," &c. The termination *gā* (which is masc.) becomes *gī* for the feminine, and *ge* for the plural, after the analogy of nouns of the first declension.

Of the tenses of the second class little need be said. The participles (which like other vocables are derived from the Prākrit) are the imperfect and the perfect, or what are vulgarly termed the present and the past. An example of each will suffice to show the construction: *wah boltī*, "he says"; *main bolā*, "I said"; *wah bolī*, "she said"; *we bole*, "they said." Such is the construction in the case of neuter and intransitive verbs. But if the verb be active transitive, the tenses formed of the perfect passive participle are passively constructed; the place of the nominative is taken by the instrumental or case of the agent, and the participle inflects so as to agree with the object, if this be expressed, and appear in the form of the nominative; but if the object is not expressed, or if when expressed it assumes the dative form, the participle is constructed impersonally and appears in the masc. sing. form; *e.g.*, *main-ne kahā*, "by me it was said," "I said"; *us-ne chiṭṭhī likhī*, "the letter was written by him," "he wrote the letter"; *rājā-ne sher-ko mārā*, "the king killed the tiger"; lit. "as regards the tiger, it was killed by the king." This construction, as we have already remarked, is commonly employed in the Sanskrit.

The tenses of the third class are formed by adding to the participles already mentioned the various tenses of certain auxiliary verbs, as *honā*, "to be"; *jānā*, "to go"; and the fragmentary forms *hūn* with its remaining persons and *thā*; *e.g.*, *main jātā hūn* "I am going"; *wah paṛhtī hai*, "she is reading"; *wah baiṭhā thā*, "he was seated," "he was sitting"; *we chale honge*, "they will have started."

Of these auxiliaries *honā* (*ho-* = Prk. *ho-*, = S. *bhū*) and *jānā* (*ja-* = Prk. *ja*, = S. *yā*) need not detain us. Both verbs are in use in all their tenses in the modern languages, and the preceding remarks on the verbal forms and tenses apply equally to them. *Jānā* is that which is employed to form the passive voice, *e.g.*, *wah mārā jāegā*, "he will be killed." It is also used for other purposes, such as intensifying a root to which it is attached, &c.

The auxiliaries *hūn* (with its other persons) and *thā* stand on a different footing. The former is derived from the present indicative of the root *as*, "to be," in the old languages :—

Singular.	*Plural.*
1. *hūn* = Prk. *amhi* = S. *asmi*.	1. *hain* = Prk. *amha* = S. *smah*.
2. *hai* = Prk. *asi* = S. *asi*.	2. *ho* = Prk. *attha* = S. *stha*.
3. *hai* = Prk. *atthi* = S. *asti*.	3. *hain* = Prk. *santi* = S. *santi*.[1]

The latter is derived from the Prākrit *thio*, = Sanskrit *sthitah*, the perfect participle of the root *sthā*, "to stand." Besides being used as auxiliaries, both are employed to express simple existence, as *main hūn*, "I am," "it is I"; *wah hai*, "he or it is"; *wah thā*, "he was"; *wah thī*, "she was." (J. T. P.)

HINDUSTANI LITERATURE.—Hindustani literature falls into two great divisions, of which the first is comprehensively styled Hindī, the second Urdū. Both of these forms of speech are, in their application to literary purposes, at first intruders upon the ground already occupied by the learned languages, Sanskrit and Persian. At no time during modern Indian history has Sanskrit altogether ceased to be used for composition by the class who regard culture and literature as their special heritage, although during the last two centuries it has much fallen from its former estate; and Persian has been still less neglected by learned Muhammadans and their Hindu imitators in India. But there is this difference between them that, whereas Hindī has been raised to the dignity of a literary language chiefly by impulses of revolt against the monopoly of the Brahmans, Urdū has been cultivated with good will by authors who have themselves highly valued and dexterously used the polished Persian. Both, however, represent the popular side of the national culture, and in the present day they are almost in sole possession of the field. The subject may be conveniently divided as follows :—

1. Early Hindī, of the period during which the language was being fashioned as a literary medium, represented by the old heroic poems of Rājpūtānā and the literature of the *Bhagats* or Vaishnava reformers, and extending from about 1200 to 1570 A.D.

2. Middle Hindī, representing the best age of Hindī poetry, and reaching from about 1570 to 1750 A.D.

3. The rise and development of literary Urdū, beginning about the end of the 16th century and reaching its height during the 18th.

4. The modern period, marked by the growth of a prose literature in both dialects, and dating from the beginning of the present century.

1. Early Hindī literature has as yet been very insufficiently explored. Chand's *Prithwīrāj Rāsau* is the only specimen of the heroic ballads of which any portion has been published, other ancient metrical chronicles of the same character being known to us only from the use made of them by such writers as Colonel Tod in his *Annals of Rajasthan*, and Major Pogson in his *History of the Boondelas*. Chand was the bard of Prithwīrāj, the last Hindu king of Dehli, whose life and death he has related. He was himself a native of Lahore, which had for nearly 200 years (since 1023) been under Musalmān domination at the time when the poem may be supposed to have been written. His language exhibits a considerable proportion of Persian words, but little of the distinctive features of what is now Panjābī. His work is probably, with the

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[1] Beames (*Comp. Gram.*, vol. iii. p. 171, *et seq.*) thinks it difficult, if not impossible, to derive these modern forms from the old ones given above, and would postulate the existence of a present tense of the root *as* conjugated after the *bhū* type, thus—(sing.) 1. *asāmi*; 2. *asasi*; 3. *asati*; (plur.) 1. *asāmah*; 2. *asatha*; 3. *asanti*. The objection to this, however, is that no such forms have been found to exist.

exception of a fragment by Jaideo (the author of the Sanskrit *Gītā-Govinda*, preserved in the *Ādi-Granth*, the oldest specimen of Hindī which we possess: but it is impossible to suppose that he was the first to attempt poetical composition in that language. The metrical perfection of his verse alone shows that he must have had many predecessors; and rude and rough though his utterance is, it abounds in poetic conventionalisms which must have been the common stock of many singers of his class. The story is told in sixty-nine books, of which some are interludes and digressions, but most are occupied with the exploits of the hero and his warriors. Considering the early date of the poem, and the opportunities of knowing the truth which the author (if he was really Prithwīrāj's bard) possessed, it is remarkable how much legend and fiction is mixed up with history in the chronicle. The repeated conflicts between the rājā and Sultān Shihābuddīn of Ghor, in which the latter always, except in the last great battle, comes off the worst, and is released on payment of a ransom, seem to be entirely unhistoric, our authorities knowing only one encounter (that of Tiraurī near Thānesar, fought in 1191) in which the sultān was defeated, and there even he escaped uncaptured to Lahore. The Mughals (Book xv.) are brought on the stage more than thirty years before they actually set foot in India (1222), and are related to have been vanquished by the redoubtable Prithwīrāj. These and other points make it questionable whether we have here, at least in its entirety, a genuine contemporary work; but we may concede, as indeed we are justified in doing by the language of the poem, that it is one of our earliest documents in Hindī.

It is very difficult for us now to form a just estimate of Chand's poem: the language, essentially transitional in character, abounds in strange forms which have long since died out of the vernacular speech; few if any Hindus, even the most learned, are able to interpret him; and his meaning must be sought by investigating the processes by which Sanskrit and Prākrit words have been transfigured in their progress into Hindī. But upon the whole he may be said to exhibit both the merits and defects of ballad-chroniclers in general. There is much that is lively and spirited in his descriptions of fight or council; and the characters of the Rājpūt warriors who surround his hero are not unfrequently sketched in their own words with skill and animation. The sound, however, too often predominates over the sense, and we find abundantly exemplified in his poem the wearisome iteration, uninventive sameness of machinery, and tedious unfolding of familiar themes and images which distinguish nearly the whole of Indian narrative poetry. His value, for us at least, is linguistic rather than literary.

The other class of composition which is characteristic of the period of Old Hindī, the literature of the *Bhagats*, both possesses more intrinsic interest and has exercised a more important influence on subsequent literary endeavour. The heroic chronicles, with perhaps the single exception of a famous saga relating the history of Padmāvatī, wife of Ratan Sen Rājā of Chitor, who in 1303 at the taking of that fortress by Sultān 'Alā-ud-dīn burnt herself and (so says the tale) 13,000 other women rather than fall into the hands of the conqueror, which has been several times handled by poets outside the pale of Rajput traditions, and especially in a still highly esteemed work by Jaisī under Sher Shāh (1540), had only a local currency, and contributed but little to the furtherance of literature outside the limits of Rajpūtāna. The Vaishnava reformers, on the other hand, exercised the most powerful influence both upon the national speech and upon the themes chosen for poetic treatment. Nearly the whole of subsequent Hindī literature is impressed with one or other form of Vaishnava doctrine; a very large proportion of the poets whose works are still current among the people were Vaishnava saints or *bhagats*; and to their initiative is due the almost exclusive use as a poetic dialect of that form of archaic Hindī known as Braj-bhākhā. Vaishnavism was essentially a reaction against Brahmanical influence and the chains of caste, a claim for the rights of humanity against the monopoly which the "twice-born" asserted of learning, of worship, of righteousness. As Siva was the peculiar deity of the Brahmans, so was Vishṇu of the people; and while the literature of the Saivas and Sāktas is almost entirely in Sanskrit, and exercised little or no influence on the popular mind, that of the Vaishnavas is mainly in Hindī, and in itself constitutes the great bulk of what has been written in that language.

The Vaishnava doctrine is commonly carried back to Rāmānuja, whose appearance is placed by Wilson about the middle of the 12th century. He was a native of Southern India, and had few immediate followers in the north. In the latter region the new opinions were spread by Rāmānand, whom the *Bhaktamālā* makes the fourth head of the sect, and other authorities the fifth; both Wilson and Trumpp place him about 1400 of our era. Nothing in Hindī by Rāmānuja has come down to us; of Rāmānand we have one short poem in the *Granth* (Introduction, p. cxxiv.). Between Rāmānuja and Rāmānand (though not in the line of teachers descending direct from the former) we may place Jaideo (about 1250) and Nāmdeo (about 1300), of the first of whom we have a fragment in the *Granth*, and of the second six pieces have been similarly preserved. Jaideo was a Brahman, and well acquainted with Sanskrit; but Nāmdeo (or Nāmā) was a *chhīpī* or calico-printer, a very despised class, and was perhaps the first to proclaim among the followers of the new doctrine the essential unity of mankind as worshippers of Hari. Kabīr comes next, and is incomparably the greatest, in the order of Vaishnava teachers. He was a weaver by caste, and in all probability originally a Musalmān. He is counted among the twelve disciples of Rāmānand; but he seems himself to trace his spiritual paternity rather to Jaideo and Nāmā.[1] He dwelt first at Benares and afterwards at Magahar, in the present district of Gorakhpur, during the reign of Sikandar Shāh Lodī (1488–1517), and was probably dead before the end of the 15th century. Nānak, the first Guru of the Sikhs, whose *Granth* is little more than a paraphrase of Kabīr's writings, was born in 1469 and died in 1538; and from the relation between the two it seems necessary to suppose that Kabīr was several years the senior.

The works attributed to Kabīr are very numerous; they are preserved complete at the headquarters of the sect, the *Kabīr chaurā* at Benares, and many portions of them have been separately printed and lithographed in India. The best known are those entitled the *Sākhīs*, *Sabds*, and *Rekhtas*, which have a wide popularity even among those who are not professed disciples of the saint. Several of the compositions enumerated under the name of Kabīr are, however, not by him, but by his disciples: as the lesser *Bījak*, by Bhago Dās, the *Sukh-Nidhān*, by Srut-Gopāl, &c.; it was the custom (as also that of Kabīr's religious heirs, the Sikh Gurus) for the successors in the guruship to speak in the name of him whose successors they were. The doctrine of Kabīr[2] was philosophically a form of pantheism, accounting for the existence of phenomena (the reality of which was denied) by the agency of a *Māyā*, or illusion, emanating from the Supreme. The varied lot of men in life, their differences of faith and aim, their desires, fears, hopes, loves, are all the work of this *Māyā*, to know which, and to recognize beneath all the Supreme, is the only means of emancipation from the chains of illusion. Neither austerities, ritual, nor works of any kind are necessary to obtain the highest end; this is only to be gained by *bhakti*, "faith," and perpetual meditation on the Supreme—His names, *Hari*, *Rām*, *Govind*, being ever on the lips and in the heart. The highest end is absorption in the Supreme, reunion with Him from whom all proceeded and who exists in all. Little place is left in this somewhat barren doctrine for a moral code, since works are naught; but negatively, at least, it is inoffensive, commanding respect for all forms of life, and quiet performance of duty without self-seeking or desire for gain.

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[1] This may be concluded from a short poem in the *Granth* (p. 469), where Kabīr says (verses 4, 5):—"Let each one seek the Mind, O brother: when the body falls away, where shall the Mind be absorbed? By the favour of the Guru Jaideo and Nāmā through the love of Faith attained to knowledge of Him." (The *Mind* is the indwelling Rāma, *divinae particula aurae*.)

[2] A tolerably full account will be found in H. H. Wilson's *Essay on the Religious Sects of the Hindus* (Works, vol. i. pp. 68 *sqq*.). Dr Trumpp's *Essay on the Religion of the Sikhs* (*Granth*, Introd., pp. xcvii *sqq*.) may also be consulted.

Of the spiritual followers of Kabīr many have left memorials in literature; one of the most eminent of these was Dādū, founder of a sect very prevalent in Rājpūtānā. A translation of two chapters from the *Granth* or scripture of this *Bhagat* will be found in a note to Wilson's *Religious Sects of the Hindus*, pp. 106–113, and will repay perusal. But those whose compositions, if not most excellent from a literary point of view, have at any rate wrought most in history, were the Gurus or spiritual heads of the Sikhs of the Panjāb. The *Ādi Granth*, or Book of the first five Gurus (from Nānak, who died in 1538, to Arjun, who died in 1601), is described by its translator as "perhaps the most shallow and empty book that exists, in proportion to its size;" and certainly the translation is not attractive reading. But the doctrines, reiterated with the most painful diffuseness, are essentially those of Kabīr, much of whose writings has been incorporated in the volume. The language is rather Old Hindī than Old Panjābī, and thus the work falls within the scope of this article; though Panjābī words and idioms frequently occur, the grammar is Hindī; and the authors evidently aimed at propagating their tenets rather among the Hindī-speaking races of Hindostan proper than (as actually happened) among the Panjābī-speaking tribes of the West and South-West. The *Granth* consists of six parts: I., the *Japjī*, the only portion as yet published in Europe in the original Hindī; II., III., and IV., arrangements for devotional purposes of extracts from Part V., the *Rāgs* or body of the *Granth*; of these *Rāgs* there are thirty-one, but only four, *Srī Rāg*, *Mājh*, *Gaurī*, and *Āsā*, have been rendered by Trumpp; the remaining twenty-seven are described as "a second gathering or gleaning, as materials offered themselves, no attention being paid to the contents, but only to the bulky size of the *Granth*;" VI., the *Bhog* or conclusion, containing verses by various authors, among them Kabīr and Shekh Farīd of Pākpattan, a famous Indian *Sūfī*, and panegyrics of the five Gurus by fifteen *bhatts* or bards. At the end of each Rāg is a collection of sayings of the *Bhagats*, chiefly of Kabīr, in confirmation of the doctrines set forth by the Gurus; and it is in these additions that the literary importance of the work, as a treasure of specimens of early Hindī, mainly consists.

Another of the following of Rāmānand, though considerably later in time than Kabīr, was Sūr-Dās. Of his life little is known: as some of his verses are included in the *Granth*, he must have lived before its redaction (about 1600); if he be the same as a saint of that name mentioned in the *Bhaktamālā*, as is probable, he was a Brahman, *amīn* or revenue collector of the *parganah* of Sandīlā in Oudh during the reign of Akbar, who is related to have appropriated the collections of his district for the service of the temple of Madan-Mohan at Brindāban, sending to the treasury instead chests filled with stones. When his delinquency was discovered, he was pardoned by Akbar, but thenceforth abandoned the world, and, becoming blind, led a wandering life as a singer of the praises of Vishnu. His stanzas, generally of four lines (*padas*), are said to number no less than 125,000; they are collected in a huge volume entitled the *Sūr Sāgar*, and are extremely popular.

While the sects of which Rāmānand may be considered the spiritual father adore the Deity chiefly under the names of *Rām*, *Hari*, *Govind*, and dwell but little on the *avatars* or human incarnations of the Hindu god whom they have selected as the type of the Supreme, there is another division of the Vaishnavas which is not less important in Hindī authorship, and counts its adherents by millions, whose worship is of a different character. The sects belonging to this division take Krishṇa as their favourite type of the godhead, and, accepting the whole mass of legends (most of them probably of comparatively late origin) relating to this incarnation, inspire themselves with fervour by the contemplation chiefly of Krishṇa's childhood and his youth in the society of the herd-maidens of Braj. As the doctrine and object of worship are, so also is the mode of life. The Rāmānandīs are for the most part men of ascetic and unworldly life, not indeed given to self-torture or needless rigour, but caring nothing for the wealth of the world, and living quietly and soberly in the possession of what they deem the truth. The worshippers of Krishṇa and his mistress Rādhā, or of the infant Bāl-Gopāl, on the other hand, are no ascetics, but persons of luxurious and often opulent lives; among women especially this form of devotion is widespread. The chief sect of this denomination is the *Vallabhāchārīs*, or the following of the *Gokulastha Gosāīns*. Their founder was one Vallabha Swāmī, a Brahman from the south, who settled at Gokul near Mathurā, probably about the beginning of the 16th century. The best known works of this sect are the *Braj-bilās*, a description of Krishṇa's sports with the maidens of Brindāban, by Brajbāsī-Dās, and the *Vārttā*, a collection of legends regarding eighty-four teachers of the following, resembling the *Bhaktamālā*, which deals chiefly with the other division of Vaishnavas. The popularity of the *Brāj-bilās* is immense, and it is to be found in a lithographed form for sale in every bazaar. Its contents (as indeed many other productions of the worshippers of Krishṇa) have been condemned by Europeans as indecent; but although containing much that seems at least outwardly licentious and prurient, it is a work the study of which is indispensable to one who would understand the religious temper of the Hindus. The mystic dwelling on the amours of Krishna and the *Gopīs* of Braj has been often compared to the mystical interpretation of the *Song of Solomon*; and in most religions we shall perhaps find at least one phase in which the sensual is curiously mingled with the spiritual, and faith and love towards the heavenly stimulated by thoughts and phrases drawn from earthly scenes of passion. Of the *Vārttā* we shall speak under the next division of our subject.

2. Middle Hindī reaches from about 1570 to 1750. To this age belong the best poets of Hindī literature, Kesav-Dās, Bihārī-Lāl, and Tulsī-Dās, whose writings are no less remarkable for skill and subtlety of language than for perfection of metrical form. The labours of their predecessors had wrought the language of western Hindustan into a medium worthy of being put to the highest poetic use; and we accordingly find in the poets of this period large borrowings from Braj, even where (as with Tulsī-Dās) that idiom is not the dialect of their own region. From their day onward Braj-bhākhā has been esteemed (in the words of Lallū-Lāl) "the standard language of sentiment

(*mahārasa-mūl*), and equal to the speech of the gods" (*i.e.*, Sanskrit).

Kesav-Dās was a Brahman who lived under Jahāngīr and Shāhjahān. He was the author of a poem on Rāma, entitled the *Rāmachandrikā*, written in 1602; the *Kavipriya*, written in the same year, a treatise on the poetic art of much celebrity; the *Rasikpriya*, on rhetoric, written in 1592; the *Bhaktilīlāmrita*, an exposition of the doctrine of Rāmānandī Vaishnavism; and several other works. Kesav-Dās's compositions are widely popular, and have been frequently lithographed in Northern India.

Bihārī Lāl is renowned as the author of the *Sat-saī*, a collection of 700 distichs, which is perhaps the most celebrated work of Hindī poetic *art*, as distinguished from narrative and simpler styles. They are inspired by the Krishṇa side of Vishṇu-worship, and take the form of amorous dialogues between Rādhā and the other *Gopīs* and their lover. The author was a native of Goāliyār, and lived at Amber during the early part of the 17th century. Editions of this work, one of the most difficult in Hindī and abounding in subtle conceits, are very numerous. It has been commented on by a crowd of scholars, among them, strange to say, more than one Musalmān,—a sufficient proof of the value set by natives of India, irrespective of their creed, on its perfection of language. It has even been translated into Sanskrit.

Tulsī-Dās, though perhaps inferior in poetic skill to the two last mentioned, is undoubtedly the most popular Hindī poet. His *Rāmāyan* (originally named by the author *Rām-charit mānas*, or "the Lake of Rāma's deeds") is perhaps better known among Hindus in Upper India than the Bible among the rustic population of England. He was a Kanaujī Brahman, and probably (from his language) a native of Oudh. The greater part of his life he spent at Benares; he died in 1624. His *Rāmāyan* was commenced at Ayodhyā in 1573. Besides this great work, he is the author of six other poems, all bearing more or less on the history and worship of Rāma, called the *Rām-gītāvalī*, the *Dohāvalī*, the *Kabitt sankalath*, the *Binay patrikā*, the *Pad-Rāmāyan*, and the *Chhandāvalī*. Seven other minor works are attributed to him, but their authenticity is doubtful.

Tulsī's *Rāmāyan* is a rehandling of the great theme of Vālmīkī, but in no sense a translation of the Sanskrit poem; real translations are scarcely to be found in original Hindī literature, the vernacular authors permitting themselves great liberty of excision, adaptation, and addition. It consists of seven books, of which the first two, called the *Bāl-kāṇḍ* and *Ayodhyā-kāṇd*, make up more than half the work, and relates the birth and boyhood of Rāma and his brethren, his marriage with Sītā, their dwelling together in the forest, her abduction by Rāvan, the expedition to Lankā and the overthrow of the ravisher, and the life at Ayodhyā after the return of the reunited pair. It is written chiefly in *dohās*, *sorthās*, and *chaupāīs*, with here and there a *chhand* interspersed; the style is very even and well sustained, and the language, while fundamentally the Old Pūrbī of eastern Hindustān, borrows largely from Braj. The most admired portion of the work is the second book, *Ayodhyā*, which tells of the mischief wrought by Kaikeyī, one of the queens of Dasarath, Rāma's father, who had bound himself by a vow to grant her what boon she should ask, and whom by this bond she compelled to command Rāma and Sītā to go into exile in the great forest south of the Jamna, and to give the throne to her own son Bharat. In this trouble Dasarath dies, and his son obediently goes forth with his wife and his brother Lachhman to the southern wilderness. The sorrow of Dasarath, the sweet filial piety and perfect manhood of the divine Rāma, the valour and generous affection of Lachhman, the modesty and humility of Bharat, the purity and wifely devotion of Sītā, are themes which a Hindu reader is never tired of dwelling upon in Tulsī's pages. And unlike though the treatment be to our own standards of taste, overgrown with theological digressions and explanations, and stocked with conventional images and stereotyped phrases as the poem is, even a European may find in it something of literary achievement which appeals to him, however distantly, as the work of a master of the art. The first two books of the *Rāmāyan* have been admirably rendered into English prose by Mr F. S. Growse (Allahabad, 1877-78).

Tulsī, though essentially a Hindu and a Brahman in religious feeling, yet belongs to the class of Vaishnavas who count among them Rāmānand and Kabīr. He has little or nothing of the sensual passion of the devotees of Krishna and Rādhā; and in the commentary on the *Bhaktamālā* it is related that, when in his old age he paid a visit to Brindaban, the centre of the Krishṇa cult, he refused to render homage to any other form of the god than Rāma. According to the legend, he was beguiled into a temple of Krishṇa, and bidden there to worship Rāma; he answered that he would only bow his head before one who should bear in his hand the bow and arrows of the king of Ayodhyā; hearing his speech, the image of the god, standing till then as Krishṇa with the flute (*Bansīdhar*), suddenly changed to the similitude of Rāma with the bow.

The *Bhaktamālā*, or "Roll of the *Bhagats*," is a celebrated work of this period, and is ascribed to Nābhājī, a Vaishnava of the despised caste called *Doms* or *Domras*, who lived during the reign of Jahāngīr, and was a contemporary of Tulsī Dās. The *Bhaktamālā*, in the form in which it is commonly met with, consists of a *mūl*, or original text, ascribed to Nābhājī, and a *ṭīkā*, or commentary, of which there are two, due respectively to Krishṇa Dās and Priya Dās, both stated to have been written in 1713, in verse, and many more in prose. The *mūl* is a short stanza (*chhappai*) for each saint, the first line of which is repeated again at the end, stating, in the briefest and most obscure language, his characteristics. The original work of Nābhājī was amplified and added to by Nārāyan Dās, who lived during the reign of Shāhjahān. Mr Growse justly says of it:—"The style (of the *mūl*) might be described as of unparalleled obscurity, were it not that each separate portion of the text is followed by a *ṭīkā*, or gloss, in which confusion is still worse confounded by a series of the most disjointed and inexplicit allusions to different legendary events in the saint's life." A considerable portion of the *Bhaktamālā* was printed in 1817 in Major Price's *Hindī and Hindūstānī Selections*, and it has been largely drawn upon by Wilson in his account of the religious sects of the Hindus. The saints treated in it are chiefly of the class of Vaishnavas addicted to the worship of Rāma; and the anecdotes of them contained in the work are generally insipid and extravagant in the extreme. "Such as it is, however, it exercises a powerful influence in Upper India on popular belief, and holds a similar place in the superstitions of this country to that which was occupied, in the darkest ages of the Roman Catholic faith, by the *Golden Legend* and *Acts of the Saints*" (Wilson).

The other side of Vaishnavism, that devoted to the cult of the infant or youthful Krishṇa, with or without his mistress Rādhā, is represented by a work similar in character to the *Bhaktamālā*, called the *Vārttā*, or *Chaurāsī Vārttā*, already mentioned. Specimens of its contents will be found in Wilson's *Religious Sects of the Hindus*, p. 132. Its legends are of the most trivial and childish description; but, with the tenth chapter of the *Bhāgavata Purāṇa*, rendered into Braj Bhākhā by Chaturbhuj Misr, and into modern Hindī in 1804-10 by Lallū Lāl, they are nevertheless the inspirers of the greater part of the popular worship throughout the whole of Northern India. The universality of the cult of the infant Krishna may be judged by the enormous number of Hindu proper names which end in *Lāl*, meaning "child," all of which embody some reference to the deity in his youthful form. In Bengal especially the sect is extremely numerous, having there arisen out of the teaching of Chaitanya, who is said to have married a daughter of Vallabhāchārya, and is believed by his followers to have been himself an incarnation of Krishna.

Such, in the broadest outline, is the character of Hindī literature during the period when it grew and flourished through its own original forces. Founded by a popular impulse in many respects similar to that which gave rise to Buddhism nearly 2000 years before, and cultivated chiefly (though by no means exclusively) by authors not belonging to the Brahmanical order, it was the legitimate descendant in spirit, as Hindī is the legitimate descendant in speech, of the Prakrit literature which preceded it. Entirely in verse, it adopted and elaborated the Prakrit metrical forms, and carried them to a pitch of perfection which is too often overlooked by those who concern themselves rather with the substance than with the form of the works they study. The language of these compositions strikes us often as rude, abrupt, and ambiguous; undoubtedly in its earlier specimens it is wanting in clearness and definiteness of grammatical form; but the shackles of metre are frequently the explanation of uncouth forms of speech, and the necessity of filling out a metrical scheme led in too many cases to irregularities and amplifications which had perhaps no representatives in the uncompelled utterances of the vernacular tongue. Interesting when regarded in the mass, its attractions in detail are few. As in all Oriental literature, repetition and shallowness of idea overcome it, and render an extensive course of reading intolerable to a European. Conventional images, platitudes exhausted to the utmost degree of tenuity, barren philosophical and theological themes which in their wideness entirely overlook the study of detail,—such are, with few exceptions, its leading features; and one who has read two or three books has in truth made himself master of the whole secret of original Hindī literature.

3 The *origines* of Urdū as a literary language are extremely obscure. The popular account refers its rise to the time of Tīmūr (1398). Some authors even claim for it a higher antiquity, asserting that a *dīwān*, or collection of poems, was composed in *Rekhtah* by Mas'ūd, son of Sa'd, in the last half of the 11th and beginning of the 12th century, and that Sa'dī of Shīrāz and his friend Amīr Khusrau of Dehli likewise made verses in that dialect before the end of the 13th century. This, however, is very questionable; and the better opinion appears to be that these ancient compositions, if they existed at all, were written in Hindī according to the metrical forms of that language, rather than in what is properly called Urdū. That Muhammadans composed in Hindī, and used that language as their vernacular, is certain; and in many passages of Kabīr, which are nevertheless pure Hindī compositions, Persian words are used almost as freely as in the modern dialect. Much of the confusion which besets the subject is due to the want of a clear definition of what Urdū, as opposed to Hindī, really is.

Urdū, as a literary language, differs from Hindī rather in its form than in its substance. The really vital point of difference, that in which Hindī and Urdū are incommensurable, is the prosody. Hardly one of the metres taken over by Urdū poets from Persian agrees with those used in Hindī; in the latter language it is the rule to give the short *a* inherent in every consonant or group of consonants its full value in scansion, except occasionally at the metrical pause: in Urdū this is never done, the only somewhat analogous rule providing for the enunciation of a short *a* (the *alif-i-waṣl*) after a nexus of consonants which would otherwise be pronounced without it; the great majority of Hindī metres are counted by the number of syllabic instants or *mātrās* (the value in time of a short syllable): in Urdū the metres follow a special order of longs and shorts.

The question, then, is not—When did Persian first become intermixed with Hindī in the literary speech?—for this process began with the first entry of Muslim conquerors into India, and continued for centuries before a line of Urdū was composed,—nor, When was the Persian character first employed to write Hindī?—for the written form is but a subordinate matter. We must ask—When was the first verse composed in Hindī, whether with or without foreign admixture, according to the forms of Persian prosody and not in those of the indigenous metrical system? Then, and not till then, did Urdu come into being. If, then, it is really the case that poems were so composed as early as the 11th or the 13th century, the origin of Urdū literature must be carried back to that period. But Hindī itself was at that date, and for many decades later (as we see from Chand and our other earliest specimens of the language), in an unsettled and transition stage. Neither in its case-inflexions nor in its verbal forms did it resemble the language which we know as Urdū. It abounded in short vowels and hiatuses, which could not accommodate themselves either to the Persian character (without the free use of vowel-signs and *hamzah*, which were seldom employed) or to Persian prosody; and its syntactical order was loose and unsettled. Urdū, as we know it, is the Hindī of the end of the 16th century enriched from Persian, not the Hindī of Chand and the early *Bhagats*.

The whole of Urdū poetry follows Persian models of composition; its themes are those which had already been worked (some might say, worked out) by writers in that language; and neither in form nor substance do we find the faintest flavour of originality from its commencement to the present day.

The paucity of themes and want of originality in Urdū verse has led to a most elaborate development of the system of rhetoric. Where the substance of what a poet has to say is identical with that which has been said by hundreds, nay thousands, of poets before him, it is of the highest importance that the way of saying it shall if possible be peculiar to himself. Rhetoric, accordingly, rather than poetic feeling, is the distinguishing feature of composition in Urdū. Pleasing hyperbole, ingenious comparison, antithesis, alliteration, carefully arranged gradation of noun and epithet, are the means employed to obtain variety; and few of the most eloquent passages of Urdū verse admit of translation into any other language without losing that which in the original makes their whole charm. Even in the *masnavīs*, or narrative poems, the story is usually quite a subordinate matter; it has in most cases been handled time after time, and is familiar to the reader in its minutest detail. Even when the names chosen for the actors are new, the intrigue is old, and the mode in which it is unfolded is the only thing which distinguishes one poem from another. The descriptions thus, confined within a narrow circle of incident and epithet, repeat each other with a monotony which to a European is inexpressibly fatiguing, but which in the East is deemed rather a merit than a defect. Differences of school, which are made much of by native critics, are to us hardly perceptible; they consist in the use of one or other range of metaphor and comparison, classed, according as they repeat the well-worn poetical stock-in-trade of the Persians or seek a slightly fresher and more Indian field of sentiment, as the old or the new style of composition.

These being the nature and features of Urdū poetry, it will be manifest that such an account of it as can be given here must be little more than a list of names and dates.

The earliest Urdū authors lived and wrote in the Dakkhan, at the courts and under the patronage of the Muhammadan dynasties of Golkonda and Bījāpur, shortly before these dynasties were overthrown by the campaigns of Aurangzeb in the south. Shujā'uddīn Nūrī, a native of Gujarāt, a friend of Faizī and contemporary of Akbar, is mentioned by the native biographers as the most ancient Urdū poet after Amīr Khusrau. He was tutor of the son of the *wazīr* of Sultān Abu-l-Hasan Qutb Shāh of Golkonda, and several *ghazals* by him are said to survive. Qulī Qutb Shāh of Golkonda, who reigned from 1581 to 1586, and his successor 'Abdullāh Qutb Shāh, who came to the throne in 1611, have both left collections of verse, including *ghazals*, *rubā'is*, *masnavīs* and *qasīdahs*. And during the reign of the latter Ibn Nishāti wrote two works which are still famous as models of composition in Dakhnī; they are romances entitled the *Tūtī-nāmah*, or "Tales of a Parrot," and the *Phūl-ban*. The first, written in 1639, is an adaptation of a Persian work by Nakhshabī, but derives ultimately from a Sanskrit original entitled the *Śukasaptati*; this collection has been frequently rehandled in Urdū, both in verse and prose, and is the original of the *Totā-Kahānī*, one of the first works in Urdū prose, composed in 1801 by Muhammad Haidar-bakhsh Haidarī of the Fort William College. The *Phūl-ban* is a love tale named from its heroine, said to be translated from a Persian work entitled the *Basātīn*. Another famous work which probably belongs to the same place and time is the *Story of Kāmrūp and Kalā* by Tahsīnuddīn, a *masnavī* which has been published (1836) by M. Garcin de Tassy; what makes this poem remarkable is that, though the work of a Musalmān, its personages are Hindu. Kāmrūp, the hero, is son of the king of Oudh, and the heroine, Kalā, daughter of the king of Ceylon; the incidents somewhat resemble those of the tale of es-Sindibād in the *Thousand and One Nights*; the hero and heroine dream one of the other, and the former sets forth to find his beloved; his wanderings take him to many strange countries and through many wonderful adventures, ending in a happy marriage.

The court of Bījāpur was no less distinguished in literature. Ibrāhīm 'Ādil Shāh (1579-1626) was the author of a work in verse on music entitled the *Nau-ras* or "Nine Savours," which, however, appears to have been in Hindī rather than Urdū; the three prefaces (*dībājahs*) to this poem were rendered into Persian prose by Maulā Zuhūrī, and, under the name of the *Sih nasr-i Zuhūrī*, are well-known models of style. A successor of this prince, 'Alī 'Ādil Shāh, had as his court poet a Brahman known poetically as Nusratī, who in 1657 composed a *masnavī* of some repute entitled the *Gulshan-i 'Ishq*, or "Rose-garden of Love," a romance relating the history of Prince Manohar and Madhumālatī,—like the *Kāmrūp*, an Indian theme. The same poet is author of an extremely long *masnavī* entitled the *'Alī-nāmah*, celebrating the monarch under whom he lived.

These early authors, however, were but pioneers and feelers of the way; the first generally accepted standard of form, a standard which has suffered little change in two centuries, was established by Walī of Aurangābād (about 1680-1720) and his contemporary and fellow-townsman Sirāj. The former of these is commonly called "the Father of Rekhtah"—*Bābā-e Rekhtah*; and all accounts agree that the immense development attained by Urdū poetry in Northern India during the 18th century was due to his example and initiative. Very little is known of Walī's life; he is believed to have visited Dehli towards the end of the reign of Aurangzeb, and is said to have there received instruction from Shāh Gulshan in the art of clothing in a vernacular dress the ideas of the Persian poets. His *Kulliyāt* or complete works have been published by M. Garcin de Tassy, with notes and a translation of selected passages (Paris, 1834-36), and may be commended to readers desirous of consulting in the original a favourable specimen of Urdū poetical composition.

The first of the Dehli school of poets was Zuhūruddīn Hātim, who was born in 1699 and died in 1792. In the second year of Muhammad Shāh (1719), the *dīwān* of Walī reached Dehli, and excited the emulation of scholars there. Hātim was the first to imitate it in the Urdū of the north, and was followed by his friends Nājī, Mazmūn, and Ābrū. Two *dīwāns* by him survive. He became the founder of a school, and among his pupils was Rafī'us-Saudā, the most distinguished poet of Northern India. Khān Ārzū (1689-1756) was another of the fathers of Urdū poetry in the north. This author is chiefly renowned as a Persian scholar, in which language he not only composed much poetry, but one of the best of Persian lexicons, the *Sirāj-ul-lughat*; but his compositions in Urdū are also highly esteemed. He was the master of Mīr Taqī, who ranks next to Saudā as the most eminent Urdū poet. Ārzū died at Lakhnau (Lucknow), whither he betook himself after the devastation of Dehli by Nādir Shāh (1739). Another of the early Dehli poets who is considered to have surpassed his fellows was In'āmullah Khān Yaqīn, who died during the reign of Ahmad Shāh (1748-54), aged only twenty-five. Another was Mīr Dard, pupil of the same Shāh Gulshan who is said to have instructed Walī; his *dīwān* is not long, but extremely popular, and especially esteemed for the skill with which it develops the themes of spiritualism. In his old age he became a *darwesh* of the *Naqshbandī* following, and died in 1793.

Saudā and Mīr Taqī are beyond question the most distinguished Urdū poets. The former was born at Dehli about the beginning of the 18th century, and studied under Hātim. He left Dehli after its devastation, and settled at Lakhnau, where the Nawāb Āsafud-daulah gave him a *jāgīr* of Rs. 6000 a year, and where he died in 1780. His poems are very numerous, and cover all the styles of Urdū poetry; but it is to his satires that his fame is chiefly due, and in these he is considered to have surpassed all other Indian poets. Mīr Taqī was born at Agra, but early removed to Dehli, where he studied under Ārzū; he was still living there at the time of Saudā's death, but in 1782 repaired to Lakhnau, where he likewise received a pension; he died at a very advanced age in 1810. His works are very voluminous, including no less than six *dīwāns*. Mīr is counted the superior of Saudā in the *ghazal* and *masnavī*, while the latter excelled him in the satire and *qasīdah*. Sayyid Ahmad, an excellent contemporary authority, and himself one of the best of modern authors in Urdū, says of him in his *Āsāru-s-Sanādīd*:—"Mīr's language is so pure, and the expressions which he employs so suitable and natural, that to this day all are unanimous in his praise. Although the language of Saudā is also excellent, and he is superior to Mīr in the point of his allusions, he is nevertheless inferior to him in style."

The tremendous misfortunes which befell Dehli at the hands of Nādir Shāh (1739), Ahmad Shāh Durrānī (1756), and the Marāthās (1759), and the rapid decay of the Mughal empire under these repeated shocks, transferred the centre of the cultivation of literature from that city to Lakhnau, the capital of the newly founded and flourishing state of Oudh. It has been mentioned how Ārzū, Saudā, and Mīr betook themselves to this refuge and ended their days there; they were followed in their new residence by a school of poets hardly inferior to those who had made Dehli illustrious in the first half of the century. Here they were joined by Mīr Hasan (died 1786), Mīr Soz (died 1800), and Qalandar-bakhsh Jur'at (died 1810), also like themselves refugees from Dehli, and illustrious poets. Mīr Hasan was a friend and collaborator of Mīr Dard, and first established himself at Faizābād and subsequently at Lakhnau; he excelled in the *ghazal*, *rubā'ī*, *masnavī*, and *marsiyah*, and is counted the third, with Saudā and Mīr Taqī, among the most eminent of Urdū poets. His fame chiefly rests upon a much admired *masnavī* entitled the *Sihru-l-bayān*, or "Magic of Eloquence," a romance relating the loves of Prince Be-nazīr and the Princess Badr-i Munīr; his *masnavī* called the *Gulzār-i Iram* ("Rose-garden of Iram," the legendary 'Adite paradise in Southern Arabia), in praise of Faizābād, is likewise highly esteemed. Mīr Muhammadī Soz was an elegant poet, remarkable for the success with which he composed in the dialect of the harem called *Rekhtī*, but somewhat licentious in his verse; he became a *darwesh* and renounced the world in his later years. Jur'at was also a prolific poet, but, like Soz, his *ghazals* and *masnavīs* are licentious and full of double meanings. He imitated Saudā in satire with much success; he also cultivated Hindī poetry, and composed *dohras* and *kabitts*. Miskīn was another Lakhnau poet of the same period, whose *marsiyahs* are especially admired; one of them, that on the death of Muslim and his two sons, is considered a masterpiece of this style of composition. The school of Lakhnau, so founded and maintained during the early years of the century, continued to flourish till the dethronement of the last king, Wājid 'Alī, in 1856. Ātash and Nāsikh (who died respectively in 1847 and 1841) are the best among the modern poets of the school in the *ghazal*; Mīr Anīs, a grandson of Mīr Hasan, and his contemporary Dabīr, the former of whom died in December 1875 and the latter a few months later, excelled in the *marsiyah*. Rajab 'Alī Beg Surūr, who died in 1869, was the author of a much-admired romance in rhyming prose entitled the *Fasānah-e 'Ajāib* or "Tale of Marvels," besides a *dīwān*. The dethroned prince Wājid 'Alī himself, poetically styled Akhtar, is no mean poet; he has published three *dīwāns*, among them a quantity of poetry in the rustic dialect of Oudh which is philologically of much interest.

Though Dehli was thus deserted by its brightest lights of literature, it did not altogether cease to cultivate the poetic art. Among the last Mughals several princes were themselves creditable poets. Shāh 'Ālam II. (1761-1806) wrote under the name of Āftāb, and was the author of a romance entitled [illegible], besides a *dīwān*. His son Sulaimān-shikoh, brother of Akbar Shāh II., who had at first, like his brother authors, repaired to Lakhnau, returned to Dehli in 1815, and died in 1838; he also has left a *dīwān*. Lastly, his nephew Bahādur Shāh II., the last titular emperor of

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[1] The late M. Garcin de Tassy's *Histoire de la Littérature Hindoui et Hindoustani*, and his annual summaries of the progress made from 1850 to 1877, afford all the materials which can be desired on this subject by one who does not care to refer to the original vernacular works; the peculiarities of the latter can be learned only from long-continued study and familiarity with Oriental modes of thought.

Dehli, died 1809, wrote under the name of [illegible], and was a pupil in poetry of Shāh Hātim [illegible] left a [illegible] which has been printed at Dehli. Mushafī (Ghulām Hamadānī), who died [illegible], was one of the most distinguished [illegible] of the [illegible] D[illegible] [illegible] of Lakhnau, he left [illegible] Dehli in 1777, and held [illegible] of poets, [illegible] several [illegible]; he has left three dīvāns, a [illegible] of Urdū poets, and a [illegible] of the kings of Dehli down to Shāh 'Ālam. [illegible] 'Alī [illegible], and died in 1792; [illegible] left several works of [illegible]. [illegible] otherwise Mīrzā [illegible] Khān, [illegible] of the last Mughal, who died in 1869, is [illegible] the most eminent of the modern Dehli poets. He wrote chiefly in Persian, of which language, especially [illegible] of Arabic words, he was a master; but his Urdū dīvān, though short, is [illegible] his reputation was spread far and wide. [illegible] may be attributed [illegible] (recently died in 1872); his [illegible], *Banjāra*-[illegible], *Pajra*-[illegible], and *Barhā*-[illegible], as well as [illegible], have been frequently reprinted, and are very widely popular. His language is less Persianized than that of the generality of Urdū poets, and some of his poems have been printed in Nāgarī, and he is well known and as much esteemed by Hindus as by Muhammadans.

4. While such, in outline, is the history of the poetic schools of the Dakhkhan, Dehli, and Lakhnau, a fourth, that of the Fort William College at Calcutta, was being formed, and was destined to give no less an impulse to the cultivation of Urdū prose than had a hundred years before been given to that of poetry by Walī. At the commencement of the present century Dr John Gilchrist was the head of this institution, and his efforts were directed towards getting together a body of literature suitable as text-books for the study of the Urdū language by the European officers of the administration. To his exertions we owe the elaboration of the vernacular as an official speech, and the possibility of substituting it for the previously current Persian as the language of the courts and the government. He gathered together at Calcutta the most eminent vernacular scholars of the time, and their works, due to his initiative, are still unsurpassed as specimens of elegant and serviceable prose composition, not only in Urdū, but also in Hindī. The chief authors of this school are Haidarī (Sayyid Muhammad Haidar Bakhsh), Husainī (Mīr Bahādur 'Alī), Mīr 'Amman Lutf, Hafīzuddīn Ahmad, Sher 'Alī Afsos, Nihāl Chand of Lahore, Kāzim 'Alī Jawān, Lallū Lāl Kavi, Mazhar 'Alī Wilā, and Ikrām 'Alī.

Haidarī died in 1828. He composed the *Totā-Kahānī* (1801), a prose rendering of the *Tūtī-nāmah* which has been already mentioned; a romance named *Ārāish-i Mahfil* ("Ornament of the Assembly"), detailing the adventures of the famous Arab chief Hātim Tāī; the *Gul-i Maghfirat* or *Dah Majlis*, an account of the holy persons of the Muhammadan faith; the *Gulzār-i Dānish*, a translation of the *Bahār-i Dānish*, a Persian work containing stories descriptive of the craft and faithlessness of women; and the *Tārīkh-i Nādirī*, a translation of a Persian history of Nādir Shāh. Husainī is the author of an imitation in prose of Mīr Hasan's *Sihru-l-Bayān*, under the name of *Nasr-i Benazīr* ("the Incomparable Prose," or "the Prose of Benazīr," the latter being the name of the hero), and of a work named *Akhlāq-i Hindī*, or "Indian Morals," both composed in 1802. The *Akhlāq-i Hindī* is an adaptation of a Persian work called the *Mufarrihu-l-qulūb* ("the Delighter of Hearts"), itself a version of the *Hitopadeśa*. Mīr Amman was a native of Dehli, which he left in the time of Ahmad Shāh Durrānī for Patna, and in 1801 repaired to Calcutta. To him we owe the *Bāgh o Bahār* (1801-2), an adaptation of Amīr Khusrau's famous Persian romance entitled the *Chahār Darwesh*, or "Story of the Four Dervishes." Amman's work is not itself directly modelled on the Persian, but is a rehandling of an almost contemporary rendering by Tahsīn of Etāwā, called the *Nau-tarz-i Murassa'*. The style of this composition is much admired by natives of India, and editions of it are very numerous. Amman also composed an imitation of Husain Wā'iz Kāshifī's *Akhlāq-i Muhsinī* under the name of the *Ganj-i Khūbī* ("Treasure of Virtue"), produced in 1802. Hafīzuddīn Ahmad was a professor at the Fort William College; in 1803 he completed a translation of Abu-l-Fazl's *'Iyār-i Dānish*, under the name of the *Khirad-afroz* ("Enlightener of the Understanding"). The *'Iyār-i Dānish* ("Touchstone of Wisdom") is one of the numerous imitations of the originally Sanskrit collection of apologues known in Persian as the *Anvār-i Suhailī*, or *Kalīlah and Damnah*. Afsos was one of the most eminent of the Fort William school; originally of Dehli, he left that city at the age of eleven, and entered the service of Qāsim 'Alī Khān, Nawāb of Bengal; he afterwards repaired to Haidarābād in the Dakhkhan, and thence to Lakhnau, where he was the pupil of Mīr Hasan, Mīr Soz, and Mīr Haidar 'Alī Hairān. He joined the Fort William College in 1800, and died in 1809. He is the author of a much esteemed *dīvān*, but his chief reputation is founded on two prose works of great excellence, the *Ārāish-i Mahfil* (1805), an account of India adapted from the introduction of the Persian *Khulāsatu-t-tawārīkh* of Sujān Rāi, and the *Bāgh-i Urdū* (1802), a translation of Sa'dī's *Gulistān*. Nihāl Chand translated into Urdū a romance, entitled the *Gul-i Bakāwalī*, under the name of *Mazhab-i 'Ishq* ("Religion of Love"); this work, in prose intermingled with verse, was composed in 1804, and has been frequently reproduced. Jawān, like most of his collaborators, was originally of Dehli and afterwards of Lakhnau; he joined the College in 1800. He is the author of a version in Urdū of the well-known story of Sakuntalā under the name of *Sakuntalā Nātak*; the Urdū was rendered from a previous Braj-bhākhā version by Nawāz Kabīshwar made in 1716, and was printed in 1802. He also composed a *Bārah-māsā*, or poetical description of the twelve months (a very popular and often-handled form of composition), with accounts of the various Hindu and Muhammadan festivals, entitled the *Dastūr-i Hind* ("Usages of India"), printed in 1812. Ikrām 'Alī translated, under the name of the *Ikhwānu-ṣ-ṣafā*, or "Brothers of Purity" (1810), a chapter of a famous Arabian collection of treatises on science and philosophy entitled *Rasā'ilu Ikhwāni-ṣ-ṣafā*, and composed in the 10th century. The complete collection, due to different writers who dwelt at Basrah, has recently been made known to European readers by the translation of Dr F. Dieterici (1858-1879); the chapter selected by Ikrām 'Alī is the third, which records an allegorical strife for the mastery between men and animals before the king of the *Jinn*. The translation is written in excellent Urdū, and is one of the best of the Fort William productions.

Srī Lallū Lāl was a Brahman, whose family, originally of Gujarāt, had long been settled in Northern India. What was done by the other Fort William authors for Urdū prose was done by Lallū Lāl almost alone for Hindī. His *Prem Sāgar* and *Rājnīti*, the former a version in pure Hindī of the 10th chapter of the *Bhāgavata Purāṇa*, detailing the history of Krishṇa, and founded on a previous Braj-bhākhā version by Chaturbhuj Misr, and the latter an adaptation in Braj-bhākhā prose of the *Hitopadeśa* and part of the *Pancha-tantra*, are unquestionably the most important works in Hindī prose. The *Prem Sāgar* was begun in 1804 and ended in 1810; it enjoys immense popularity in Northern India, has been frequently reproduced in a lithographed form, and has several times been printed. The *Rājnīti* was composed in 1809; it is much admired for its sententious brevity and the purity of its language. Besides these two works, Lallū Lāl was the author of a collection of a hundred anecdotes in Hindī and Urdū entitled *Latāif-i Hindī*, an anthology of Hindī verse called the *Sabhā-bilās*, a *Sat-sai* in the style of Bihārī-Lāl called *Sapta-Satikā*, and several other works. He and Jawān worked together at the *Singhāsan Battīsī* (1801), a redaction in mixed Urdū and Hindī (Devanāgarī character) of a famous collection of legends relating the prowess of King Vikramāditya; and he also aided the latter author in the production of the *Sakuntalā Nātak*. Mazhar 'Alī Wilā was his collaborator in the *Baitāl Pachīsī*, a collection of stories similar in many respects to the *Singhāsan Battīsī*, and also in mixed Urdū-Hindī; and he aided Wilā in the preparation in Urdū of the *Story of Madhānal*, a romance originally composed in Braj-bhākhā by Motī Rām.

The works of these authors, though compiled and published under the superintendence of Dr Gilchrist, Captain Abraham Lockett, Professor J. W. Taylor, Dr W. Hunter, and other European officers of the College, are essentially Indian in taste and style, and owe to this character a popularity and wide reputation which have been gained by no other work (and there have been many) undertaken under British initiative. If not absolutely the first works in Urdū and Hindī prose, they were at any rate the first literary standards in those languages; and almost the whole of recent prose authorship is due either to their influence or to one of two other impulses, the first of which was almost synchronous with the Fort William productions, and the other not many years posterior to them. These were the reform in Islām led by Sayyid Ahmad, and the introduction of lithography and a newspaper press.

Sayyid Ahmad was born in 1782, and received his early education at Dehli; his instructors were two learned Muslims, Shāh 'Abdu-l-'Azīz, author of a celebrated commentary on the Qur'ān (the *Tafsīr-i 'Azīziyah*), and his brother 'Abdu-l-Qādir, the writer of the first and best translation of the Holy Volume into Urdū. Under their guidance Sayyid Ahmad embraced the doctrines of the Wahhābīs, a sect whose preaching appears at this time to have first reached India. He gathered round him a large number of fervent disciples, among others Ismā'īl Hājī nephew of 'Abdu-l-'Azīz and [illegible] the chief author of the sect. After a course of [illegible] at Dehli, Sayyid Ahmad set out in 1820 for [illegible], attended by numerous adherents. Thence in 1822 he started on a pilgrimage to Mecca, whence he went to Constantinople, and was there received with distinction and gained many [illegible]. He travelled for nearly six years in Turkey and Arabia, and then returned to Dehli. The religious degradation and [illegible] which he found in his native country strongly impressed him after his sojourn in lands where the life of Islām is stronger, and [illegible] a progress through the [illegible] of Northern India, [illegible] the superstitions which had crept into the faith [illegible] Hindus, and preaching a *jihād* or holy war against the Sikhs. In 1826 he started for Peshāwar, attended by [illegible] of [illegible], and accompanied by his chief [illegible], Hājī Ismā'īl and 'Abdul-Hayy. He was furnished with money by a [illegible] in Northern India, and by several Muhammadan princes who had embraced his doctrines. At the beginning of 1829 he declared war against the Sikhs, and in the course of time made himself master of Peshāwar. The Afghans, however, with whom he had allied himself in the contest, were soon disgusted by the rigour of his creed, and deserted him and his cause. He fled across the Indus and took refuge in the mountains of Pakhli and Dhamtaur, where in 1831 he encountered a detachment of Sikhs under the command of Sher Singh, and in the combat he and Hājī Ismā'īl were slain. His sect is, however, by no means extinct; the Wahhābī doctrines have continued to gain ground in India, and to give rise to much controversial writing, down to our own day.

The translation of the Qur'ān by 'Abdu-l-Qādir was finished in 1803, and first published by Sayyid 'Abdullāh, a fervent disciple of Sayyid Ahmad, at Hūglī in 1829. The *T[illegible]*, or "Awakener of the Heedless," a work in Persian by Sayyid Ahmad, was rendered into Urdū by 'Abdullāh, and published at the same press in 1829. Hājī Ismā'īl was the author of a treatise in Urdū entitled *Taqwiyatu-l-Īmān* ("Corroboration of the Faith"), which had great vogue among the following of the Sayyid. Other works by the disciples of the *T[illegible]* (as the new [illegible] was called) are the *T[illegible] Jihād* ("Invitation to Holy War"), *H[illegible]-l-Mu'minīn* ("Guide of the Believers"), *Mazāhiru-l-K[illegible] Bid'ah* ("Exposition of Mortal Sins and Heresy"), *N[illegible]-l-M[illegible]* ("Admonition to Muslims"), and the *Mi'at M[illegible]* or "Hundred Questions."

Printing was first used for vernacular works by the College Press at Fort William, and in [illegible] prepared for Dr Gilchrist and his [illegible] which have been already mentioned were thus [illegible]; but the expense of this method of reproduction long [illegible] use in India, and the ungraceful characters used as types were not appreciated by the natives. In 1837 the first lithographic press was set up at Dehli, and from that date onwards the publication of original or editions of other works [illegible] may be counted by hundreds. The newspaper press soon followed the introduction of lithography, and there are at present about [illegible] journals in Urdū and Hindī [illegible] India, the majority in the North-Western Provinces, [illegible] and Oudh, but [illegible] Madras, Haidarābād, Bangalore, [illegible]. The [illegible] literature during the last thirty years is enormous, but to describe it [illegible]. The [illegible] for the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] by the [illegible] [illegible] paper, [illegible].

[illegible] He is the author of [illegible] of Dehli, and [illegible]. His [illegible] for [illegible] a [illegible] of [illegible] the Urdū language as a means of [illegible]. Maulavī Nazīr Ahmad of Dehli is the [illegible] *M[illegible]* ("the Bride's Mirror") and *Taubatu-n-Nasūh* ("the Repentance of Nasūh"), and [illegible] of Agra has written a good treatise on ethics, [illegible] Persian [illegible] on the subject, called *Akhlāq-i [illegible]*. These three works have received rewards from the Government of the North-Western Provinces, and enjoy much popularity. [illegible] of the educational department have been prolific in schoolbooks of various degrees of excellence. Mr H. S. Reid and his assistants, [illegible] Gulāb Khān, Chiranjī Lāl, [illegible], Sri Lāl, and Mohan Lāl, were at work from 1851 to 1860 in this direction, and several good translations and compilations are due to them. In the Panjab Zakā-ullāh Khān of Dehli, and Karīmuddīn and Pandit [illegible] of Lahore, have been no less active; and Northern India is now well supplied with the means of elementary education in the vernacular in literature, history, geography, and mathematics. Science, owing to the difficulties of technical nomenclature, is less efficiently represented, and the controversy regarding the best method of clothing its vocabulary in a vernacular dress is hardly yet solved. Owing to the [illegible] circumstance that Urdū is [illegible] to draw for its vocabulary upon Persian and Arabic as well as upon its native Indian resources, the attempts which have been made in Egypt, Turkey, and other countries where these languages are in use to provide vernacular equivalents for scientific terminology will, it may be hoped, work not only for the benefit of those countries, but also for that of India, and thus in time provide a satisfactory means of raising vernacular education in [illegible] to the level of other branches of culture.

In Hindī also there is much activity, though not so much as in Urdū. The pure or "High" Hindī, which rejects all foreign words, and supplies its vocabulary exclusively from Sanskrit, is a recent creation, and cannot even yet be said to represent the language of any large class of the population. A good specimen of this dialect is Nīlkanth Shāstrī Gore's *[illegible] Darpan*, or "Mirror of the Six [illegible] Systems of Hindū philosophy," a controversial work by a converted Brahman. The genuine Hindī of the old literature, used now exclusively for poetry, is represented by an excellent publication issued weekly at Benares by Bābū Harish-Chandra, entitled *K[illegible]*, or "Ambrosia of the Words of Poets." In this will be found much good original work, and a vast quantity of old Hindī poetry now for the first time published. The translations of the *M[illegible]* and *H[illegible]*, made by Pandit Gokulnāth of Benares, and printed at Calcutta in 1829, deserve mention; and one of the most important collections of Hindī poetry, the *Rāg-K[illegible]* of Krishnānand Vyāsdev Rāg-Sāgar, was printed at the same place in 1842-45 in an immense volume of 1800 pages.

English education has naturally had a vast influence on modern vernacular literature, though not wholly a beneficial one. More than a half of the new works issued within the last thirty years are translations or adaptations from English; the journals, the great popularizers of new ideas, take their matter chiefly from English newspapers; the courts, where Urdū has since 1832 become the official language, contribute to the spread of the stiff and difficult phraseology of the Acts of the legislature, as different from the natural idiom of the people as can well be imagined. Literature in India has always owed much to the fostering influence of Government. It has been seen how the schools of Dehli and Lakhnau rose and declined with the fortunes of the Mughal empire and the kingdom of Oudh, and how that of Calcutta similarly owed its existence to British initiative. At the present day the patronage of the rulers of India is no less influential in determining the course of literary activity. Poetical composition is little practised, both because of the exhaustion of its themes and the little appreciation which it meets with from Europeans. More solid studies, politics, science, philosophy, morals, history, and [illegible] theology, are the topics now in favour; and, though much that is produced is of the slightest possible intrinsic value, the resources of the language are being gradually cultivated and enlarged to meet the needs of the day. There is thus no reason to doubt that Hindustani will in time possess a body of literature worthy of the [illegible] and expressive speech of its people, and [illegible] the standard of culture which it owes to its Western rulers. (C. J. L.)

HINGANGHAT, a town in the Wardha district, Central Provinces, India, 21 miles S.W. of Wardha, in 20° 33′ 30″ N. lat., and 78° 52′ 30″ E. long., with a population in 1877 of 9415. It is a main seat of the cotton trade, the Hinganghat cotton produced in the rich Wardha valley being esteemed one of the best indigenous staples of India. The principal native traders are Marwaris, many of whom have large transactions and export on their own account; but the greater number merely act as middle-men between the cultivators and the large merchants. The municipal committee have opened a large gravelled market place and storage-yard, with raised platforms, and scales for weighing the cotton. The place consists of Old and New Hinganghat,—the former, a straggling town, liable to be flooded by the river Wana; the latter, in which the better classes reside, laid out in broad streets and avenues.

HINOJOSA DEL DUQUE, a town of Spain, in the province of Cordova, from which city it is distant about 58 miles N. by W. The manufacture of linens and woollens is carried on to some extent; the population is estimated at about 8000.

HINTON, James (1822-1875), aural surgeon and author, son of John Howard Hinton, Baptist minister and author of the *History and Topography of the United States* and other works, was born at Reading in 1822. He was educated at his grandfather's school near Oxford, and at the Nonconformist school at Harpenden, and in 1838, on his father's removal to London, was apprenticed to a woollen-draper in Whitechapel, where he came into contact with a phase of human life in its miserable and degraded forms which influenced powerfully the whole cast of his after thought. After retaining this situation about a year he became clerk in an insurance office. The most of his evenings were spent by him in intense study, and this, joined to the ardour, amounting to morbidness, of his interest in moral problems, so affected his health that in his nineteenth year he resolved to seek refuge from his own thoughts by running away to sea. His intention having, however, been discovered, he was sent, on the advice of the physician who was consulted regarding his health, to St Bartholomew's Hospital to study for the medical profession. After receiving his diploma in 1847, he was for some time assistant surgeon at Newport, Essex, but the same year he went out to Sierra Leone to take medical charge of the free labourers on their voyage thence to Jamaica, after which his interest in their welfare prompted him to remain a year on the island. After his return to England in 1850, he entered into partnership with a surgeon in London, where he soon had his interest awakened specially in aural surgery, and gave also much of his attention to physiology and to problems bearing on the relation between mind and body. In his practice he became convinced that in the immense majority of cases of ill-health it was the hope of cure rather than the drug that effected the remedy, a fact which explained to him much of the success of homœopathy, and induced him to lay the principal stress on moral methods of cure. He made his first appearance as an author in 1856 by contributing a series of papers on physiological and ethical subjects to the *Christian Spectator*; and the success of his work *Man and his Dwelling Place*, which appeared in 1858, determined him, notwithstanding that he had married in 1852, to give up his medical practice in order to devote his whole attention to writing on those practical moral problems which chiefly occupied his thoughts. A series of papers entitled "Physiological Riddles," which he contributed to the *Cornhill Magazine*, and afterwards published under the title *Life in Nature*, as well as another series entitled *Thoughts on Health*, written for the same periodical and collected and published separately in 1871, gave evidence of great aptitude in popular scientific exposition; but his interest in speculation was too absorbing to permit him to apply himself with sufficient pertinacity to literary work, and after a year's trial of it he found it necessary to resume his profession. In 1863 he obtained the appointment of aural surgeon to Guy's Hospital, after which he speedily acquired a lucrative west-end practice, and the reputation of being the most skilful aural surgeon of his day, a reputation fully borne out by his works, *An Atlas of Diseases of the Membrana Tympani* and *Questions of Aural Surgery*, which are regarded as the chief authorities in this branch of surgery. The skill he had now obtained in his profession seemed to justify him in 1869 in resuming his philosophical studies, but the mental excitement thus produced, added to his professional labours, appears to have inflicted permanent injury on his brain; and, although by giving up his practice in 1874 he obtained partial relief, he began to suffer from sleeplessness and depression, and died of acute inflammation of the brain, 16th December 1875.

In addition to the works already mentioned, Hinton was the author of the *Mystery of Pain*, and *The Place of the Physician*. On account of their fresh and vigorous discussion of many of the important moral and social problems of the time, his writings have had a wide circulation on both sides of the Atlantic. He contributed also several papers to the *Contemporary Review* and other periodicals. His *Life and Letters*, edited by Ellice Hopkins, with an introduction by Sir W. W. Gull, appeared in 1878.

HIOGO, or Fiogo, a seaport town of Japan, in the island of Nipon and province of Setsu, on the western shore of the Idzumi Sea, or Bay of Osaka, about 40 miles S.W. of Kioto, with which it has had railway communication since 1874. It was opened to foreign commerce in 1860, and since that date it has risen with the maritime suburb of Kobe (the Gate of God) to be a place of 50,000, or according to other authorities, 80,000 or 90,000 inhabitants. Its harbour, formerly dangerous, has by the construction of a costly breakwater been rendered one of the most serviceable in the kingdom. The best anchorage is found in front of Kobe, which has been chosen as the locale of the foreign settlement. Since the opening of the port great improvements have been effected in the native town, and the value of land and house property has greatly increased. The settlement, which consists of 162 lots, has been regularly laid out; its streets are macadamized and lighted with gas; and it possesses a bank, municipal buildings, and the largest warehouses yet erected by foreigners on Japanese soil. There is a recreation ground open to both natives and foreigners, with a cricket field and a croquet lawn. The population of the settlement was 163 in 1876; that of Kobe in 1874 was upwards of 8500. The trade of Hiogo consists mainly in the exportation of tea (1,599,199 dollars in 1877), silk, copper, camphor, wax, tobacco, ginseng, isinglass, and dried fish, and the importation of European manufactured goods—woollens, cotton, glass, &c. Most of the tea goes to New York, very little to London. The total value of the imports in 1874, 1875, 1876, and 1877 was respectively 6,030,239, 5,354,917, 3,748,967, and 4,313,641 dollars (the dollar being worth about 4s.), and the corresponding figures for the exports were 4,956,724, 2,813,102, 3,401,230, and 4,518,570. The industrial establishments comprise a shipbuilding yard, an iron-foundry, and a factory for the manufacture of paper pulp or "half stuff." There is a busy traffic maintained by ferry steamers between Hiogo and Osaka. The number of foreign ships that entered and cleared from the port in 1875 was 335, with a burden of 453,958 tons.

Hiogo was built in the days of the glory of the Taira family, and its name is equivalent to arsenal. At Minato Gawai near Kobe a small temple marks the spot where Kusunoki Masashige, the mirror of Japanese loyalty, met his death; and in Kobe itself there is a temple erected on the site of the ancient fane built by Jingu Kogo on her return from Corea.

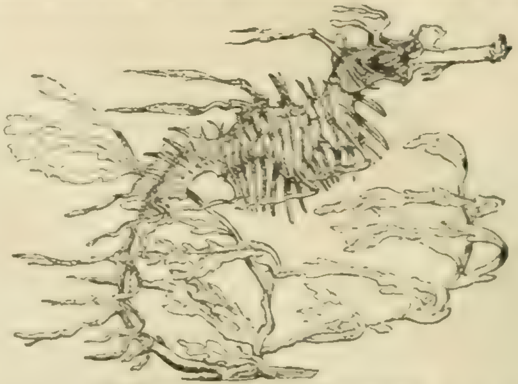
HIPPARCHUS, the founder of mathematical astronomy, was born at Nicæa in Bithynia. The years of his birth and death are both unknown, but the period of his activity, according to the evidence of his observations, which have been preserved by Ptolemy, must have been between 160 and 125 B.C. Of his writings only one has come down to us, *Τῶν Ἀράτου καὶ Εὐδόξου φαινομένων ἐξηγήσεων βιβλία γ′*, published by Vittorius at Florence, 1567, and by

Petavius in his *Uranologia*, Paris, 1630. For a notice of his discoveries see ASTRONOMY, vol. ii. p. 749.

HIPPEL, THEODOR GOTTLIEB VON (1741–1796), a German author, known chiefly as a humorist, was born on the 31st January 1741, at Gerdauen in East Prussia, where his father was rector of a school. In his sixteenth year he went to Königsberg to study theology; but through the influence of the Dutch councillor of justice, Woyt, he was induced to devote himself to jurisprudence. A Russian lieutenant, Von Keyser, whose acquaintance he made in Königsberg, took him in 1760 to St Petersburg, where he might have had a brilliant career had not his love for his country made it impossible for him to live away from it. Returning to Königsberg he became a tutor in a private family; but, falling in love with a young lady of high position, he, as the readiest means of enabling him to marry her, gave up his tutorship and devoted himself with enthusiasm to legal studies. He was successful in his profession, passing from one grade to another, until in 1780 he was appointed burgomaster and director of police in Königsberg, and in 1786 privy councillor of war and president of the town; as he rose in the world, however, his inclination for matrimony vanished, and the lady who had stimulated his ambition was forgotten. To write books in his country house near Königsberg was his favourite amusement, and some of them have still a certain popularity. Perhaps the best known is his *Ueber die Ehe* (Concerning Marriage). He has also works on *The Social Improvement of Woman*, and on *Female Education*. Another curious book of his is *Lebensläufe nach aufsteigender Linie, nebst Beilagen A, B, C* (Careers according to an ascending line, with supplements A, B, C). His name is attached to several political writings of a satirical turn, and he was the author of a comedy *Der Mann nach der Uhr*, which was fortunate enough to win the applause of Lessing. Hippel was a friend of Kant, who admired his ingenuity and resource in forming and executing plans. Before the publication of Kant's *Kritik*, Hippel was made familiar with its main conclusions, and in his *Lebensläufe* he did his utmost to prepare the way for their reception. In nearly all his writings he had a serious purpose, but disliking a cold, systematic style, he communicated his ideas in what he intended to be a light and witty form. Much of his wit is rather crude, but he gave sufficient evidence of a lively fancy to justify his success as an author. His private character presented some curious contrasts. He shared the enthusiasm of his age for passionate friendships, but none of his friends were treated with confidence; endowed with a clear and penetrating intellect, he had a strong tendency to superstition; he seemed to have generous sympathies, yet his conduct was often hard and selfish; and although he incessantly praised simplicity of life, no one could be more fond of pomp and show. He died on the 23d April 1796, leaving a considerable fortune. In 1827–38 a collected edition of his works in 14 vols. was issued at Berlin.

HIPPO. See BONE.

HIPPOCAMPUS, or SEA-HORSE. The small fishes thus named constitute, together with the Pipe-fishes or *Syngnathi*, a distinct order of the class of fishes, that of Lophobranchs or fishes with the gills arranged in tufts. The name "Sea-horse" has been given from the singular horse-like shape of the head and fore part of the body. The head is compressed, and is prolonged into a flat snout, at the end of which opens the small mouth. The eye occupies the same position as in the horse, and the head is joined at an angle to a narrow and curved neck, which posteriorly is dilated into the broader body. As in all the fishes of this order, the body is not covered with soft skin or scales, but encased in a mail composed of hard and tough scutes, which are of a more or less quadrangular shape, and generally armed with tubercles or spines. The tail is long, flexible, and prehensile, without caudal fin. These fishes are very bad swimmers, their locomotion being entirely dependent on the long dorsal fin which slowly propels them by a rapidly undulating screw-like motion; placed in the middle of the back of a body which generally occupies a vertical or oblique position in the water, this organ of locomotion has a propelling power far inferior to that of a terminal caudal fin. By means of their prehensile tail the sea-horses attach themselves to the stems of sea-weed or corals, which they resemble so closely in their outward appearance that it is difficult to distinguish them,—a resemblance which is still more increased in a group of sea-horses (*Phyllopteryx*) in which many of the spines and tubercles bear long tapering bands like the fronds of sea-weeds. Originally littoral fishes, sea-horses are, nevertheless, frequently found in mid-ocean, attached to floating substances on which they are carried away by currents far from their native shore. In the Sargasso Sea they are common. Like the other Lophobranchs, they take care of their progeny till the young have attained sufficient size and strength to shift for themselves. The male receives the eggs immediately after oviposition in a pouch situated on the lower part of his tail, where they are hatched, and where indeed the young remain until hunger compels them to leave their parent in search of food. More than twenty different species are known from the tropical and the warmer parts of the temperate zones. They are all of small size; that seen in our aquaria is the *Hippocampus antiquorum*, common on many parts of the French coast and farther south.



Phyllopteryx eques, attached to sea-weed.

HIPPOCRATES, termed the "Father of Medicine," was born, according to Soranus, in Cos, in the first year of the 80th Olympiad, *i.e.*, in 460 B.C. He was a member of the family of the Asclepiadæ, and was believed to be either the nineteenth or seventeenth in direct descent from Æsculapius. It is also claimed for him that he was descended from Hercules through his mother, Phænarete. He studied medicine under Heraclides, his father, and Herodicus of Selymbria; in philosophy Gorgias of Leontini and Democritus of Abdera were his masters. His earlier studies were prosecuted in the famous Asclepion of Cos, and probably also at Cnidos. He travelled extensively, and taught and practised his profession at Athens, probably also in Thrace, Thessaly, Delos, and his native island. He died at Larissa in Thessaly, his age being variously stated as 85, 90, 104, and 109. The incidents of his life are shrouded by uncertain traditions, which naturally sprang up in the absence of any authentic record; the earliest biography was by one of the Sorani, probably Soranus the younger of Ephesus, in the

2d century; Suidas, the lexicographer, wrote of him in the 11th, and Tzetzes in the 12th century. In all these biographies there is internal evidence of confusion; many of the incidents related are elsewhere told of other persons, and certain of them are quite irreconcilable with his character, so far as it can be judged of from his writings and from the opinions expressed of him by his contemporaries; we may safely reject, for instance, the legends that he set fire to the library of the temple of health at Cnidos, in order to destroy the evidence of plagiarism, and that he refused to visit Persia at the request of Artaxerxes Longimanus, during a pestilential epidemic, on the ground that he would in so doing be assisting an enemy. He is referred to by Plato (*Protag.*, p. 283; *Phædr.*, p. 211) as an eminent medical authority, and his opinion is also quoted by Aristotle. The veneration in which he was held by the Athenians serves to dissipate the calumnies which have been thrown on his character by Andreas, and the whole tone of his writings bespeaks a man of the highest integrity and purest morality.

Born of a family of priest-physicians, and inheriting all its traditions and prejudices, Hippocrates was the first to cast superstition aside, and to base the practice of medicine on the principles of inductive philosophy. It is impossible to trace directly the influence exercised upon him by the great men of his time, but one cannot fail to connect his emancipation of medicine from superstition with the widespread power exercised over Greek life and thought by the living work of Socrates, Plato, Æschylus, Sophocles, Euripides, Herodotus, and Thucydides. It was a period of great intellectual development, and it only needed a powerful mind such as his to bring to bear upon medicine the same influences which were at work in other sciences. It must be remembered that his training was not altogether bad, although superstition entered so largely into it. He had a great master in Democritus, the originator of the doctrine of atoms, and there is every reason to believe that the various "asclepia" were very carefully conducted hospitals for the sick, possessing a curious system of case-books, in the form of votive tablets, left by the patients, on which were recorded the symptoms, treatment, and result of each case. He had these records at his command; and he had the opportunity of observing the system of training and the treatment of injuries in the gymnasia. One of his great merits is that he was the first to dissociate medicine from priestcraft, and to direct exclusive attention to the natural history of disease. How strongly his mind revolted against the use of charms, amulets, incantations, and such devices appears from his writings; and he has expressly recorded, as underlying all his practice, the conviction that, however diseases may be regarded from the religious point of view, they must all be scientifically treated as subject to natural laws (*De Aere*, 29). Nor was he anxious to maintain the connexion between philosophy and medicine which had for long existed in a confused and confusing fashion.[1] His knowledge of anatomy, physiology, and pathology was necessarily defective, the respect in which the dead body was held by the Greeks precluding him from practising dissection; thus we find him writing of the tissues without distinguishing between the various textures of the body, confusing arteries, veins, and nerves, and speaking vaguely of the muscles as "flesh." But when we come to study his observations on the natural history of disease as presented in the living subject, we recognize at once the presence of a great clinical physician. Hippocrates based his principles and practice on the theory of the existence of a spiritual restoring essence or principle, φύσις, the *vis medicatrix naturæ*, in the management of which the art of the physician consisted. This art could, he held, be only obtained by the application of experience, not only to disease at large, but to disease in the individual. He strongly deprecated blind empiricism; the aphorism "ἡ πεῖρα σφαλερή, ἡ κρίσις χαλεπή" (whether it be his or not), tersely illustrates his position. Holding firmly to the principle, νούσων φύσιες ἰητροί, he did not allow himself to remain inactive in the presence of disease; he was not a merely "expectant" physician; as Sydenham puts it, his practice was "the support of enfeebled and the coercion of outrageous nature." He largely employed powerful medicines and blood-letting both ordinary and by cupping. He advises, however, great caution in their application. He placed great dependence on diet and regimen, and here, quaint as many of his directions may now sound, not only in themselves, but in the reasons given, there is much which is still adhered to at the present day. His treatise Περὶ ἀέρων, ὑδάτων, καὶ τόπων (*Airs, Waters, and Places*) contains the first enunciation of the principles of public hygiene. Although the treatises Περὶ κρισίμων cannot be accepted as authentic, we find in the Προγνωστικόν evidence of the acuteness of observation in the manner in which the occurrence of critical days in disease is enunciated. His method of reporting cases is most interesting and instructive; in them we can read how thoroughly he had separated himself from the priest-physician. Laennec, to whom we are indebted for the practice of auscultation, freely admits that the idea was suggested to him by study of Hippocrates, who, treating of the presence of morbid fluids in the thorax, gives very particular directions, by means of succussion, for arriving at an opinion regarding their nature. Laennec says, "Hippocrate avait tenté l'auscultation immédiate." Although the treatise Περὶ νούσων is doubtfully from the pen of Hippocrates, it contains strong evidence of having been the work of his grandson, representing the views of the Father of Medicine. Although not accurate in the conclusions reached at the time, the value of the method of diagnosis is shown by the retention in modern medicine of the name and the practice of "Hippocratic succussion." The power of graphic description of phenomena in the Hippocratic writings is illustrated by the retention of the term "facies Hippocratica," applied to the appearance of a moribund person, pictured in the *Prognostics*. In surgery his writings are important and interesting, but they do not bear the same character of caution as the treatises on medicine; for instance, in the essay *On Injuries of the Head*, he advocates the operation "of trephining" more strongly and in wider classes of cases than would be warranted by the experience of later times.

The *Hippocratic Collection* consists of eighty-seven treatises, of which a part only can be accepted as genuine. The collection has been submitted to the closest criticism in ancient and modern times by a large number of commentators. (For full list of the early commentators, see Adams's *Genuine Works of Hippocrates*, Sydenham Society, vol. i. pp. 27, 28.) The treatises have been classified according to (1) the direct evidence of ancient writers, (2) peculiarities of style and method, and (3) the presence of anachronisms and of opinions opposed to the general Hippocratic teaching,—greatest weight being attached to the opinions of Erotian and Galen. The general estimate of commentators is thus stated by Adams:—"The peculiar style and method of Hippocrates are held to be conciseness of expression, great condensation of matter, and disposition to regard all professional subjects in a practical point of view, to eschew subtle hypotheses and modes of treatment based on vague abstractions." The treatises have been grouped in the four following sections:—(1) genuine; (2) those consisting of notes taken by students and collected after the death of Hippocrates; (3) essays by disciples; (4) those utterly spurious. Littré accepts the following thirteen as absolutely genuine:—(1) *On Ancient Medicine* (Περὶ ἀρχαίης ἰητρικῆς); (2) *The Prognostics* (Προγνωστικόν); (3) *The Aphorisms* (Ἀφορισμοί); (4) *The Epidemics*, i. and iii. (Ἐπιδημιῶν α' καὶ γ'); (5) *On Regimen in Acute Diseases* (Περὶ διαίτης ὀξέων); (6) *On Airs, Waters, and Places* (Περὶ ἀέρων, ὑδάτων, καὶ τόπων); (7) *On the Articulations* (Περὶ ἄρθρων); (8) *On Fractures* (Περὶ ἀγμῶν); (9) *The Instruments of Reduction* (Μοχλικός); (10) *The Physician's Establishment, or Surgery* (Κατ' ἰητρεῖον); (11) *On Injuries of the Head* (Περὶ τῶν ἐν κεφαλῇ τρωμάτων); (12) *The Oath* (Ὅρκος); (13) *The Law* (Νόμος). Of these Adams accepts as certainly genuine the 2d, 6th, 5th, 3d (7 books), 4th, 7th, 8th, 9th, and 12th, and as "pretty confidently acknowledged as genuine, although the evidence in their favour is not so strong," the 1st, 10th, and 13th, and, in addition, (14) *On Ulcers* (Περὶ ἑλκῶν); (15) *On Fistulæ* (Περὶ συρίγγων); (16) *On Hemorrhoids* (Περὶ αἱμοῤῥοΐδων); (17) *On the Sacred Disease* (Περὶ ἱερῆς νούσου). According to the sceptical and somewhat subjective criticism of Ermerins, the whole collection is to be regarded as spurious except *Epidemics*, books i. and iii. (with a few interpolations), *On Airs, Waters, and Places*, *On Injuries of the Head* ("insigne fragmentum libri Hippocratei"), the former portion of the treatise *On Regimen in Acute Diseases*, and the "obviously Hippocratic" fragments of the *Coan Prognostics*. Perhaps also the *Oath* may be accepted as genuine; its comparative antiquity is not denied. The *Aphorisms* are certainly later and inferior. In the other non-Hippocratic writings Ermerins thinks he can distinguish the hands of no fewer than nineteen different authors, most of them anonymous, and some of them very late.

The earliest Greek edition of the Hippocratic writings is that which was published by Aldus and Asulanus at Venice in 1526 (folio); it was speedily followed by that of Frobenius, which is much more accurate and complete (fol., Basel, 1538). Of the numerous subsequent editions, probably the best was that of Foesius (Frankfort, 1595, 1621, Geneva, 1657), until the publication of the great works of Littré, *Œuvres complètes d'Hippocrate, traduction nouvelle avec le texte grec en regard, collationnée sur les manuscrits et toutes les éditions, accompagnée d'une introduction, de commentaires médicaux, de variantes, et de notes philologiques* (10 vols., Paris, 1839-61), and of F. Z. Ermerins, *Hippocratis et aliorum*

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[1] "Hippocrates Cous, primus quidem ex omnibus memoria dignus, ab studio sapientiæ disciplinam hanc separavit, vir et arte et facundia insignis" (Celsus. *De Medicina*).

medicorum veterum reliquiæ (3 vols., Utrecht, 1859-64). See also Adams as cited above, and Renbeli's *Hippocrates* (2 vols., Athens, 1864-67). Daremberg's edition of the *Œuvres choisies* (2d ed., Paris, 1855) includes the *Oath*, the *Law*, the *Prorrhetics*, book ii., the *Prognostics*, *On Airs, Waters, and Places*, *Epidemics*, books i. and iii., *Regimen*, and *Aphorisms*. Of the separate works attributed to Hippocrates the editions and translations are almost innumerable; of the *Prognostics*, for example, seventy editions are known, while of the *Aphorisms* there are said to exist as many as three hundred. For an account of the Arabic, Syriac, and Hebrew translations of works professedly by Hippocrates (Bukrat or Bukrate), the number of which greatly exceeds that of the extant Greek originals, reference may be made to Flügel's contribution to the article "Hippokrates" in the *Encyklopädie* of Ersch and Gruber. They have been partially catalogued by Fabricius in his *Bibliotheca Græca*. (J. B. T.)

HIPPOLYTUS, an ecclesiastical writer belonging to the first half of the 3d century. Of the details of his life little that is authentic is known. He appears to have been born in the latter half of the 2d century. From the fact that he employs Greek as his mother tongue, it has been supposed that he belonged to the eastern portion of the Roman empire; but this conclusion is by no means stringent, and there are various indications in his writings that he had passed some at least of his early years in Rome. On the apparently trustworthy authority of Photius (cod. 121), he is believed to have been while still a youth a personal disciple of Irenæus, perhaps in Rome, but most likely in Lyons. By inference from the vivid minuteness with which he relates details of the personal history of Callistus in the 9th book of his *Refutation* he is believed to have been in Rome from the beginning of the episcopate of Victor (189–199). It is certain that in the early years of the 3d century he was stationed in that city as a presbyter conspicuous for energy, zeal, eloquence, and learning. He was a prominent defender of Victor's view on the much vexed Paschal controversy, but came into collision with Victor's successors, Zephyrinus and Callistus, on several questions of ecclesiastical dogma and discipline. As regarded the relation between the Father and the Son in the Trinity, for example, Hippolytus defended what is known as subordinationism against the patripassianism of the bishops, he accusing them of Noetianism while they retorted upon him with a charge of ditheism. Again, in the dispute as to whether the lapsed could ever be lawfully restored to the fellowship of the church visible, Hippolytus took the severer and Callistus the milder view. So also on the subject of clerical marriages. From his own language in the 9th book of the *Refutation*, combined with his designation of himself in the proem, it appears that Hippolytus ultimately came to occupy in Rome the position of a bishop (*cf.* Euseb., *H. E.*, vi. 20), although not in communion with the "Catholic" party; and the difficulty of reconciling this with the strong evidence we have that Portus (*i.e.*, the Roman harbour opposite Ostia, and not Portus Romanorum or Aden, as Le Moyne and others founding upon a misunderstanding of Eusebius, have conjectured) was the scene of his activity is probably best got over if we assume that as dissenting bishop he undertook the episcopal superintendence of his adherents in both places, but took his title from the smaller. As regards the close of his life our most trustworthy information is derived from the chronographer of 354 (Mommsen, *Ueber den Chronographen vom Jahre 354*, Leipsic, 1850), according to whom "the presbyter" Hippolytus in the time of Alexander Severus (235) was banished along with the Roman bishop Pontianus to Sardinia, where, it seems to be suggested, he died.

In 1551 a marble statue of Hippolytus [illegible], dating from the 6th century, was dug up in Rome; it is now to be seen in the Vatican. He is represented as seated upon an episcopal chair, bearing the Greek paschal cycle which the Roman [illegible]; on the sides of the chair are engraved in Greek [illegible] of which he is believed to have been the author, [illegible] of his extant works. The catalogues given by Eusebius, Jerome, and Nicephorus differ slightly in details, but all bear witness to his diligence as a writer. The extant fragments were first collected by Fabricius (*Hippolyti Opera gr. et lat.*, 2 vols. fol., Hamburg, 1716-18), and were afterwards reprinted by Galland in the second volume of his *Bibliotheca Veterum Patrum* (1766). See also Migne, *Curs. Patr. Gr.*, vol. x. They include fragments of commentaries on various books of Scripture, a treatise "On Christ and Antichrist," an "expository" (ἀποδεικτική) discourse "To the Jews," a fragment "To the Greeks" or "On the Universe," tracts "Against Noetus," "Against Beron and Helix," and "On the Holy Theophany," fragments of homilies (in which kind of composition he particularly excelled), and a few short quotations preserved by the author of the *Chronicon Paschale*. The appendix in Fabricius, containing doubtful or spurious pieces, includes "A Discourse on the End of the World, and on Antichrist, and on the Second Coming of our Lord Jesus Christ," also a short account of the twelve apostles, stating where each of them laboured and where each of them died, a list of the seventy apostles, heads of the canons of Abulides or Hippolytus as used by the Æthiopian Christians, and the canons of the Church of Alexandria. Of the spuriousness of the last mentioned at least there can be no doubt. A new interest in Hippolytus as an ecclesiastical writer was awakened among scholars about 1851 in connexion with his *Omnium Hæresium Refutatio*, which has an interesting history. As an anonymous MS. of the 14th century it had in 1842 been brought among various other manuscripts from Mount Athos to Paris by Minoides Mynas, a learned Greek who had been commissioned by the French Government to search for such treasures, and had been deposited in the great national library where it was registered as a work *On all Heresies*. It failed for some time to attract any special notice; but the attention of M. Emmanuel Miller, an official of that institution, having been at length excited by some fragments of Pindar and of an unknown lyric poet which it contained, he was led to examine it more closely and to adopt the conclusion that it was the continuation of the fragment entitled *Philosophumena*, printed in the Benedictine edition of Origen as the work of that author. Under this persuasion he offered it for publication to the university of Oxford, from whose press it appeared in 1851 under his editorship, bearing the title *Origenis Philosophumena, sive Omnium Hæresium Refutatio*. It was at once welcomed by the learned world as a literary treasure of singular value; but it was almost immediately perceived that, though Miller had certainly judged rightly in affirming it to be a continuation of the fragment in *Philosophumena*, he had as certainly erred in attributing its composition to Origen, whose authorship of the previously known portion had already been disputed by Huet, Heumann, and Gale. By Jacobi and Duncker in 1851, who were speedily followed by Gieseler, Bunsen, Wordsworth, and Döllinger, it was with more or less confidence claimed for Hippolytus, to whom it is now attributed with almost entire unanimity by critics,—the arguments of Baur (*Theol. Jahrb.*, 1853) in favour of the presbyter Caius, and still more those of Armellinus (*De prisca refutatione hæresum*, Rome, 1863) in favour of Novatian, having been found to be quite unconvincing.

Originally it consisted of ten books, of which, however, only eight survive, namely, the first and the fourth to the tenth inclusive. Book i. gives an account of the different schools of ancient philosophy—Greek, Indian, and Druidical; books ii. and iii. appear to have dealt with the doctrines and mysteries of the Egyptians and Chaldæans respectively; book iv. (which is slightly defective at the commencement) treats of Chaldæan horoscopy and Egyptian theurgy; books v.-ix. dispose of the various heresies which had asserted themselves within the Christian Church. These are taken up in chronological order and arranged in five main groups, the Ophite, Simonist, Basilidian, Valentinian or Docetic, and Noetian. Whether they be regarded as attempts to Christianize paganism, to conciliate Judaism, or to paganize Christianity, their unscriptural character is invariably insisted on. The entire work is summarized in book x. The value of the *Refutation* as a whole, in its bearing on the history of the apostolic and immediately post-apostolic ages, and on the critical problems arising out of that history, can hardly be overestimated.

Since its first publication by Miller (Oxford Clarendon Press, 1851) it has been edited by Lagarde (*Hippolyti Romani quæ feruntur omnia Græce*, Göttingen, 1858), by Duncker and Schneidewin, Göttingen, 1859, and by Cruice, Paris, 1860. [illegible] with the other extant *Hæresiologica* [illegible] of Hippolytus [illegible] in the English translation in the "Ante-Nicene Christian Library" (Edin., 1868).

[illegible] (2d ed., 1854 [illegible], 1852), [illegible] See also Jacobi's art. "Hippolytus" in Herzog's *Real-Encyklopädie*.

HIPPOLYTUS, St, according to the Roman breviary, was one of St Lawrence's converts, who, when summoned before the emperor Valerian on account of the practice of his religion, made a public profession of Christianity. First beaten with rods, he was finally delivered over along with all his family to death, the mode of execution in his case being similar to that by which Hippolytus the son of Theseus perished. The mythical character of this legend, which, however, can in part be traced as far back as to Prudentius (*Περὶ στεφ.* 11), is recognised by Döllinger (see his *Hippolytus und Kallistus*, chap. ii.). This saint, along with Cassianus, is commemorated by the Roman Church on August 13. He is the patron of Mexico.

HIPPONAX, of Ephesus, a poet placed third, after Archilochus and Simonides, among the classic iambic poets of Greece. Expelled from Ephesus in 540 B.C. by the tyrants Athenagoras and Comas, he took refuge in Clazomenæ. There his deformed figure and malicious disposition exposed him to the caricature of the Chian sculptors Bupalus and Athenis; and he revenged himself by issuing against them a series of satires. These, though keen and bitter, are in thought and execution much inferior to the similar works of his predecessor Archilochus. His coarseness of thought and feeling, his rude vocabulary, his want of grace and taste, and his numerous allusions to matters of merely local interest prevented his becoming a favourite in Attica. He invented epic parody, and the four opening lines of a parody on the *Iliad* have been preserved in Athenæus (xv. 698 B). He was also the inventor of a peculiar metre, used after him by many writers, called the *scazon* or *choliambus*, which substitutes a spondee for the final iambus of an iambic senarius. His works, which were annotated by Hermippus of Smyrna, were at an early date mingled and confused with those of Ananius, for whom some even claim the invention of the choliambus.

HIPPOPOTAMUS, a family (*Hippopotamidæ*) of artiodactyle ungulate mammals comprising two genera, each containing a single living species. Of these the best known is the hippopotamus (*Hippopotamus amphibius*), occurring only in Africa, where it abounds in many of the river courses. It is a huge unwieldy creature, measuring in the largest specimens fully 14 feet from the extremity of the upper lip to the tip of the tail, while it ordinarily attains a length of 12 feet, with a height of 5 feet at the shoulders, and a girth round the thickest part of the body almost equal to its length. Its remarkably small ears are exceedingly flexible, and are kept in constant motion when the animal is seeking to catch a distant sound. Its eyes are placed high up on the head, and but little below the level of the ears; its gape is wide, and its upper lip thick and bulging so as to cover over even the largest of its teeth when the mouth is closed. It is provided with a considerable number of molar teeth adapted for grinding vegetable substances, and a formidable array of long spear-like incisors and curved chisel-edged canines or tusks which, according to Baker, root up the rank grass like an agricultural implement. Its legs are short, so that the body is but little elevated above the ground; and its feet, which are small in proportion to the size of the animal, terminate in four short toes each bearing a small hoof. With the exception of a few tufts of hair on the lips, on the sides of the head and neck, and at the extremity of the short robust tail, the skin of the hippopotamus, some portions of which are 2 inches in thickness, is entirely destitute of covering. It is usually of a dark fleshy red colour, irregularly marked with blackish spots. The hippopotamus is a gregarious animal, living in herds of from 20 to 40 individuals on the banks and in the beds of rivers, in the neighbourhood of which it most readily finds its appropriate food. This consists chiefly of grass and of aquatic plants, of which it consumes enormous quantities, the stomach of one of those creatures being capable of containing from 5 to 6 bushels. They feed principally by night, remaining in the water during the day, although in districts where they are little disturbed by man they are less exclusively aquatic. In such remote quarters they put their heads boldly out of the water to blow, but when rendered suspicious by man's persecution, they become exceedingly cautious in this respect, only exposing their nostrils above the water, and even this they prefer doing amid the shelter of water plants. In spite of their enormous size and uncouth form, they are expert swimmers and divers, and can, it is said, remain easily under the water from five to eight minutes. They are also said to walk with considerable rapidity on the bottoms of rivers, beneath at least a foot of water. At nightfall they come on land to feed; and when, as often happens on the banks of the Nile, they reach cultivated ground, they do immense damage to growing crops, destroying by their ponderous tread even more than they devour. To scare away those unwelcome visitors the natives in such districts are in the habit of kindling great fires at night. Although they do not willingly go far from the water on which their very existence depends, occasionally they have been found to travel long distances by night in search of food, and in spite of their clumsy appearance they are able, according to Baker, to climb up steep banks and precipitous ravines with astonishing power and ease. Of a wounded hippopotamus which that traveller once saw leaving the water and galloping inland, he says, "I never could have imagined that so unwieldy an animal could have exhibited such speed. No man could have had a chance of escape." The hippopotamus does not confine itself to rivers only, but when opportunity occurs of exercising choice it has been known to prefer the waters of the ocean as its home during the day. Of a mild and inoffensive disposition, it seeks to avoid collision with man; when wounded, however, or in defence of its young, it is wont to exhibit the greatest ferocity, and the native canoes are frequently capsized and occasionally demolished by its infuriated attacks, its usual bellowing grunt then becoming loud enough to be heard a mile away. As among elephants, so also among hippopotami there are "rogues"—old bulls which, having been expelled from the herd, have become soured in solitude; these are at all times dangerous. Assuming the offensive on every occasion, they attack all and sundry without shadow of provocation; the natives, therefore, are careful to avoid the haunts of those *solitaires*, which are usually well known.

Hippopotamus.

The rifle of the European has proved the most potent destroyer of the hippopotamus: but to prove effective it must be aimed at the head, the most vulnerable points in that region being immediately behind the ear and in the eye. Everywhere regarded as a valuable prize, the natives employ a variety of methods in order to secure it, the most common of these being the use of an iron harpoon attached to a line. Allowing themselves to float down stream on a raft, the hippopotamus hunters no sooner reach the sleeping herd than the expertest of them plunges his harpoon deep into the body of the selected victim. The light canoes are then launched from the raft, and with all speed the hunters make for the shore, bearing with them the line attached to the harpoon, which they further secure by giving it a turn round the trunk of a tree. Unable to free itself, the hippopotamus wastes its strength in impotent rage, its persecutors meanwhile assailing it with a shower of javelins under which its life blood gradually ebbs away, until at last it is hauled up dead or dying on the shore. Another native method of destroying these animals is by means of a trap known as the "downfall," consisting of a heavy wooden beam armed at one end with a poisoned spear-head and suspended by the other to a forked pole or overhanging branch of a tree. The cord by which the beam is suspended descends to the path beneath, across which it lies in such a manner as to be set free the instant it is touched by the foot of the passing hippopotamus; the beam thus liberated immediately descends, and the poisoned weapon passes into the head or back of the luckless beast, whose death in the adjacent stream takes place soon after. Such "downfalls" are placed over the paths by which the animals are in the habit of reaching their nightly feeding grounds. They are also occasionally taken by means of ordinary pitfalls, so dexterously concealed as often to entrap the unwary traveller. Although inferior in sagacity to the elephant, the hippopotamus is very far from being stupid, as is frequently proved by its remarkable adroitness in the discovery and avoidance of traps and pitfalls, as well as in its timely migration from localities which, owing to the prevalence of the rifle, have become no longer tenable. It is said to be possessed of a remarkably tenacious memory, so that, according to Sir Andrew Smith, when once it has been assaulted in its watery dwelling and injured through incautiously exposing itself, it will rarely be guilty of the same indiscretion a second time, even although a very long period should elapse before its haunts are revisited. The female is less in size than the male, and is exceedingly shy, taking to the water with her young, which she usually carries astride on her neck, on the slightest alarm. It is only after long practice that the young become able to remain as long under the water as their parents, and for this reason the females while tending them come much oftener to the surface than their own necessities require. The period of gestation, as observed in females confined in the Zoological Gardens of London and Paris, extends to nearly eight months; the young reach maturity in five years; and the full term of life in the species is believed to extend to thirty years. The male hippopotamus which recently (1878) died in the Zoological Gardens, London, was captured in August 1849 when only a few days old; it had thus nearly attained the age of twenty-nine, while an examination of its dead body disclosed, says Professor Owen, "no special morbid appearance to suggest that death from old age had been anticipated" (*Annals and Magazine of Nat. Hist.*, September 1879). The flesh of the hippopotamus is generally considered a delicacy both by natives and colonists, although according to Livingstone there are certain tribes on the Zambesi who have as great an abhorrence of hippopotamus meat as Mahometans have of swine's flesh. The fatty matter lying between the skin and the muscles is one of the purest of animal fats, and was formerly in great request among the Cape colonists when as yet those amphibians abounded in the rivers of that colony. The skin of the hippopotamus is turned to profitable account in the manufacture of elastic whips, which are in great demand throughout the African continent. The skin, according to Schweinfurth, when fresh is cut into long quadrilateral stripes, which when half dried are trimmed with a knife and afterwards hammered out, like iron on an anvil, into round whips. As several hundreds can be made from a single hide, that part is of considerable commercial value. Still more valuable are the tusks and incisor teeth, which, from their extreme hardness and the fact that they do not readily become yellow, were once largely used in the manufacture of artificial teeth. The hippopotamus formerly abounded in such rivers as the Nile, the Niger, the Senegal, and most of the rivers of South Africa. It is now, however, becoming gradually more restricted in its distribution, having disappeared altogether from the Egyptian Nile,—although still abundant in its Abyssinian tributaries,—as well as from the rivers of Cape colony.

The Liberian hippopotamus (*Choeropsis liberiensis*), the only other existing member of the family, is exceedingly rare, having been only known until recently from the two skulls on which the genus and species were founded. It differs from the common species in possessing only one pair of incisors in each jaw instead of two, and in several other minor points. A few years ago a young specimen of this rare species was brought alive to England from the Scarcies river, north of Sierra Leone, but it died soon after landing. The species is found on the west coast of Africa and on certain of the rivers flowing into Lake Chad.

Although there are thus only two living species, both of which are confined to Africa, the hippopotamus family was both larger and more widely distributed in former periods of the earth's history, fossil remains of at least nine species having been found in the Tertiary deposits of Europe and India. In Europe they occur as far north as Belgium and the south of England, but they are found nowhere in such abundance as in the island of Sicily, from which they were formerly exported in shiploads to England and France, where they were used in the manufacture of lamp-black and manure. The occurrence of these animals in a place which they could not possibly have reached had it always been an island, is regarded as one of the many proofs that dry land existed during some portion at least of the Tertiary period between Italy and Africa. (J. GI.)

END OF VOLUME ELEVENTH.

APPENDIX

AMERICAN REVISIONS AND ADDITIONS

TO THE

ENCYCLOPÆDIA BRITANNICA

(NINTH EDITION.)

A DICTIONARY OF

ARTS, SCIENCES AND GENERAL LITERATURE

BY

W. H. DE PUY, DD., LL.D.,

ASSISTED BY A CORPS OF TRAINED WRITERS.

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GORTSCHAKOFF, PRINCE ALEXANDER MICHAELOVITCH (1798–1883), a Russian statesman. In 1854–56 he was ambassador at Vienna, and then became minister of foreign affairs. In 1863 he was appointed chancellor of the empire, and from this time until the ascendency of Bismarck he was the most powerful minister in Europe. In 1882 he retired from public life and went to Baden-Baden, where he died.

GOSCHEN, GEORGE JOACHIN, an English statesman, born in 1831. In 1863 he entered Parliament, as a Liberal, for the city of London, and in 1866 he entered the cabinet; in 1868 he became president of the poor-law board, and in 1871 head of the admiralty, holding the latter post until 1874. In 1878 he represented Great Britain at the international monetary conference held at Paris. In 1887 he took his seat as a Liberal-Unionist and accepted the chancellorship of the exchequer. In 1890 his budget proposals in connection with licensing were warmly opposed by the Liberals.

GOSHEN, a city and county-seat of Elkhart county, Ind., midway between Chicago and Toledo. Elkhart River furnishes abundant water-power, and great quantities of lumber are manufactured here. There are flour mills, a woolen mill, oil mill, and plow factories.

GOSHEN, a railroad junction and one of the county-seats of Orange county, N. Y. Dairying is the chief business.

GOSNOLD, BARTHOLOMEW, an English navigator, who first became known as an associate of Raleigh in his unsuccessful attempt to found a colony in Virginia. In 1602 he sailed from England with one ship and twenty colonists; steered directly across the Atlantic; entered Massachusetts Bay; discovered and named Cape Cod; stopped at an island now known as No Man's Land, and planted his colony on Cuttyhunk; but the colonists soon became discouraged and returned to England. Gosnold then organized a company, which settled at Jamestown, Va., in April, 1607. He died there Aug. 22, 1607.

GOSPELS. See Britannica, Vol. X, pp. 789–843.

GOSSAMER, a light filamentous substance, which often fills the atmosphere during fine weather in the latter part of autumn, or is spread over the whole face of the ground, loaded with dewdrops. This has been ascertained to be produced by small spiders, although it is not yet well known if the gossamer spread over the ground is produced by the same species of spider which produces that seen floating in the air, or falling as if from the clouds. The eagerness which some of the small spiders known to produce these webs show for water to drink, has led to the supposition that dew may be one of the objects of the formation of those on the ground, also that they may afford a rapid mode of transit from place to place. As to the gossamers in the air, conjecture is more at a loss; although the supposition that the spider forms them in order to shift from place to place is more probable. The spiders which produce these threads eject with great force from their spinnerets, a viscid fluid which presently becomes a thread; sometimes several such threads are produced at once in a radiating form, and these, being caught by the ascending current of heated air, are borne upwards, the spider along with them. It has been said that the spider has power of guiding in the air the web by which it is wafted up.

GOSSE, EDMUND WILLIAM, an English poet and critic, born in London, Sept. 21, 1849, and educated privately. He was appointed assistant librarian at the British Museum in 1867; translator to the board of trade in 1875, and is Clark lecturer in English literature at Trinity College, Cambridge. He has published *Madrigals, Songs, and Sonnets* (1870); *On Viol and Flute* (1873); *New Poems* (1879); *From Shakespeare to Pope* (1885); *The History of 18th Century Literature, 1660–1780* (1889); and the dramas *King Eric* (1876); *The Unknown Lover* (1878); and *The Masque of Painters*. He has edited a new series of translated foreign novels, commencing in 1890 with *In God's Way*, by Björnson.

GOSSE, PHILIP HENRY, a British zoölogist, born at Worcester, April 10, 1810, died Aug. 23, 1888. He was reared at Poole; in 1827 went to Newfoundland as a clerk, and was afterwards in turn farmer in Canada, schoolmaster in Alabama, and professional naturalist in Jamaica. Returning to England he published in 1840 the "Canadian Naturalist," and after another stay in the West Indies settled in England to a busy life of letters. He was elected a fellow of the Royal Society in 1856. His best-known work is *Romance of Natural History* (1860–62). *Actinologia Britannica* (1860), and the *Prehensile Armature of the Papilionidæ* (1885), are later and more strictly scientific works. He also published a number of works on American natural history.

GOTHA ALMANAC (*Almanach de Gotha*), a universal political register, published annually at Gotha, in Germany. It was issued in the German language from 1764 to 1804, and from the latter date till the present has been published both in French and German. The Gotha Almanac is a small volume, containing nearly 1,000 pages, and recording the sovereigns and royal families of every civilized country, the civil, diplomatic, military, and naval officers, a great amount of statistical information, a compact summary of historical events, and other matters of political interest.

GOTHAM, a parish of Notts, England, whose people were long famed for their stupidity, being termed in derision "the wise men of Gotham." The name was by Irving humorously applied to the city of New York, and the appellation is still a familiar one in the United States.

GOTTSCHALK, LOUIS MOREAU, an American pianist and composer, born in New Orleans, La., May 8, 1829, died at Tijuca, Brazil, Dec. 18, 1869. He early showed marked musical ability, and at the age of twelve was sent to Paris, where he studied the piano with Hallé and Camille Stamatz, and harmony with Maleden. His first appearance was made in Paris in 1845. He afterwards traveled in Switzerland and Spain, and achieved a high reputation before returning to the United States. His first appearance in this country was made in Boston. He was subsequently heard in other cities of the Union, in Mexico, and South America. Gottschalk was popular as a man and admired as an artist. Among other decorations he received the cross of the Legion of Honor and the Order of Isabella the Catholic. His numerous pieces are chiefly illustrative of Southern life.

GOUGH, JOHN BARTHOLOMEW, a temperance lecturer, born at Sandgate, Kent, England, Aug. 22, 1817, died at Philadelphia, Pa., Feb. 18, 1886. At the death of his father, in 1829, he came to the United States, and was for a time employed on a farm in Oneida county, New York; in 1831 he went to New York city, where he became a bookbinder. After some years of poverty, caused by dissipated habits, which finally reduced him to the utmost misery, he reformed and devoted himself to the temperance cause, laboring with great zeal and success. He visited England in 1853, by invitation of the London Temperance League, and lectured for two years in the United Kingdom. He was again in England in 1857–60 and in 1878. In some of his later addresses he took up literary and social topics, and acquired a moderate fortune by his lectures. He published an *Autobiography* (1846); *Orations* (1854); *Temperance Addresses* (1870); *Temperance Lectures* (1879); and *Sunlight and Shadow, or Gleanings from My Life Work* (1880).

GOULBURN, Edward Meyrick, an English clergyman and author, born in 1818. In 1841 he was elected a fellow of Merton, and after holding the Oxford incumbency of Holywell he became head master of Rugby, 1850–58. In 1858 he was prebendary of St Paul's; was chaplain to the queen, and vicar of St John's, Paddington, 1859, and dean of Norwich, 1866–89. Among his publications are: *The Philosophy of Grammar, With Especial Reference to the Doctrine of the Cases* (1852); *Thoughts on Personal Religion* (1862); and *The Office of the Holy Communion* (1863).

GOULD, Benjamin Apthorp, born at Lancaster, Mass., June 15, 1787, died in Boston, Oct. 24, 1859. He graduated at Harvard in 1814, and was appointed principal of the Boston Latin School, continuing in charge until 1828. Under his administration the institution became famous for thoroughness in classical teaching. Mr. Gould was one of the first Americans to annotate classical authors, and his critical editions of Horace, Ovid and Virgil, prepared for use in the Boston school, had an extensive circulation throughout the country. In 1828 failing health compelled him to relinquish teaching, and after several years spent in European travel he returned and engaged in the importing business. He subsequently filled important offices in his native State.

GOULD, Benjamin Apthorp, astronomer, born in Boston, Mass., Sept. 27, 1824, graduated at Harvard in 1844, and received the degree of Ph. D. at Gottingen in 1848. Returning to America, he conducted the "Astronomical Journal" from 1849 to 1861; was director of the Dudley Observatory at Albany in 1856–59, and in 1868 was appointed to organize and direct the National Observatory at Cordoba, in the Argentine Republic. He organized an admirable series of stations throughout the country, and mapped a large part of the southern heavens. In 1885 he returned to the United States, where he received the degree of LL.D. from Harvard in 1885, and from Columbia in 1887. Dr. Gould has published valuable astronomical reports and charts, and is a member of numerous scientific societies in Europe.

GOULD, Hannah Flagg, an American poet, born in Lancaster, Mass., Sept. 3, 1789, died in Newburyport, Mass., Sept. 5, 1865. She began her literary career by writing for periodicals. Her poems, published in 1832–36 and 1841, were much admired both in England and America. Her life was passed quietly in the homestead at Newburyport.

GOULD, Jay, an American financier, born at Roxbury, N. Y., May 27, 1836. He early developed a taste for mathematics and surveying, and on leaving school was employed in making surveys for county maps. He was afterwards employed for a short time in lumbering, and accumulated sufficient capital to become in 1857 the principal shareholder in the bank of Stroudsburg, Pa. He now began to buy up railroad bonds, and in 1859 established himself as a broker in New York city. He was president of the Erie Railway company till 1872; afterwards invested largely in the stocks of other railways and telegraph companies, and in 1881 became interested in the elevated railroad system of New York city. In 1882, a question of his financial stability having arisen, Mr. Gould produced for examination stock certificates in his own name having a face value of $53,000,000, and offered to produce $20,000,000 more if desired. In 1887 it was estimated that he controlled over 13,000 miles of railway, or nearly a tenth of the entire mileage of the country.

GOULD, John (1804–81), an English ornithologist. From an early age he interested himself in the study of natural history, and in 1824 became employed in preparing specimens for the museum of the London Zoölogical Society. He gave much attention to humming birds, and collected more than 2,000 specimens, illustrating 320 species. Among his publications are: *A Century of Birds From the Himalaya Mountains* (1832); *The Birds of Europe* (1837); *Birds of Australia* (1848); *The Mammals of Australia* (1859); *Monograph of The Trochilidæ* (1850); *Odontophorinæ, or Partridges of America* (1850); *The Birds of Great Britain* (1873); and *The Birds of New Guinea* (1875).

GOULD, Thomas R., sculptor, born in Boston, Mass., in 1818, died in Florence, Italy, Nov. 26, 1881. He early engaged in mercantile business, and did not devote himself to art until later life, his first work being done in 1851. He followed his profession in Boston until 1868, when he went to Italy and settled in Florence. In 1878 Mr. Gould visited Boston. Among his most celebrated statues are *The West Wind*, *Cleopatra*, *Timon of Athens*, and *Ariel*. He also executed several portrait statues, and a number of busts.

GOUNOD, Charles François, a French composer, born at Paris in 1818. He received his musical education at the Paris Conservatory, where he enjoyed the instruction of the celebrated composers Halévy and Lesueur. In 1839 he gained the prize, and was thereby enabled to go to Rome for further study. At Rome he entered a priests' seminary for the purpose of devoting himself to old Italian church music. In 1843 he returned to Paris, and became there the musical director of a church, which position he held for six years. In 1851 he produced the *Messe Solennelle*. After that he gave his attention more to secular music, producing first the lyric drama *Sappho*, and several pastorals, which were not much appreciated. But his *Faust*, which appeared in 1859, captivated the French, and in some degree also the Germans. Afterwards Gounod composed other operas, less popular than *Faust*. Among them *La Reine de Saba*; *Mireille*; *Romeo and Juliet*—all from 1862 to 1867. The war of 1870 drove him to London, but he returned to Paris in 1875. In London he produced the opera *Polyeucte*, and a cantata, *Gabia*. After his return to Paris the opera *Le Tribut de Zamora* (1881), and the oratorios *Redemption* (1882), and *Mors et Vita* (1885), have been his chief productions. He has lately been elected a member of the French Institute.

GOURD. See Britannica, Vol. XI, pp. 4–5.

GOURKO, Joseph Vladimirovitch, Count, a Russian general, born in 1825. He served as captain in the infantry during the Crimean war. In 1861 he became colonel, in 1873 brigade commander, and in 1876 division commander. At the outbreak of the war with Turkey in 1877, he commanded the Russian vanguard. At the Shipka Pass he joined the Russian main army after the Turks had compelled him to retreat. At the head of a corps of cavalry he invested Plevna, where Osman Pasha maintained a gallant struggle. Gourko compelled him to surrender, Dec. 10, 1877. After this Gourko crossed the Balkans in midwinter with 75,000 men, captured Sophia, Philippopolis, etc. At the end of the Turkish war he was made general of cavalry, and in 1883 military governor of Warsaw

GOUVERNEUR, a town of St. Lawrence county, N. Y., situated on the Oswegatchie River, and on the Rome, Watertown and Ogdensburg Railroad, 36 miles northeast of Watertown. It contains a seminary and several large mills.

GOVAN, a police burgh of Lanark and Renfrew shires, on the south bank of the Clyde, outside the municipal boundaries of Glasgow, but connected with the city by continuous rows of buildings. Its leading industry is shipbuilding.

GOVERNMENT (see Britannica, Vol. XI, p. 9–21), the ruling power in a political community. It governs the community by means of laws, decrees, ordinances, rules, orders, etc. Every law, decree, etc., is a command issued by the ruling power to those who are bound to obey, and every such command restricts somebody's liberties. In some of the Swiss cantons all the citizens of the state assemble on stated days, and enact then and there the laws for the community. The "Landammann" executes the laws. These are pure democracies, and represent the ideal government. In all other republics of the present day the people elect representatives to make the laws for them. A "president" or "governor" executes the laws. These are representative republics. In most European monarchies the people elect delegates to make the laws for them, and a "monarch" executes these laws. These are *constitutional monarchies*. In Russia, China, Persia, etc., the monarch makes the laws and enforces them also. These are absolute monarchies. In some of the ancient republics the nobility (aristocrats) ruled absolutely. These were oligarchies. As none of these exist now, we shall not further consider them in this article; and since pure democracies are only possible in very small communities, we shall also dismiss this form from further consideration. We have then only three forms of governments to consider: (1) The representative republic; (2) the constitutional monarchy, and (3) the absolute monarchy.

The principal republican governments are the United States, France, Switzerland, Mexico, the Central American Republics, Hayti, Colombia, Bolivia, Peru, Chili, Venezuela, Brazil, and the Argentine Republic.

The principal constitutional monarchies are the British Empire, the German Empire, the Austro-Hungarian Empire, the Kingdoms of Denmark, Sweden and Norway; Holland, Belgium, Spain, Portugal, Italy, Greece, Servia, Roumania, and in Germany the Kingdoms of Prussia, Bavaria, Wurtemberg and Saxony, besides several duchies and grand duchies; in Asia, the governments of Japan, Afghanistan and Beloochistan.

The principal absolute monarchies are: Russia, Turkey, Egypt, Persia, China, Abyssinia, and Morocco.

A *federal government* rules over several states united for national purposes as for common offense and defense, for establishing mutual free trade, for common representation before other governments, etc. Such governments are those of the United States of North America, of Mexico, of Colombia, of Brazil, the Swiss government, the German Empire, etc. This form secures to each portion a local government for its domestic purposes, familiar with its habits and sympathizing with its peculiar wants. At the same time, it secures to the united nation a common government sufficiently powerful for its protection against foreign nations, and clothed with authority to provide general regulations for the welfare of the whole. But the powers of the federal and state governments must be clearly defined and distinctly limited; and the citizens of such states must be politically well educated, and in order to exercise their political rights intelligently, each state of such a union must be independent in those matters which concern itself only. On the other hand, all the members of the union must be subject to the federal power in those matters which concern all the states collectively. In such matters as these, the sovereignty of each state must cease. Among the subjects included in this latter category are the making of peace and war; the sending of ambassadors and ministers to other governments and the reception of their diplomatic agents; the levying of imports, internal revenues, etc., and the maintenance of a standing army and navy, and also of a postal service. In relation to other nations a federal union forms one state only. All those rights that are not distinctly delegated to the federal power belong to the several states individually.

Every good government is divided into three departments or branches—the legislative, executive, and judicial. The constitution of the United States carries out this principle with the clearest distinctness. In the first sections of its articles I, II, and III, it is respectively declared, that "all legislative power shall be vested in a Congress of the United States," etc.; "the executive power shall be vested in a President of the United States;" "the judicial power of the United States shall be vested in one supreme court, and in such inferior courts as the Congress may from time to time ordain and establish." Each of these departments aids the other two and acts as a check upon them. Together they work out most beneficial results.

The Congress of the United States consists of a Senate and a House of Representatives. The former represents the States, for the Senators are appointed by the State governments. The latter represents the people directly, because the representatives are elected by the voters of their districts. The President can veto any bill passed by the Congress. But if it afterwards receives the vote of two-thirds of each house, it becomes a law in spite of the President's veto. And if any law is subsequently brought into the Supreme Court to investigate its constitutionality, the Supreme Court has the power to decide whether it is constitutional or not. All these arrangements are well calculated to prevent hasty and inconsiderate legislation.

Similar arrangements exist in the several States. After a State legislature has passed a bill, the governor of the State can veto it, but the legislature may subsequently pass it over his veto by a two-thirds vote. And if, after a bill has become a law, it is carried into the Supreme Court of the State, this court has the power to declare the law unconstitutional. These restraints upon legislation are necessary, because, under popular governments like ours, where the people are in close contact with the legislators, all the petty grievances, wants and wishes are taken to the latter for redress, and there is always danger of too much legislation, of overdoing the thing by passing numerous private or special laws to the detriment of the majority of the citizens.

Our government is often called a "government of the people, for the people and by the people." This is a figurative expression. For the "people" of the United States do not govern directly. They only elect their ruling officers very frequently; and by this means, and the public press, they exert a powerful influence over them. Nevertheless the laws and constitutions are enacted in the name of the "people." As an example, we insert here the opening words of the Constitution of the United States, which read as follows "We, the people of the United States, in order to form a more perfect union, establish justice insure domestic tranquillity, provide for the common defense promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do *Ordain* and *Establish* this *Constitution for the United States of America.*" This sentence gives us a clear and forcible answer to the question, "Why do people voluntarily surrender their natural liberty and equality, constitute governments, and obey their commands, laws and decrees?" "The social compact" is to secure safety, tranquillity, justice, and the general welfare."

GOVERNMENT'S ISLAND, in Rock Island county, Ill., lies in the Mississippi River, between the cities of Rock Island, Ill., and Davenport, Iowa. It belongs to the United States government, has fine armories and arsenals, and is connected by bridges with either shore. During the civil war it was used as a military prison. Area, 960 acres.

GOVERNOR'S ISLAND, a fortified island of Suffolk county, Mass., forming part of the defensive system of Boston harbor. It lies on the north side of the main ship-channel, opposite Castle Island.

GOVERNORS' ISLAND, a small island in New York harbor, owned by the U. S. Fort Columbus and Castle William are here, and the ordnance department has a depot. The general recruiting service of the army has its rendezvous here.

GOWAN, OGLE ROBERT, born in County Wexford, Ireland, in 1796, died in Toronto, Can., Aug. 21, 1876. He received a good education, and early became editor of the "Antidote," a newspaper of Dublin. Removing to Canada in 1829, he resided for a time in Escott, and afterwards in Toronto. He served with distinction against the insurrectionists of 1837–39; was a member of the Canadian Parliament (1834–41), and was for a time postoffice inspector and subsequently a license-officer in Toronto. He was the founder of the Orange lodges of North America, and was for 20 years their grand master.

GOWANDA, a village of New York on Cattaraugus Creek, the boundary line dividing Cattaraugus and Erie counties. It has manufactories of flour, agricultural implements, carriages and cheese-boxes.

GRACE, an expression frequently used in Scripture and in theological discussion. Its distinctive meaning is the idea of *free and unmerited* favor. According to Aristotle this is the proper meaning of *charis* (*Gr.*, grace), even when applied to man. It is a benefit springing out of the liberality and free-heartedness of the giver, and bestowed without any hope or expectation of reward. Applied to God in the New Testament and in theology, it denotes the free outcoming of his love to man; and when man, on the other hand, is said to be in a state of grace, it implies that he is in the enjoyment of the divine love and favor. St. Paul draws a sharp contrast (Rom. xi, 6) between *charis* and *erga* (*Gr.*, works), as mutually excluding one another. "And if by grace, then it is no more of works: otherwise grace is no more grace. But if it be of works, then it is no more grace: otherwise work is no more work." Theologians have distinguished grace into *common or general*, and *special or particular*. *Common* grace is supposed to denote the love which God has to all his creatures, and the light of nature and of conscience which they all enjoy. *Special* grace is the love which God has for his elect people, and by which he saves them from their sins.

GRACKLE, the common name of many birds of the Starling family (*Sturnidæ*) See Britannica, Vol. XI, p. 26.

GRADIENT, a term used, chiefly in connection with railways, to signify a departure of the line from a perfect level.

GRADIENTIA, a group of reptiles which combines in one order all living ambulatory amphibians. It is represented by numerous species in temperate and tropical parts of the globe. With the exclusion of such amphibians as newts and salamanders, *Gradientia* is sometimes used as equivalent to *Lacertilia*. See Britannica, Vol. XIV, p. 732; and Vol. XX, pp. 439, 444.

GRADUAL PSALMS, or SONGS OF DEGREES, a name given by the Hebrews and in the Christian service-books to the fifteen psalms, 120–34 (119–33 in the Vulgate). The origin of this name is uncertain, but the most probable conjecture supposes that the psalms were sung by pilgrims when going up to Jerusalem for the great annual feasts. In the Roman Catholic church they are recited on all Wednesdays in Lent, except the last.

GRÄFENBERG, a village in the northwest corner of Austrian Silesia. It is celebrated as the spot where the water-cure was introduced in 1826 by Vincenz Priessnitz (1799–1851). It still is visited yearly by some 1,500 persons.

GRAFFITI (Ital., *graffito*, a scratching), or WALL SCRIBBLINGS, the name given to certain classes of mural inscriptions and drawings found at Pompeii, Rome, and other ancient cities in Italy. They are generally scratched with a sharp instrument, or scrawled with red chalk or charcoal, on walls, door-posts, and portico-pillars, and seem to be the work of idle triflers; but some were executed with more serious intention. The subjects that oftenest occur are doggerel verses, quotations from the poets amatory effusions, rude caricatures, especially of gladiators, etc. The more serious examples are electioneering admonitions, play-bills, and similar public announcements, philosophic apothegms, notices of household events, etc. These scribblings serve as an admirable index to the current life of the people, especially in Pompeii. Without them we should have a far less adequate idea of the street life of the ancient Roman people, and of the phraseology and idiom of the vernacular spoken toward the end of the first century A. D. in Southern Italy. Three alphabets were used—Latin, Greek and Oscan. In Rome *graffiti* have been found on some of the great buildings, as the palace of the Cæsars, Nero's golden house, and in the catacombs. See Britannica, Vol. XIX, p. 450.

GRAFTING: in horticulture, the uniting of a shoot or scion, containing one or more buds, to a stock or root with a view, by their union, to produce a superior fruit. There are a number of ways of grafting: for an account of some of which the reader is referred to the article on HORTICULTURE, in Britannica, Vol. XII, pp. 236–37. On farms cleft-grafting is the form generally adopted, and the only tools required are a sharp saw, a keen pocket-knife, a butcher-knife and a mallet, for splitting the stocks, and grafting wax for spreading over the mutilated parts. The stock is sawed off square, split, and two scions inserted, one on each side, tapered down to a wedge shape, and so placed that the inner bark of the stock and the scion will just meet. Old orchards may be renewed and the fruit improved by grafting the limbs with desirable varieties, the thorough pruning involved infusing new life; and new varieties can sooner be brought into bearing when thus top-grafted than if planted as nursery trees. Fine results have been attained by grafting a third of the limbs of a tree at once, and the remaining two-thirds at intervals of a year. Twenty-eight and one-half bushels of choice apples are reported to have been gathered, in Connecticut, in the sixth year from the first grafting, from a single tree that was seventy-five years old, and had previously borne inferior fruit.

Another common mode of grafting is by in-arching. A modification of this may be practiced where the bark of a valuable tree has been injured. The injury is pared smooth at the edges of the bark down to the live wood, and a piece of healthy bark fitted accurately thereto, and covered with grafting wax until it is healed, or scions set close together, and brought fresh bark to fresh bark, at top and bottom, and securely fastened.

In root-grafting experience proves that a perfect union of the root and scion may be effected at any point of the root, and that cuts of roots of one or two years' growth, smooth and straight are best. These should be taken up from the seed-bed in the fall, selected, tied in bundles, and stored in a cellar or buried in the soil, where they will remain fresh. After the roots have been cut into pieces 2 to 4 inches in length, and the scions prepared, the work of grafting may be taken up at any time during the winter. In performing the work the grafter takes up a stock, cuts the slope near the collar, and also the tongue, if that style of grafting is to be done. The tongue and slope of the scion have been previously cut and the scions laid ready to hand. The grafter then picks up a scion and adapts it to the root-stock, the tongues of the two keeping them together. The process of grafting is completed by applying melted wax with a brush, and wrapping the grafts with waxed strips of muslin or paper, or tying them with waxed thread. By a division of labor immense numbers of grafts may be turned out. Machinery has also been applied to the business, and grafting apparatus facilitates the work. One machine consists of a frame or gauge which regulates the angle of the slope, which is cut with a broad chisel, while others consist of shears to cut the slope and tongue at one operation.

The grafting of grapevines has never been successful until quite recently. For this operation the earth is removed from the old vine as far as the root will permit, exposing the collar. The vine is cut off 3 or 4 inches below the surface of the earth. Cuts are then made in the stub about half an inch deep or a little more. These clefts are made with the "Wagner saw," which has two thin saw-blades ⅛ inch apart, with a sharp chisel blade between them, and the scions of the grape to be propagated about 6 inches long, are inserted into these clefts in the stump, letting their lower ends extend into the soil below the incision. In order to effect this the cuts are made obliquely downward into the bark and wood of the root. The earth is firmly pressed about the cutting and the stock, and only one or two eyes of the scions left exposed. This method of grafting the grape-vine permits the use of strong-growing varieties as stocks for those that grow less vigorously. If, for instance, the Delaware vine, which is a slow grower, is grafted upon a Concord stock, which is a strong grower, a more vigorous Delaware vine is secured, inclined to produce larger berries and more of them, and less inclined to drop the leaves. Where phylloxera has devastated vineyards, it has been found necessary to graft the desired varieties upon the roots of varieties that are not affected by the destructive insect.

GRAFTING: in surgery, is the transplanting of a portion of flesh, bone or skin to supply a deficiency caused by disease or wounds. The material may be taken from another part of the same body, as in the case of skin-grafting is usual, or from another person or animal, which is the usual method in bone or flesh-grafting. This system has grown in favor as the structure of the body has become better understood—the construction of the tissues, and the methods by which the process of repair can be assisted. Under the titles of ANATOMY, PATHOLOGY, and SURGERY, in Britannica, Vols. I, XVIII, XXII, the subjects are well considered.

At first applied in repairing injuries to the nose, ears, and lips to render deformity less conspicuous by Tagliacossi (see Britannica, Vol. XXIII, p. 20), skin-grafting is now used also in cases where large surfaces of the skin are abraded, or where burns or scalds have taken off the cuticle. This is called Reverdin's operation. Small pieces of skin are planted over the exposed surface, which become fixed and extend toward each other and toward the extensions put out by the sides of the wound. Although the result is not true skin, it is a healthy tissue, and prevents, where it is successful, the sloughing of a wound and dangerous complications. A case reported as having recently occurred in New York has caused much comment. A prominent member of a club was unfortunate enough to lose a large patch of the skin of his face, whereupon a number of his club associates volunteered to have small patches of their respective skin, generally from the left arm, removed for his benefit. All these small patches were transplanted to the bared surface of the patient, and made up a complete covering of the denuded part. The operation was reported to have been successful.

BONE-GRAFTING has also been tried with varying success. In a case lately reported in New York, where the shinbone of a boy had been injured, the defective part of the bone was carefully removed, but leaving a portion of the osseine intact, and a similar portion of a bone of a dog's fore-leg was fitted into the vacated space without detaching it from the live dog. The boy and dog were kept immovably connected for some time, in order to induce the two joined bones to grow together. But the operation appears to have been only a partial success.

Prof. A. F. McGill, of Leeds, England, reported in 1889 the successful treatment of a case of "*non-united bone fracture*," by the use of a bone-graft taken from a rabbit. The patient, a young man of twenty, had been suffering for a year from a fractured forearm. The fracture was compound, the wound being on the radial side. Through the wound the broken ends protruded. The ulna united perfectly, but the fragments of the radius would not join. Three months after the accident a surgeon exposed the ends of the bone refreshed them, and wired them together. The wound healed, but the fragments did not unite.

Several months later the patient applied to Dr. McGill for relief. The bones were bared for the space of three inches, and the ends found rounded, with no signs of union, but covered with a thick membrane resembling periosteum. This was filed away and the bone tissue again bared, and an interval of three-fourths inch left between the punctured ends. Then small fragments of the femur of a freshly-killed rabbit (six months old) were taken, having been chiseled out of the femur—13 pieces of one or two lines in length; and with these the interval between the ends of the bones was filled, and the inserted pieces were held together by the replaced skin, which was carefully stitched, and the whole held in place by numerous catgut sutures. No drainage tube was used. In about a month the patient left the hospital fully cured, and with the arm as useful as ever.

GRAFTON, the county-seat of Walsh county in the northeastern part of N. Dak., about 110 miles north of Fargo.

GRAFTON, the county-seat of Taylor county, W. Va., on Valley River. The chief industries are lumber and coal. The village has railroad shops, foundries, flouring-mills, planing and saw mills.

GRAHAM, SYLVESTER, vegetarian, born in Suffield, Conn., in 1794, died in Northampton, Mass., Sept. 11, 1851. In 1823 he entered Amherst College, intending to prepare for the ministry, but did not complete the course. He began to preach in 1826, and in 1830 engaged in the temperance work. Becoming convinced that intemperance could be cured by the adoption of a purely vegetable diet, he afterwards applied the theory to other forms of disease. He published *Essay on Cholera* in 1832, and in 1839 delivered a course of lectures entitled *Graham Lectures on the Science of Human Life*. He also published *Bread and Bread-making; A Lecture to Young Men*, and one volume of *The Philosophy of Sacred History*.

GRAHAM, WILLIAM ALEXANDER, an American statesman, born in Lincoln county, N. C., in 1804, died at Saratoga, N. Y., Aug 11, 1875. He became a lawyer, and in 1833 was elected to the legislature of North Carolina. Several times he was chosen speaker of the assembly of that State, and in 1841 he was elected United States Senator. From 1845 to 1849 he was governor of North Carolina. When Fillmore became President, he appointed Graham Secretary of the Navy. In June, 1852, the Whig party nominated him for Vice-President, but he was defeated. After this he remained in private life until 1864, when he became a Senator in the Confederate Congress.

GRAHAMÉ, JAMES, historian, born in Glasgow, Scotland, Dec. 21, 1790, died in London, England, July 3, 1842. He graduated at St. John's College, Cambridge, and in 1812 was admitted to the Scottish bar. He subsequently removed to the south of England. In 1827 he published the first two volumes of a history of the United States, and in 1836 a new edition in four volumes was published, bringing the history down to the year 1776. The work was highly praised by the historian Prescott and others, but was not popular in England, because of its thoroughly American spirit. A Philadelphia edition was published in 1845.

GRAMOPHONE. Emile Berliner, of Washington D. C. announced in 1891 that he had prefected his invention, the gramophone. He claimed that it is the greatest sound producing machine in existence. Mr. Berliner is the inventor of the transmitter used on the telephones of the Bell Company, and is still retained by the company as one of its electricians. He first exhibited the gramophone, not then brought perfection, in Philadelphia, May 16, 1888, before the Franklin Institute. The process of reproduction is short. A disk of polished zinc is covered wifh a fatty film for an etching ground. It is placed on a turntable, and as one talks in a tube the disk is revolved, and the vibrations caused by the sound are traced in the film by a small pen. The etched plate is put in chromic acid, and in fifteen minutes is ready for use It is put on another turntakle and revolved by the turning of a crank. A stiff pen traces the etched lines and reproduces the vibrations on a ruber or vulcanite diaphragm, by which the original sound is carried into the tube. The pitch of the reproducted voice can be made high or low according as the crank is turned rapidly or slowly. There is practically no limit, Mr. Berliner says, to the number of reproductions that can be made from one plate, and any number of plates can be made from one original. Moreover the plate can be printed from a photo-engraving made from the print and the sounds reproduced from this plate with one of the machines.

GRAIN ELEVATOR. See LIFTS, Britannica, Vol. XIV, p. 574.

GRAND BANK, a fishing village and port of entry on the south side of Fortune Bay, N. F. It has considerable trade.

GRAND BANK, a submarine plateau in the Northern Atlantic, extending about 350 miles eastward from Newfoundland. Its formation is attributed to the deposit of stone and earth from icebergs melted by the warm waters of the Gulf Stream. The grand bank is the headquarters of the cod-fishery.

GRAND BAY, or HA-HA Bay, an inlet from the Saguenay River in Chicoutimi county, Quebec, Can. It is a beautiful sheet of water, averaging a mile in width and about 100 fathoms in depth, and is a source of attraction to summer tourists. At its head the largest vessels load with lumber.

GRAND CROSSING, a village of Cook county, Ill., at the intersection of the Illinois Central, Lake Shore and Michigan Southern, New York, Chicago and St. Louis, and Pittsburgh, Ft. Wayne and Chicago railroads, nine miles south of Chicago. It has manufactures of sewing-machines and furniture.

GRANDEES (Span., *grandes*), since the 13th century the most highly privileged class of nobility in Castile, the members of the royal family being included. Their honors were hereditary; they held lands from the crown on the tenure of military service, were exempted from taxation, could not be summoned before any civil or criminal judge without a special warrant from the king, and could leave the kingdom, and even enter the service of a foreign prince at war with Castile, without incurring the penalties of treason. They had also the right of being covered in the presence of the king. In the national assemblies they sat immediately behind the prelates and before the titled nobility (*titulados*). Under Joseph Bonaparte their privileges were entirely abolished, but they were partially regranted at the subsequent restoration. Grandees are still members of the Senate in their own right.

GRAND FORKS, the county-seat of Grand Forks county, N. Dak., on the Red River of the North. It contains the University of North Dakota.

GRAND ISLAND, a city, railroad junction and county-seat of Hall county, Neb. Shipping grain is the chief industry.

GRAND JUNCTION, the capital of Mesa county, Colo., on the Denver and Rio Grande Railroad, at the confluence of Grand and Gunnison Rivers.

GRAND JUNCTION, a town of Greene county, Iowa, on the Chicago and Northwestern Railroad, where it crosses the Des Moines and Fort Dodge Railroad, 38 miles south of Ft. Dodge. The principal business in the vicinity is farming and stock-raising.

GRAND LEDGE, a village of Eaton county, Mich., 12 miles west of Lansing. It has a mineral spring, is a health resort, and has good water-power.

GRAND MANAN, an island in the Bay of Fundy, 22 miles long and from 3 to 6 wide, belonging to New Brunswick. It is fertile and has many good harbors. The chief settlement is Grand Harbor. The cod, herring, and haddock fisheries are important. The island is a summer resort.

GRAND MONADNOCK, or MONADNOEK, a solitary mountain peak of Cheshire county, N. H., supposed to be a detached member of the White Mountain group. It is 3,718 feet high.

GRAND PRÉ (post-office Lower Horton), a village lying in the basin of Minas, Kings county, N. S., 15 miles from Windsor. It is the scene of Longfellow's *Evangeline*. The village contains a seminary.

GRAND RAPIDS, a city and county-seat of Kent county, Mich., at the head of steamboat navigation on Grand River, and at the junction of six railroads. It is 60 miles west-northwest of Lansing. The sawing and planing of pine and hardwood lumber, and the manufacture of furniture, cooperage, and wooden-ware, are the leading industries. Farm implements, iron goods, wire, leather, flour, machinery, beer, chemicals, white bricks, cement, stucco-plaster, and land-plaster are also extensively manufactured. See Britannica, Vol. XI, p. 47. Population in 1860, 8,025; 1870, 16,507; 1880, 32,016; 1890, 64,147.

GRAND RAPIDS, a city and county-seat of Wood county, Wis., on Wisconsin River. Lumbering and agriculture are the chief occupations. There are lumber mills, machine shop, and foundry in the city, and pure kaolin is found in the vicinity.

GRAND RIVER, of Michigan, rising in the lower peninsula, flows westerly into Lake Michigan after a course of about 280 miles. Large steamers can ascend it for 40 miles.

GRAND RIVER, Missouri, an affluent of the Missouri River. Its course is southeasterly and its length about 300 miles.

GRAND TRAVERS BAY, an arm of Lake Michigan, extending into the lower peninsula of Michigan. It is about 30 miles long and 12 miles wide.

GRANGER, Gideon, born in Suffield, Conn., July 19, 1767, died in Canandaigua, N. Y., Dec. 31, 1822. He graduated at Yale in 1787, was admitted to the bar, and soon became prominent in his profession. He was a member of the legislature of Connecticut, and was instrumental in the establishment of the school fund; became Postmaster-General of the United States in 1801; in 1814 returned to Canandaigua, and in 1819 was elected to the State Senate.

GRANGER, Gordon, born in New York in 1821, died in Santa Fé, New Mexico, Jan. 10, 1876. He graduated at the United States Military Academy in 1845, engaged in the Mexican war, and at the commencement of the civil war was assigned to duty on the staff of Gen. Sturgis. In September he was appointed colonel 2d Michigan cavalry, in 1862 commanded the cavalry in the operations that led to the fall of Corinth, and commanded various districts in Kentucky and Tennessee. He was in command of the 4th army corps at the battle of Missionary Ridge; of a division at Fort Gaines, Ala., in 1864; and commanded the 13th army corps in the Southwest, engaging in the siege of Fort Morgan, and throughout the operations that resulted in the fall of Mobile. He was brevetted first-lieutenant and captain for services in the Mexican war, and for gallant conduct in the civil war, the brevets from major to that of major-general were conferred upon him. In January, 1866, he was mustered out of the volunteer service, in the following July was promoted to colonel, and at the time of his death was in command of the district of New Mexico.

GRANGERS, an American national association of agriculturists, founded in 1867 under the title of "Patrons of Husbandry." See Secret Societies in the United States, in these Revisions and Additions.

GRANITE. See Britannica, Vol. XI, pp. 48–50.

GRANT; in English law, the conveyance of property by deed. Movables are granted when they are comprised in a bill of sale or deed of gift. The Real Property act of 1845 enacted that the immediate freehold might be conveyed by deed of grant. In the United States generally livery of seizin is dispensed with, and the term "grant" applies to all transfers of real property.

GRANT, Sir Alexander (1826–84), a Scotch educator. He was educated at Harrow and Balliol College, Oxford, and was elected to an Oriel fellowship. He succeeded as baronet in 1856, was appointed inspector of schools at Madras, India, in 1858, and became professor of history in Elphinstone College there; then its principal, and afterwards vice-chancellor of Elgin College, Bombay.

GRANT, Ulysses S. General of the United States Army, and eighteenth President of the United States, was born at Mt. Pleasant, O., April 27, 1822, and died on Mt. McGregor, near Saratoga N. Y., July 23, 1885. He was the son of Jesse R. and Hannah S. Grant, of Scottish ancestry. General Grant was the oldest of six children. His father was a tanner, as well as farmer, but Ulysses spent his early youth in aiding in the farm work. In the spring of 1839 he was appointed to a cadetship in the United States military academy at West Point, N. Y. As a student he was specially characterized by proficiency in mathematics and in cavalry drill, but gained a fair standing in all his studies. In horsemanship he held the highest standing in his class. At his graduation in 1843 his general average was marked 21 in a class of 39. Receiving his commission as brevet Second Lieutenant he was attached to the 4th Infantry, and was assigned to duty at Jefferson Barracks near St. Louis. Early in 1844 he accompanied his regiment to Camp Salubrity, La. In September, 1845, he was commissioned Second Lieutenant, and was transferred with his regiment to Corpus Christi, Texas, to aid the army of occupation under General Zachary Taylor. He participated in the battles of Palo Alto, May 8, 1846, Resaca de la Palma, May 9, 1846, (and in the latter commanded his company,) and Monterey, Sept. 23, 1846. In the last battle, when the troops had gained an advanced position, a volunteer was called for to make his way to the rear under heavy fire and order up the ammunition wagons. Lieutenant Grant instantly volunteered and successfully accomplished the perilous work. He took part under General Scott in the siege and capture of Vera Cruz in March, 1847, and later in the battle of Cerro Gordo, San Antonio, Churubusco, Molino del Rey, and Mexico. In all of them his conduct was characterized by the highest and most intelligent bravery. On the withdrawal of the troops from Mexico he was granted leave of absence, and visited St. Louis where, on Aug. 22, 1848, he married Miss Julia B. Dent, sister of one of his classmates.

Soon after, he returned to his regiment, and in the spring of 1851 was transferred to Sackett's Harbor, N. Y., and later to Detroit, Mich.; and again to Sackett's Harbor; and from the latter place he sailed July 5, 1852, with his regiment, via Panama, for California, and thence to Fort Vancouver, Oregon. On Aug. 5, 1853, he was promoted to a Captaincy in the Regular Army. On July 31, 1854, he resigned his commission and settled on a small farm near St. Louis. He remained on the farm and in real estate, until April, 1860, when he removed to Galena, Ill., and there became a clerk in the hardware and leather store of his father.

The attack on Fort Sumter in Charleston and the opening of the great civil war, in 1861, restored to the army General Grant, who instantly and warmly espoused the Union cause, and presided at the first Union meeting held in Galena. On June 17, 1861, he was appointed Colonel of the 21st Regiment of Illinois Volunteers and was soon in the field and a little later in charge of a sub-militar district in Missouri under Gen. Pope, his command consisting of three regiments of infantry and a section of artillery. He was appointed a brigadier general Aug. 7, 1861, his commission dating from May 17. He was ordered to Ironton, Mo., where he reported a day later. Ten days after he was ordered to St. Louis, and thence to Jefferson City, and eight days later was directed to report in person at St. Louis, where he found that he had been assigned the command of the military district of Southeastern Missouri, embracing all the territory of Missouri south of St. Louis and all Southern Illinois, with permanent headquarters at Cairo. Instantly he was at the work assigned him. He arrived at Cairo Sept. 4, and the next day hearing that the Confederates were about to seize Paducah, Ky., he moved the same night and early next morning was in possession of the place, and issued his famous proclamation to the citizens, in which he said: "I have nothing to do with opinions, and shall deal only with armed rebellion and its aiders and abettors." Gen. Grant's first engagement was on the morning of Nov. 7, when having learned that the enemy had established a camp at Belmont, opposite Columbus, he resolved to attack it and with a force of about 2,500 moved down the river and landing about three miles above the place, moved rapidly forward and led the attack in person. In the spirited engagement his horse was shot under him, but the enemy was routed and his camp captured, after which Grant returned to his boats with 175 prisoners, and two guns, and having spiked four other guns of the enemy. The whole force of the enemy was about 7,000, of whom 642 were lost. General Grant's loss was 485 men. The capture of Fort Henry came next, followed by that of Fort Donelson. In the latter Grant captured 65 guns, 17,600 small arms and 14,623 prisoners with an additional loss to the enemy of 2,500 killed. Grant's loss was 2,041 killed, wounded and missing.

The remaining story of General Grant's life is that of the great civil war itself—the record of great battles, great achievements, and great successes over a gallant and powerful foe. A few additional dates only are needed in this outline sketch of the great General. The grade of Lieutenant-General was revived by act of Congress in February, 1864, and General Grant was nominated by President Lincoln for the post on March 1, and the nomination was confirmed by the Senate on March 2. He left March 4, in obedience to the order of the President for Washington, where he arrived on the 8th, and on March 9, received his commission as commander of all the Union armies. On April 9, 1865, the surrender to General Grant of General Lee, the commander in chief of the Confederate armies, with his whole forces composing the army of Virginia, took place at Appomattox Court House, and the war virtually ended.

Gen. Grant returned to Washington, April 10, to supervise the work of disbanding the armies. President Lincoln was assassinated on the evening of April 14, and it is believed that Gen. Grant would have shared the same fate had he not been out of the city on that date. On the accession of Vice President Johnson to the presidency immediately following the death of Mr. Lincoln, he (Johnson) indicated a purpose to have Lee and others punished for the crime of treason, under an indictment found bý the United States Court in Virginia. Gen. Lee appealed to Gen. Grant asking to be permitted to enjoy the priviliges of amnesty extended by presidential proclamation to others of the Confederate army. Grant endorsed the application as follows: "Respectfully forwarded, through the Secretary of War, to the President, with the earnest recommendation that the application of Gen. Robert E. Lee for amnesty and pardon be granted him." But President Johnson emphatically denied the petition. Lee then appealed to Gen. Grant for protection and the latter endorsed the letter by a strong statement in which he said: "In my opinion the officers and men paroled at Appomattox Court House, and since upon the same terms given to Lee, cannot be tried for treason so long as they preserve the terms of their parole . . . and I would ask that he (Judge Underwood) be ordered to quash all indictments found against paroled prisoners of war, and to desist from further prosecution of them." The result was the abandonment of the prosecution. But the estrangement between the President and Gen. Grant continued. On July 25, 1866, in accordance with an act of Congress previously passed creating the rank of *General*, a rank higher than any previously existing in the United States, Lieutenant General Grant received the commission of GENERAL.

In the latter part of 1866 President Johnson, finding that General Grant would not support some of his measures ordered him out of the country on a special mission to Mexico; but General Grant declined the mission on the ground that it was outside of the military service. Various other efforts were made to remove General Grant, but he was promptly sustained by Congress and by the great body of the people, and in 1868 he was nominated and elected President of the United States, carrying the electoral votes of 26 out of 34 states, and 214 electoral votes out of a total of 294. Four years later he was re-elected, carrying 31 states with a popular vote of 3,597,070, and an electoral vote of 286 out of a total of 352. During his two presidental administrations the taxes were reduced over $300,000,000 and the public or national debt over $450,000,000.

After retiring from the Presidency March 4, 1877, Gen. Grant decided to visit foreign countries and on May 17 of that year he sailed from Philadelphia for England accompanied by his wife and son. He was everywhere received with "royal greetings" by the sovereigns and peoples of the old world.

After leaving Great Britain he visited the continental countries of Europe and then journied through Egypt and Palestine; thence he sailed for India, visiting Calcutta and other places of interest. In the latter part of March, 1879, he sailed for Burmah and later visited the Malacca peninsula, Siam, Cochin China, and Hong Kong, reaching the last named place April 30th. Next he made a tour into the interior of China. At Pekin Prince Kung requested him to act as arbitrator in settling a controversy between China and the Loo Choo Islands. In this matter, while prevented by his plans from acting in a formal arbitration, he studied the question in controversy, and gave such advice as to aid in a settlement without war. Next he visited Japan where the honors showed him were even greater than those received in any other country. He sailed from Yokohama Sept. 3, 1879, reaching San Francisco on Sept. 20 and received the heartiest of greetings everywhere on the Pacific coast, and on his journey eastward through the states to his former home in Galena. Early in 1880 he visited some of the southern states and Mexico.

The enthusiasm of General Grant's receptions in the old and new worlds, the favorable impression made upon the public by his brief, prudent, and practical speeches while abroad, together with the high estimate of his military genius and his civil administration as President of the United States, led many of his friends to seek for him the nomination for a third presidential term. At the Republican nominating convention held in Chicago in June, 1880, the name of General Grant was presented and during the first thirty-six ballots secured votes ranging from 302 to 313; but many of his best friends were opposed to a "third term" nomination, believing that the precedent might prove harmful to the country, and therefore secured the withdrawal of his name and the substitution therefor of the name of Gen. James A. Garfield, one of General Grant's most devoted friends.

In 1881 General Grant purchased a house in New York, which he subsequently made his home, spending a part of his summers in a cottage presented to him at Long Branch near the city. The great interest taken by the public in a series of articles furnished by General Grant to *The Century* induced his friends to urge him to write his own biography down close of the Civil War. He consented to do this, especially as the contract he was able to make with the publishers of his books promised him such large financial returns, as would relieve his family from much of the embarrassment caused by the losses of his property through the fraudulent conduct of some of his former partners in business. His contract for his biography, two volumes octavo, was signed Feb. 27, 1885, the work appearing about a year later; and so large was the patronage of an appreciating public, that the share of the profits inuring to Mrs. Grant and family from the first two years' sales, reached the large sum of nearly $400,000.

In the summer of 1884 General Grant began to suffer from what soon proved to be a cancer at the root of the tongue. The sympathy of the whole nation was aroused in his behalf, and on March 4, 1885, Congress passed a bill making him General on the retired list, thus restoring him to the rank from which he resigned after the close of the war. In the meantime General Grant knowing that his disease was rapidly shortening his life, diligently worked on his biography, in the midst of almost continuous and intense suffering, heroically persisting in the task even after he became speechless, and until its completion, only four days before his death.

A few weeks before his death General Grant accepted the occupancy of an amply furnished cottage on Mount McGregor generously tendered to him by Mr. Joseph W. Drexel, of Philadelphia. There, in the quiet of that unpretentious, rural summer home, surrounded by his family, and enjoying the sympathy of the whole nation, and the respect and admiration of the nations of the world, he passed away, July 23, 1885. His remains were soon after taken to New York City where a great public funeral took place—the most magnificent in the history of the country—and where the body was deposited in a beautiful spot in Riverside Park, over which at this writing, December, 1891, a fitting and imposing monument is in process of erection.

Mrs. Julia Dent Grant, [illegible] ever the faithful and beloved "queen" of his home circle. After his death she was granted a yearly pension of $5,000. A similar pension has been granted to three other widows of Presidents—Mrs. Polk, Mrs. Tyler, and Mrs. Garfield. At this writing, Mrs. Grant still resides in New York City, surrounded by her children, Frederick Dent, Ulysses S., Jesse, and Nellie, and her grandchildren.

Frederick Dent Grant, eldest son of the late Gen. Grant, was born in St. Louis, May 30, 1850. He accompanied his father during the civil war, and was in five battles before he was thirteen years old. He graduated at West Point at the age of 21 and was assigned to the 4th Cavalry. In 1872 he accompanied Gen. Sherman to Europe. A year later he was detailed to command the military escort to the parties making the survey for the Southern Pacific Railway. In 1873 he was assigned, with the rank of lieutenant-colonel, to the staff of Gen. Sheridan, holding the position for eight years, when he resigned. He was with his father during his trip around the world, and was his father's constant assistant during his closing years.

GRANVILLE, GRANVILLE GEORGE LEVESON-GOWER, EARL, an English statesman, born in London in 1815, died March 31, 1891. After being educated at Eton and Christ Church, Oxford, he entered public life in 1835 as an attaché to the embassy at Paris, where his father was the ambassador. In 1836 he was elected to Parliament. In 1846 he succeeded to the title. Granville was under-secretary for foreign affairs, 1840–41; vice-president of the board of trade, 1848–51; foreign secretary, 1851–52; lord-president of the council, 1852–54; again 1855–58; and 1859–66. He was colonial secretary, 1868–70, and secretary of state for foreign affairs, 1870–74, and again from 1880 to 1885. When Gladstone became prime minister, in 1886, Granville was made secretary for the colonies. He held several other offices and positions of honor—as, for instance, when he represented Great Britain at the coronation of Czar Alexander, at Moscow in 1856. As to his politics, Granville was one of the most out spoken Liberals in the House of Lords.

GRANVILLE, a village of Washington county, N. Y. Its industries are agriculture, quarrying, and the manufacture of roofing slate, and mantels and other articles made of marbleized slate.

GRANVILLE, a village of Licking county, Ohio. It is the seat of Denison College, two female colleges, and has several manufacturing establishments.

GRAPE, the berry of climbing shrubs called vines, indigenous to warm latitudes, and much cultivated in all ages and in both hemispheres. See HORTICULTURE, Britannica, Vol. XII, pp. 277–28; VINE, Vol. XXIV, pp. 237–38; WINE, Vol. XXIV, pp. 600–11; and VITICULTURE, in these Revisions and Additions.

GRAPPLE-PLANT (*Uncaria procumbens*), a procumbent plant of the same genus with the Gambir, a native of South Africa. The seed vessel has many hooked thorns, and clings most tenaciously to any animal—a provision for the distribution of the seed. When it lays hold of the mouth of an ox, Livingstone says, the animal stands and roars with pain and a sense of helplessness.

GRAPTOLITES, a name given to a group of fossils, commonly supposed to be hydrozoans, and allied to the living sertularians. They usually appear as impressions on the shales of the Silurian rocks.

GRASS-CLOTH, a name sometimes given to different kinds of coarse cloth, whose fiber is rarely that of a grass. Cloth is made from bamboo, and a coarse matting is made from esparto, both true grasses. A fine cloth is woven from the fiber of a species of *Boehmeria*, popularly called China grass, but the plant is really a nettle. To the nettle order also belongs the so-called Queensland grass-cloth plant (*Pipturus argenteus*), which yields a fine strong fiber.

GRÄSSE, JOHANN GEORG THEODOR, an eminent German bibliographer, was born at Grimma, in Saxony, in 1814, died at Dresden at September, 1885. He studied philology at Leipsic, was afterwards engaged in teaching at Dresden, but in 1843 was made librarian of King Friedrich-August II. In 1871 he became sole director of the "Green Vault," with its celebrated collection of jewels, gold, silver and curios. From 1837 to 1860 he published a large work entitled *Lehrbuch einer allgemeinen Literärgeschichte aller bekannten Volker der Welt*, wherein he collected and arranged a great mass of bibliographical material. His *Handbuch der allgemeinen Literärgeschichte* is a compendium of the larger work. He also very diligently studied the myths and legends of the Middle Ages, and wrote several books on these subjects. Besides these works he published treatises on hunting, on beer, on porcelain, on ancient coins, on surnames and Christian names, on Latin names, etc., and published in 1876 a popular history of Saxony.

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* [illegible] New York, [illegible] by [illegible] Edward C. Marshall, [illegible]

GRASSE, FRANÇOIS JOSEPH PAUL, COMTE DE, a French admiral, born at Valette, Provence, in 1723, died at Paris, Jan. 11, 1788. He was first in the navy of the Knights of Malta (1734), when he fought against the Turks. In 1749 he passed into the service of France; but, while on a convoy to the East Indies, he was captured by a British admiral and imprisoned in England for two years. In 1762 he became a captain, and when France came to the assistance of America in 1778 he was made a rear-admiral. In March, 1781, De Grasse set out from Brest with a large fleet, conveying also a large land force to the United States. In June he assisted at the taking of Tobago, and then sailed to the mouth of the Chesapeake, in order to assist in the operations against Lord Cornwallis. The British admirals endeavored in vain to drive him from his position; and Cornwallis, shut up in Yorktown, was obliged to surrender to Washington, Oct. 19, 1781. De Grasse received the thanks of Congress for his share in this decisive victory. In January, 1782, he captured from the British the island of St. Christopher, in the West Indies. But on April 12 of the same year, after a gallant fight with Rodney near Jamaica, De Grasse was taken prisoner and conveyed to London. There he assisted in the negotiations relating to the peace of 1783, by which the Independence of the United States was acknowledged.

GRASSES AND OTHER FORAGE PLANTS. For an elaborate botanical description of GRASSES, see Britannica, Vol. XI, pp 53–60. Grasses (*Gramineæ*) are widely distributed from equatorial to arctic regions, some genera being especially abundant in the tropics, but the majority belonging to the temperate zones. In the number of individuals they probably exceed all other flowering plants, while in the number of species the family stands third, the first and second places belonging to *Compositæ* and *Leguminosæ*. In usefulness to man they easily take the first rank, as they are the foundation of all agriculture, their herbage affording the larger share of the food of animals, while their seeds supply, in the cereal grains, the chief food of the world. Rice, durra, maize, wheat, rye, oats, barley, and sugar-cane need only to be mentioned to show the economical importance of the family. It is a singular fact that the most useful, those which furnish the cereal grains, are none of them known with certainty in the wild state, even their native countries being in doubt. But few grasses present marked properties. *Anthroxanthum*, *Hierochloe*, and a few others have a pleasant vanilla-like odor, due to a principle like *coumarin*. Some Oriental species of *Andropogon* afford in their foliage the oils of lemon-grass, citronella and geranium, and from the roots of another species is obtained the perfume "vettiver." The rhizomes of *Triticum repens* and of *Cynodon dactylon* have long had a reputation for usefulness in diseases of the bladder. The many uses which the stems of species of *Bambusa*, the bamboos, are made to serve in China and other Eastern countries give them a high rank among the useful grasses. In ornamental gardening, besides furnishing the carpet of verdure without which our gardens would lose much of their attractiveness, grasses play an important part. From the humble *Festuca glauca*, the striking blue foliage of which is used for edgings, up to the stately *Gynerium argenteum*, the pampas-grass, the list of ornamental species and varieties is a long one (BOTANY OF CALIFORNIA, Britannica, Vol. II, p. 254).

The term grass is applied to all those plants which are used for pastures and meadows—a classification founded upon use alone, disregarding the distinctive features of the plants. A true grass is an endogenous plant having simple leaves, a stem generally jointed and tubular, the husks or glumes in pairs, and the seed single. This definition includes, wheat, rye, oats, etc., and excludes clover and some other plants commonly called by the name of grass. In this article, however, the principal forage plants, other than true grasses, which are employed in agriculture, are treated of. With respect to grasses and forage plants adapted to different sections of the United States little is known. There are many climates, many kinds of soil, and many degrees of aridity and moisture; and consequently one species of grass cannot be equally adapted to all parts of this extensive territory; yet hardly a dozen species have been successfully introduced into agriculture. This number answers with a tolerable degree of satisfaction the wants of quite an extensive portion of the country, chiefly the northern and cooler regions; but in other localities the same kinds of grasses do not succeed equally well. This is particularly the case in the southern and southwestern States, the arid districts of the West and in California. The grasses which are in cultivation were once wild, and are still such in their native homes. Undoubtedly some kinds could be selected from the wild or native species which would be adapted to cultivation in those portions of the country which are not provided with suitable kinds. The solution of the question is largely a matter of experiment and observation.

The kinds of grasses now cultivated in this country are generally (1) red clover (*Trifolium pratense*); (2) white or Dutch clover (*T. repens*); (3) timothy (*Phleum pratense*); (4) blue grass (*Poa pratensis*); (5) wire grass (*Poa compressa*); (6) red top (*Agrostis vulgaris*); (7) orchard grass (*Dactylis glomerata*); (8) fowl meadow grass (*Poa serotina*); and (9) meadow fescue (*Festuca pratensis*). For feeding during droughts, Indian corn, sown at the rate of two bushels per acre, in drills two feet apart, cultivated thoroughly, once or twice, and cut when in blossom will make a good reliance, as also will German millet (*Panicum Germanicum*), and common millet (*P. miliaceum*). Above are designated nine species of foliage plants that do well generally. One, two, three, four, five and six constitute the bulk cultivated for pasture; and one and three for hay. Number seven is one of the most valuable in the whole list, and should be tried everywhere, on land not wet. Eight and nine are also well worthy of trial; fowl meadow grass especially has been found to take the place of blue grass in those sections of the Northwest where blue grass does not succeed. The hay is especially valuable for horses, it having all the advantages of wild hay, being free from the dust that infests timothy and clover, while it possesses all the nutriment of the best tame hay; and those dairymen who are acquainted with it pronounce it valuable hay for milch cows. Meadows of timothy alone are also very common, and when well managed are very satisfactory and profitable. It is also very common to combine red clover with timothy in various proportions. In low, wet meadows redtop is considerably employed, and it is a common constituent of pastures in all the Northern States. Some species of grass are adapted to clay lands, some to sandy soils, some to loam, some to dry upland, and some to low land; but for land of uniform quality it is believed that a mixture of five or six suitable varieties will yield a larger crop than one alone. The mixture of several varieties is perhaps most valuable in land that is designated for pasturage, as then they reach maturity at different times and furnish a succession of good feed, and also cover more completely and uniformly the ground. For a permanent pasturage under most circumstances the following kinds in proper proportions make a good mixture: June grass (blue grass), fox-tail (*Alopecurus pratensis*), redtop (bent grass), timothy, tall fescue, and perennial rye grass. For an immediate pasture the following mixture is generally satisfactory: Blue grass, 8 pounds; orchard grass, 4 pounds; timothy, 4 pounds; red clover, 6 pounds.

In all new countries the dependence must, of course, be first upon the wild grasses. As a rule these have not been sufficiently appreciated. Many of them are of exceeding value, but unfortunately are, as a rule, sparse seeders, and hence are apt to be neglected. The trouble is that farmers, as a class, do not investigate and experiment enough for themselves. Thus they are content with the most meager list of grasses, and, as a result, for a good part of the season their stock find insufficient food of proper succulence, and oftentimes are really distressed for subsistence.

There are many native and [illegible] grasses in the West. There are sixty [illegible] [illegible] [illegible] found on the [illegible] Agricultural [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] found [illegible] [illegible] grasses [illegible] to the State, [illegible] in the state, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of Illinois [illegible] from Lake Michigan to Kentucky. It has [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

tine; the ovary, a one-celled carpel, becoming a legume or pod with less or many seeds, the pod sometimes marked into joints called loments. The genus *Trifolium* is one of the most useful of the order, and embraces a large number of species, several of which are well known in cultivation. The genus is characterized by having the leaves mostly trifoliate; that is, made up of three leaflets at the end of the leaf-stalk; some species have five or more leaflets, either close together at the end of the leaf stalk or somewhat scattered in opposite pairs. The flowers are collected in roundish or oblong heads, with or without a general involucre. The calyx is five-toothed, the petals five, irregular, persistent, nine stamens united and one free; the pods small, mostly inclosed in the calyx, and one to four seeded. Among the specimens of this genus are: *T. pratense*, (red clover, common clover), *T. medium* (mammoth clover); *T. hybridum* (pl-, alsike clover); *T. incarnatum* (pl-, French clover), *T. repens* (white clover; Dutch clover); and *T. stoloniferum* (pl- running Buffalo clover). Other genera are *Onobrychis* (pl-), *Medicago* (pls-), *Desmodium* and *Lespedeza* (pl-). As regards the value of clover, we quote a paragraph from the report on the agricultural grasses and forage plants of the United States for 1889: "No matter how mismanaged, clover is a benefit, and whatever else he may do, the farmer who grows clover is making a farm better. It does not need cultivating; the long deep-reaching roots mellow and pulverize the soil as nothing else can. If it grows thriftily the top acts as mulch, shading the ground and keeping it moist. A crop of two tons or more of clover plowed under or cut for hay can hardly fail to leave the ground better than it was before. It should be the farmer's aim to grow the largest possible crop of clover."

CHEMICAL COMPOSITION OF AMERICAN GRASSES.—Of late years considerable attention has been given to the chemical composition of grasses, and much information has been gained concerning their nutritive value. The determinations of the grasses given in the above list of those commonly cultivated in the United States will be found in the table on the following page.

The specimens are from various parts of the country, and grown under several conditions of soil and environment. The development in nearly every case was full bloom or shortly after, that being the period at which the grasses as a whole seem to be cut for hay. The analyses have been calculated for "dry substance," and also for fresh grass, where the amount of water in the fresh grass had previously been determined; otherwise for the amount of water in hay. The great variation in composition of grasses becomes apparent on examining a table of one hundred and thirty-six analyses given in the special bulletin of the United States Department of Agriculture on the agricultural grasses and forage plants of the United States for 1889. The highest and lowest determinations, selected from this table, are shown in the following list of extremes:

Dry Substance.	Highest.	Lowest.
Ash	[illegible]	[illegible]
Fat	[illegible]	[illegible]
Nitrogen free extract	[illegible]	[illegible]
Crude fiber	[illegible]	[illegible]
Albuminoids	[illegible]	[illegible]
Nitrogen	[illegible]	[illegible]
Non-albuminoid nitrogen	[illegible]	[illegible]
Per cent of nitrogen as albuminoid	[illegible]	[illegible]
Water in fresh grass	[illegible]	[illegible]

The highest ash is undoubtedly owing to the [illegible] of [illegible] and the lowest carbohydrates are due [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] lowing [illegible]

Soil and Stages of Growth.	When cut.	Height in centimeters.	Ash.	Fat.	Nitrogen-free extract.	Crude fiber.	Albuminoids.	Total nitrogen.	Non-albuminoid nitrogen.	Per cent. of nitrogen, non-albuminoid.	Water.	Ash.	Fat.	Nitrogen-free extract.	Crude fiber.	Albuminoids.
Good soil:																
Spikes appear	June 1	42	8.68	4.56	54.31	19.91	12.54	2.01	.70	35.0	70.7	2.54	1.34	15.92	5.83	3.67
Spikes visible	June 1	62	6.41	3.40	57.26	21.03	11.90	1.86	.55	29.5	71.9	1.80	.96	16.09	5.91	3.34
Before bloom	June 23	45	9.82	3.63	54.19	22.03	10.33	1.65	.36	21.8	67.5	3.19	1.18	17.61	7.16	3.36
In early bloom	June 23	60	6.04	3.85	57.21	22.70	10.20	1.63	.30	18.4	64.9	2.12	1.35	20.08	7.97	3.58
In full bloom	June 18	58	5.66	3.58	58.93	21.93	9.90	1.58	.38	24.0	67.2	1.86	1.17	19.33	7.19	3.25
Early seed	June 18	52	10.53	3.40	51.07	22.90	12.10	1.93	.51	26.4	77.8	2.34	.76	11.34	5.08	2.68
Poorer soil:																
In bloom	June 4	60	6.56	3.95	57.18	23.58	8.48	1.36	.30	22.0	63.4	2.40	1.45	21.01	8.61	3.10
In full bloom	July 1	70	5.64	2.98	61.08	22.84	7.46	1.19	.36	30.3	71.9	1.58	.81	17.16	6.42	2.10

GRASSE-TILLY, François Joseph Paul, Count de, born in Valette, Provence, France, in 1723, died in Paris, Jan. 11, 1788. He entered the French navy, and had become renowned as a captain when, at the beginning of 1781, he was appointed to command a French fleet to assist the Americans in the war with Great Britain. He contributed essentially to the reduction of Yorktown, sharing with Washington and Rochambeau in the honors voted by Congress. At the close of the campaign Grasse embarked for the West Indies, where he served with distinction, but being defeated by a superior British force April 12, 1782, he lost the favor of the king. At the time of his death he held the rank of lieutenant-general of the naval forces.

GRASSHOPPER (see Britannica, Vol. XI, p. 60; Vol. XIV, p. 765, and Vol. XV, p. 450).

GRASSMANN, Herman Gunther (1809–77), a German mathematician, born at Stettin in 1809. At Berlin he studied theology, philology and mathematics, and in 1852 succeeded his father as professor of mathematics in the gymnasium of Stettin. He held this post till his death, Sept. 26, 1877. His mathematical works are: *Die Wissenschaft der Extensiven Grosse; Geometrische Analyse; Die Ausdehnungslehre*; and *Lehrbuch der Arithmetik*. These works are valuable contributions to modern mathematics. He also prepared a Sanskrit dictionary to the *Rigveda* (1875), and a German translation of this work, with notes (1876–77).

GRASS-MOTH (*Crambus*), a genus of small moths, allied to the clothes-moth. The species, which are numerous, inhabit pastures. Their form, when their wings are closed, is long and narrow, pointed at the head, abruptly cut off at the opposite end. They are often brown and white, sometimes silvery and golden.

GRASS OF PARNASSUS (*Parnassia*), a genus of plants belonging to the natural order *Saxifragaceæ*. It is a native of bogs and moist heaths in Britain, Northern Europe and Russian Asia, becoming a mountain plant in Southern Europe and West-central Asia. The calyx is deeply five-cleft, the petals white, five in number, and there are five perfect and five imperfect stamens, the latter bearing instead of anthers a tuft of ten to twelve globular-headed hairs. There are several other species, natives of Asia and North America.

GRASS-OIL, a name under which several volatile oils derived from widely different plants are grouped. The grass-oil obtained from the leaves of *Andropogon warancusa* is used for rheumatism. Ginger-grass oil is obtained from *A. nardus*, a native of India. Geranium oil, derived from *Pelargonium radula*, is used like ginger-grass oil. Turkish-grass oil is obtained from *A. pachnodes*, indigenous to India, Persia and Arabia. Lemon-grass oil, or citronella oil, is derived from *A. schœnanthus*, indigenous to India and cultivated in Ceylon. It is largely used for scenting soap. Cyperus-grass oil is extracted from the tubers of *Cyperus esculentus*, indigenous to Southern Europe, and is used as a table oil and in the manufacture of soap.

GRASS-TREE (*Xanthorrhœa*), a genus of plants of the natural order *Liliaceæ*, natives of Australia. They have shrubby stems, with tufts of long, wiry foliage at the summit, a long cylindrical spike of densely aggregated flowers shooting up from the center of the tuft of leaves. The base of the inner leaves of some species is edible. All the species abound in a resinous juice, which, on exposure to the air, hardens into a reddish-yellow inodorous substance, soluble in alcohol, and useful as a tonic in dysentery, diarrhœa, etc. The common grass-tree (*X. hastilis*) has a stem about four feet high, but sometimes a foot in diameter. It is of extremely slow growth. Several species are found in Eastern Australia and also in New Zealand.

GRASSUM: in the law of Scotland, a sum paid on taking a lease of landed property. In England the words "premium" in some cases, and "fine" in others, mean the same thing.

GRASS VALLEY, a post-town of Nevada county Cal. It contains two orphan asylums, several schools, foundries and quartz mills. This place is the center of the chief gold quartz-mining district of California.

GRASSWRACK (*Zostera*), a genus of plants of the natural order *Naiadaceæ*, belonging to the genera found at the bottom of the sea. The leaves are narrow and grass-like, and the flowers consist of stamens and pistils, without any perianth, inserted on the central nerve of one side of a flat, thin linear *spadix*, with a leafy *spathe*. The pollen is confervoid. The common grasswrack (*Z. marina*) is a perennial plant, which forms green meadows on the bottom of almost all European seas. It becomes white by exposure to air. The rush-like coverings of Italian liquor flasks are made of it, and it is used for packing glass bottles. The plant is now an article of commerce under the name of *Alga marina*.

GRATIAN, a Benedictine monk, who at Bologna, between 1130 and 1142, compiled the *Decretum Gratiani*.

GRATIOLA, a genus of plants of the natural order *Scrophularineæ*. *G. officinalis*, sometimes called hedge hyssop, is found in pastures in most parts of Europe. It is extremely bitter, acts violently as a purgative, diuretic and emetic, and in overdoses is an acrid poison. It was formerly so highly esteemed as a medicine that the name of *Gratia Dei* ("Grace of God") was given to it, and for the same reason it is known as *Herbe-au-Pauvre Homme* ("Poor Man's Herb"). *G. Peruviana*, a South American species, has somewhat similar properties. These properties are supposed to depend upon a resinous principle called *Gratiolin*.

GRATRY, Auguste Joseph Alphonse, Abbé, a French theologian, born at Lille in 1805, died at Montreux, Switzerland, Feb. 6, 1872. After being educated at the École Polytechnique he became an ecclesiastic, and was in 1841 appointed director of the College Stanislas, Paris. In 1846 he was made chaplain of the normal school, Paris. In 1852 Gratry joined the Abbé Petetot in reorganizing the order of the Oratorians of the Immaculate Conception, having previously resigned his position in the normal school. In 1861 Bishop Dupanloup appointed him vicar-general of Orleans, and in 1863 he was made professor of Christian morals at the Sarbonne, Paris. Gratry had then already published a course of philosophy entitled *De la Connaissance de Dieu; De la Connaissance de l'Ame; Logique*, and several other philosophical works. He wrote and spoke against M. Renan in defense of the authenticity and truth of the Gospels, and his eloquence procured his election to the French Academy in 1867. Being censured by the superior of his order for his connection with Père Hyacinthe and the League of Peace, which advocates religious tolerance, Gratry retired from the Oratorians. *La Morale et la Loi de l'Histoire* is his latest work of importance. He declares therein that the French Revolution is a true regeneration of human society.

GRATTAN, Thomas Colley, British author, born in Dublin, Ireland, in 1796, died in London, England, July 4, 1864. He studied law in Dublin, but afterward devoted himself chiefly to literature. In 1828 he went to Belgium and settled in Brussels, where he actively supported the pretensions of King Leopold to the throne of Belgium. He was British consul at Boston in 1839–53, and subsequently held an office in the Queen's household. He published a pamphlet on the boundary question between Great Britain and the United States, and an attack on American society and institutions, entitled *Civilized America* (2 vols., London, 1859). He also published *The Woman of Color*; and *England and the Disrupted States of America* (1861).

GRATUITOUS DEED, in the law of Scotland, a deed granted without any value received. Such deeds, if made after the contracting of debt and in favor of a near relation or confidential friend, are presumed to be fraudulent and so null. In England gratuitous deeds are styled gifts.

GRAY, Albert Zabriskie, born in New York city, March 2, 1840, graduated at the University of New York in 1860, and at the general theological seminary of the Protestant Episcopal church in 1864. He served as chaplain of the 4th Massachusetts cavalry during the civil war; subsequently held various pastorates, and in 1882 was elected warden of Racine College, Wisconsin. He was engaged in the work of church reform in Europe, and was a delegate to the general convention in 1886. Among his writings are *The Land and the Life* (1876); *Mexico As It Is* (1878); *Words of the Cross* (1880); and *Jesus Only, and Other Sacred Songs* (1882).

GRAY, Asa, an American botanist, born in Paris, Oneida county, N. Y., Nov. 18, 1810, died in Cambridge, Mass., Jan. 30, 1888. He received his degree of M. D. in 1831, but soon devoted himself to the study of botany with the late Professor Torrey, of New York. In 1834 he received the appointment of botanist to the United States exploring expedition to the Southern seas, but declined the post. In 1842 he became Fisher professor of natural history at Harvard, from the active duties of which position he retired in 1873. In 1874 he succeeded Agassiz as a regent of the Smithsonian Institution. Dr. Gray was recognized throughout the scientific world as one of the leading botanists of the age, and was a member of the principal learned societies of both America and Europe. He was the first in America, in conjunction with Dr John Torrey, to arrange the heterogeneous assemblage of species upon the natural basis of affinity; and he was an influential supporter of the Darwinian theories of evolution. Professor Gray published an admirable series of text-books, which are used extensively throughout the United States, and have passed through many editions. In 1838 he commenced, with Dr. Torrey, the unfinished *Flora of North America*. Others of his works are: *Genera Floræ Americæ Boreali-Orientalis Illustrata* (1848–50); *A Free Examination of Darwin's Treatise* (1861); *Darwiniana* (1876); and *Natural Science and Religion* (1880). He also wrote biographical sketches of a number of eminent scientists, and contributed largely to scientific periodicals, and to the transactions of learned societies.

GRAY, Elisha, an American inventor, born at Barnesville, Ohio, Aug. 2, 1835. He studied at Oberlin College, meanwhile supporting himself by working as a carpenter. His patents number about 50, a large number of which relate to the telephone, and the remainder to telegraphic apparatus. Among them are a speaking telephone, and a multiplex telegraph.

GRAY, Henry Peters, born in New York city, June 23, 1819, died there Nov. 12, 1877. He commenced the study of art with Daniel Huntingdon in 1838, and in the following year went to Europe, remaining abroad until 1843. He made a second trip to Europe in 1846, but returned a few months later and settled in New York. He was president of the National Academy of Design, 1869–71, when he went to Italy, remaining two years. Among his paintings are: *Wages of War; Hagar and the Angel; Cleopatra; Charity; Greek Lovers; Normandy Girl; Pride of the Village*; and *The Apple of Discord*. He also executed a large number of portraits.

GRAY, Robert, discoverer, born at Tiverton, R. I., in 1755, died in Charleston, S. C., in 1806. In September, 1787, he sailed from Boston in command of the sloop *Washington*, for the purpose of trading with the natives of the northwest coast, and returned in 1790 by way of Canton, China; thus being the first man to carry the American flag around the globe. He made a second voyage, and on May 11, 1791, discovered the mouth of the great river which is now called Columbia.

GRAYDON, ALEXANDER, born in Bristol, Pa., April 10, 1752, died in Philadelphia, May 2, 1818. He was educated in Philadelphia, and studied law, but in 1775 received the appointment of captain and engaged in raising recruits for the army. He was in the battle of Long Island, and was taken prisoner in a subsequent action. He was exchanged in 1778, but did not rejoin the army. He was prothonotary of Dauphin county, Pa., 1785–99, resided for some years near Harrisburg, and removed to Philadelphia in 1816. He was a contributer to literary and political journals, and published *Memoirs of a Life, Chiefly Passed in Pennsylvania, Within the Last Sixty Years* (Harrisburg, 1811, reprinted in London and Edinburgh).

GRAYLING. See Britannica, Vol. XI, p. 78.

GRAYLING, the capital of Crawford county, Mich., situated on the Au Sable River and on the Mackinaw division of the Michigan Central Railroad. It has several lumber mills.

GRAY'S INN, one of the four inns of court in London.

GRAY'S PEAK, Rocky Mountains, in Summit and Clear Creek counties, Colo., 12 miles west of Georgetown. It is the twin of Torrey's Peak and of the same height, 14,466 feet. It was named in honor of Dr. Asa Gray.

GRAYVILLE, a town of White county, Ill., situated on the Wabash River at the mouth of the Bonpas River, and on the Cairo and Vincennes Railroad. The surrounding country is fertile, and considerable grain is shipped at this point.

GRAYWACKE: in geology, a sort of conglomerate rock, found chiefly in the Palæozoic series. The term has been little used since the establishment of the Silurian system.

GREASE, a term of general application to all fatty matters, but generally to those having some degree of solidity. It is mostly applied to fatty substances so deteriorated by dirt or other impurities as to be unfit for candle-making and other manufactures requiring some degree of purity in the material. Grease is largely employed as a lubricant for heavy machinery. The grease employed for the axles of wagons and carts consists of inferior kinds of grease mixed with a little tar.

GREASE-WOOD, a name applied to various chenopodiaceous shrubs growing abundantly in saline localities in the Western United States.

GREAT BARRINGTON, a village of Berkshire county, Mass., beautifully situated and noted as a summer resort. It has manufactories of woolens, cotton goods, paper, brick, pig-iron and lumber.

GREAT BASIN, a vast elevated plateau stretching 500 miles between the Sierra Nevada and Cascade Mountains on the west, and the Wahsatch Range of the Rocky Mountains on the east. It is crossed by about one hundred short mountain ranges, which traverse it mostly in a southerly direction. North of it the country is drained by the Columbia River into the Pacific Ocean, and east of it by the Colorado River into the Gulf of California. The Great Basin itself has no outlet whatever.

The whole country is a desert like the Sahara, but more mountainous, rocky and desolate. Months pass without any rain. In most parts the entire yearly rainfall amounts to scarcely 4 inches. On account of the exceeding dryness no part of this region can be cultivated without irrigation, except some small strips of land along the Humboldt and Carson Rivers. Most of its valleys, which are as a rule wide and open, have no rivers, except the small, narrow rivulets that rush down from the melting snows of the neighboring mountains. These rivulets rapidly disappear on reaching the plains, either by evaporation from the soil or by finding their way into one of the many small lakes and sinks which dot the surface. The waters of these lakes are generally salt, bitter, and unfit to drink for man or beast.

The area of the Great Basin is as large as France, and nearly five times as large as the State of Pennsylvania. It reaches from the northern boundaries of the States of Nevada and California down to the northern end of the peninsula of Lower California, a distance of nearly 600 miles. Most of it belongs to the States of Nevada and California and the Territory of Utah. A portion of this basin, north of the Mud Lake, reaches up into the State of Oregon, as far as 44° N. lat. Almost the whole State of Nevada lies in the Great Basin.

The northern portion of the Great Basin is the more mountainous and elevated. Here the valleys are usually 5,000 feet above sea-level, while the mountains rise to 10,000 or 12,000 feet. They become gradually lower as we go south; larger patches of country become flat, until we find in the southern portion valleys that are even lower than the level of the sea. Such are the Death and Coahuila Valleys.

MOUNTAINS.—Most of the mountain ranges of the Great Basin are composed of huge blocks which have been lifted by subterranean forces, broken in various directions, and tilted up on one side or the other. They have one steep face, exposing the broken edges of the original rock strata, and one gently sloping side, the slope conformable to the dip of the strata. The *Wahsatch Range* in Utah, which forms the eastern boundary of the Great Basin, has a north and south direction, like most of the basin ranges. On its western side it presents a bold, abrupt escarpment facing Great Salt Lake, while on the more gently sloping eastern side it is covered by tertiary deposits. Its highest peaks are 12,000 feet high. South of the Wahsatch Mountains is a region of high plateaus—the highest in America. Their drainage is carried by the Sevier River into the Great Basin. To the west of the Sevier Valley lies a range of three high tables, the southernmost, the *Markagunt Plateau*, about 11,000 feet high. On the opposite side of the Sevier Valley are the *Sevier* and *Paunsagunt Plateaus*, the former a table 60 miles long. East of this is the long stretch of Grass Valley, the waters of which burst through a deep gorge in the *Sevier Plateau* and join the Sevier River. East of this are the *Wahsatch Plateau*, a southerly extension of the Wahsatch Mountains, the *Fish Lake Plateau*, the *Awapa* and *Aquarius Plateaus*. All of these are over 11,000 feet high, and the Aquarius Plateau is partly covered by a forest of pine and fir trees.

The main range of Central Nevada is the *East Humboldt Range*, a single bold ridge 80 miles long, terminating at the Humboldt River, with many rugged summits over 10,000 feet high. Mount Bonplant at the northern end rises even 11,320 feet above sea level. Its long slopes carry pine forests. Westward of the East Humboldt lie the *Augusta*, *Carson Sink* and *West Humboldt Ranges*, the latter culminating in Star Peak, 9,920 feet high, and the *Virginia Range*, which latter is the first of the north and south ranges lying east of the Sierra Nevada. The Virginia Range is 150 miles long.

Besides the mountain ranges named there are nearly one hundred smaller ranges in the Great

Basin. In Southern Nevada and Southeastern California there are the *Amargosa* and *Funeral Mountains*, east of Death Valley; the *Panamint Range* west of that valley, and the *Inyo Range* just east of the Sierra Nevada, which it almost rivals in grandeur and exceeds in dreariness. South of the Inyo and Panamint ranges are the *Opal*, *Payute* and *Dead Mountains*, which are scarcely 5,000 to 6,000 feet high, and south of these the *Chocolate*, *Chuvavalla* and *Riverside Mountains*, which hardly average 4,000 feet.

Valleys.—The valleys between the ranges are more barren and desolate than the mountains. They are generally destitute of trees, because they are mostly destitute of water in summer. In some places we find sage-brush, more seldom bunch-grass, covering large level patches of ground. Here and there we find a snow-white alkaline flat without any vegetation whatever. The soil in these valleys is formed by alluvial deposits, and can very often be identified as the beds of ancient lakes of large extent. Some parts of these mud plains become so baked by the solar heat in summer that horses' hoofs leave no tracks, and so cracked in all directions as to look like mosaic-work. The alkaline dust, caught up by the wind, sometimes forms hollow columns two to three thousand feet high, and is at all times most vexatious to the eyes of travelers.

The *Carson* and *Black Rock Deserts* of Northern Nevada and the desert west of great Salt Lake exhibit the extreme of desolation and dreariness, but they are surpassed in area by the *Mohave Desert* in Southern California. *Amargosa Desert*, or *Death Valley*, lies in the southeastern part of Inyo county, Cal., and is 60 miles long and from 10 to 15 miles wide. Its lowest point is known as Bennetts Wells. It is 300 feet below the level of the sea, while the highest point of the Telescope range, just west of the valley, rises 11,000 feet above sea level. Furnace Wash, a small stream, enters Death Valley near its northern end. As it descends it forms a great swamp that spreads over a large portion of the valley, and gives off a fearful odor of sulphureted hydrogen. One sinks down to one's knees in walking over this swamp. Right above it is a salt crust a foot thick, surmounted by rough pinnacles of saline efflorescence.

As we move away from this marsh and up the mountain-side we meet a growth of salt grass so strongly saline that the horses will not eat it. Then comes the mesquite brush, consisting of big bushes covered with long poisonous thorns. A sage brush is next in order, and finally on the mountain tops grows a sort of stunted pine.

The animal life of Death Valley is very small. Besides the coyote we find rattlesnakes, lizards, scorpions and tarantulas. No birds are to be seen, except once in a while a few crows looking for perishing travelers. Rains are almost unknown to this region. The air is so dry that men venturing into the valley without carrying a large supply of water with them [illegible] thirst. This happened to parties of immigrants and explorers, and has given the valley its name. In 1850 thirty persons left Salt Lake City for California. They attempted to pass this valley at the north end. Soon their water gave out. They abandoned their wagons and wandered for days without finding a stream of drinkable water. Then, parched with thirst, physically exhausted, and mentally deranged, they lay down beneath the blazing sun and died.

The thermometer rises in summer often to 130° F. in the shade, so that this region is the hottest spot on earth, as it is the most desolate and forbidding. Wet clothes wrung out of water and hung up to dry in summer will have every stitch dried in 25 minutes. This excessive dryness makes it impossible for any vegetation to exist in Death Valley.

Lakes and Rivers.—Numerous small lakes in the mountains are fed by springs and melting snow. Their water is pure and fresh. The finest of these is *Lake Tahoe*, a beautiful sheet of water, which lies amid the peaks of the Sierra Nevada over 6,240 feet high. Its outlet, the Truckee River, flows northward into the *Pyramid Lake*, which is less than 4,000 feet high. Lake Tahoe is one of the deepest lakes in this country (1,645 feet), and abounds in fish. It is 21 miles long by 12 miles wide.

On the eastern side of the Great Basin lie *Utah Lake*, which discharges its waters through the Jordan into great Salt Lake, Utah, and *Bear Lake*, whose surplus waters are conveyed by Bear River into the same reservoir. *Great Salt Lake* is exceedingly saline and bitter. It is nearly 90 miles long by 32 miles wide at its greatest width, covering a surface of 2,360 square miles. Its greatest depth is 50 feet, but the greater part is scarcely 10 feet deep. The Bear, Ogden, Weber and Jordan Rivers feed this lake; but it has no outlet whatever. Its water contains about 15 per cent. of mineral matter, and is therefore so dense that the human body floats on it like a cork. Common salt forms nearly four-fifths of the solid contents; the remaining fifth is made up by chloride of magnesium as the principal ingredient, and the sulphates of sodium and potassium, with a trace of sulphate of lime. The lake is slowly rising since 1861.

Lake Mono is in California, a little south of Virginia City. It is 14 miles by 10, and has no outlet. Its water is strongly charged with sodium carbonate, and contains smaller quantities of lime carbonate, common salt and borax. Masses of tufa surround Lake Mono. They have been deposited from the lime carbonate formerly held in solution by the water. Near the center of the lake is a group of volcanic islands. Prof. Le Conte, upon his visit to this lake in 1872, found ample proof that it had risen 10 or 12 feet in about as many years.

Pyramid and *Winnemucca Lakes*, although they have no outlets, are only slightly saline. Both of them are rising, the latter as much as 22 feet in as many years. *Owen's Lake* is between the Sierra Nevada Mountains and the Inyo range. Its saltness is about twice that of sea-water. Sodium carbonate and common salt, in equal parts, are the chief saline ingredients, but potassium and sodium sulphates are also present. The *Humboldt* and *Carson Rivers* feed the *Humboldt* and *Carson* sinks or lakes, which have no outlets. They are the remains of the former Lake Lahontan. [illegible] *Lake*, north of Lake Lahontan, is the only fresh-water lake in the central part of the Great Basin. It is small, only 10 feet deep, and has no outlet. The numerous other lakes are alkaline and brackish; only a few of them contain water fit for stock to drink.

Summer and *Albert Lakes* are strong solutions of potash and soda salts, the potassium salts of the latter lake amounting to 70 per cent of the total mineral contents. Millions of brine-shrimps live in these two lakes. [illegible], *Goose*, *Warner*, *Harney* and *Christmas Lakes*, as well as those of Surprise and Long Valleys, are very shallow, and most of them evaporate to dryness in summer. *Goose Lake*, the deepest, does not exceed 20 feet.

Quaternary Lakes.—During the Glacial period, which covered the Eastern and Northern States with ice, the greater part of the Great Basin was occupied by a number of lakes. Twenty-four of these lakes have been explored, the largest being Lakes Bonneville and Lahontan, both in the northern half of the basin, and that which occupied Death Valley, in the southern half of it.

Lake Bonneville was the largest of the quaternary lakes. It covered the regions now occupied by the Great Salt Lake and the broad desert west of it, including the Utah and Sevier Lakes. The highest water-line of Lake Bonneville is 1,000 feet above the present level of Great Salt Lake, and is conspicuously marked, but the most prominent water-line is [illegible] feet lower, and has been named the Provo shore-line. The outlet of this lake was found at the northern end of Cache Valley, through which the water escaped into the Snake River, and by the latter into the Columbia River and Pacific Ocean.

Lake Lahontan included the regions of Pyramid, Willamucca, Humboldt, Walker and the two Carson Lakes, all in Nevada, and Honey Lake in California; also the Truckee and Humboldt Valleys, and what is now called the Carson and Black Rock Deserts.

The shore-lines of this ancient lake are clearly defined throughout, and its coasts are scored by several horizontal terraces, each cut by the waves at a period when the lake maintained about the same height. A terrace 200 to 300 feet wide on the south side of the Carson Desert marks a level at which Lake Lahontan stood for a long period. A hundred feet above the present level of Pyramid Lake is a distinctly cut terrace. Tufa deposits rise from the alluvial beds of the lake bottom to various heights. Remains of fresh-water shells prove that the water of Lake Lahontan was fresh at its earlier periods. But salts, chiefly common salt, but including borate, sulphate and carbonate of soda, and also borate of lime, are contained in the lake-beds in quantities sufficient to pay for their being worked for salt and borax. These deposits prove that the lake was strongly saline at its later period.

The most important rivers are the *Jordan*, in Utah, flowing northwards into Great Salt Lake; the *Sevier* and *Bear Rivers*, also in Utah; the *Humboldt River*, in Nevada, which flows 350 miles in a southwesterly direction, and disappears in the shallow and brackish waters of the Humboldt Lake and sink; the *Truckee River*, which connects Lake Tahoe and Pyramid Lake; the *Carson River*, flowing from the Sierra Nevada Mountains down into Carson Lake and sink; and *Walker River*, rising in the same mountain range and losing itself in Walker Lake. None of these rivers is navigable. But they are very valuable for the purpose of irrigating the very dry country.

Of animals we find only the mountain sheep native, and some fishes in the mountain lakes. Trouts are found in the upper portions of the rivers. In the southern valley there are many snakes and lizards, but none of these are found in the northern parts.

The agriculture of the Great Basin is limited to those few areas that can be irrigated. The grazing of sheep and cattle on the bunch grass, which is found in some of the mountains, is of greater importance. The principal source of wealth is mining The silver mines of Virginia City, Nevada, have produced large quantities of silver. There is also a growing industry in mining borax, salt, sulphur and carbonate of soda.

GREAT BEND, a city and county-seat of Barton county, Kan., on Arkansas River, near the center of the State.

GREAT BRITAIN—BRITISH EMPIRE. For elaborate articles on the geography, history, government, literature, and earlier statistics of Great Britain and the British Empire, see in the Britannica the countries, severally, which together constitute the present British Empire.

The total area of the Empire in 1890 was estimated at 11,355,057 square miles, with an estimated population of 366,642,105. Capital, London, with a population of 4,421,661.*

SOVEREIGN AND ROYAL FAMILY.—Victoria, Queen of Great Britain and Ireland, and Empress of India, was born May 24, 1819; the daughter of Edward, Duke of Kent, fourth son of King George III, and of Princess Victoria of Saxe-Saalfeld-Coburg, widow of Prince Emich of Leiningen. She ascended the throne at the death of her uncle, King William IV, June 20, 1837; was crowned at Westminster Abbey, June 28, 1838; was married Feb. 10, 1840, to Prince Albert of Saxe-Coburg-Gotha; widow, Dec. 14, 1861.

CHILDREN OF THE QUEEN.—I. Princess *Victoria* (Empress Frederick), born Nov. 21, 1840; married, Jan. 25, 1858, to Prince Friederich Wilhelm (Friedrich III of Germany), eldest son of Wilhelm I, German Emperor and King of Prussia; widow 1888.

II. *Albert Edward*, Prince of Wales, born Nov. 9, 1841; married, March 10, 1863, to Princess *Alexandra*, eldest daughter of King Christian IX of Denmark. Five children: Albert Victor, born Jan. 8, 1864; George, born June 3, 1865; Louise, born Feb. 20, 1867, married to the Duke of Fife, July, 1889; Alexandra, born July 6, 1868; Maud, born Nov. 26, 1869. Albert Victor, Duke of Clarence, died Jan. 14, 1892.

III. Prince *Alfred*, Duke of Edinburgh, born Aug. 6, 1844; married, Jan. 21, 1874, to Grandduchess Marie of Russia, only daughter of Emperor Alexander II. Five children: Alfred, born Oct. 15, 1874; Marie, born Oct. 29, 1875; Victoria, born Nov. 25, 1876; Alexandra, born Sept. 1, 1878; Beatrice, born April 20, 1884.

IV. Princess *Helena*, born May 25, 1846; married, July 5, 1866, to Prince Christian of Schleswig-Holstein. Four children: Christian, born April 14, 1867; Albert John, born Feb. 26, 1869; Victoria, born May 3, 1870; Louise, born Aug. 12, 1872.

V. Princess *Louise*, born March 18, 1848; married, March 21, 1871, to John, Marquis of Lorne, eldest son of the Duke of Argyll.

VI. Prince *Arthur*, Duke of Connaught, born May 1, 1850; married, March 13, 1879, to Princess Louise of Prussia, born July 25, 1860. Three children: Margaret Victoria, born Jan. 15, 1882; Arthur, born Jan. 13, 1883; Victoria, born March 17, 1886.

VII. Princess *Beatrice*, born April 14, 1857; married, July 29, 1885, to Prince Henry, third son of Prince Alexander of Battenberg, uncle of Ludwig IV, Grand-duke of Hesse. Three children: Alexander Albert, born Nov. 23, 1886; Victoria Eugénie, born Oct. 24, 1887; Leopold Arthur Lewis, born May 21, 1889.

COUSINS OF THE QUEEN.—I. Prince *Ernest August*, Duke of Cumberland, born Sept. 21, 1845, the grand-son of Duke Ernest August of Cumberland, fifth son of King George III; married Dec. 21,

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*See "Stateman's Year-book" for 1891, p. 19.

1878, to Princess Thyra, of Denmark, born Sept. 29, 1853. Six children.

II. Prince *George*, Duke of Cambridge, born March 26, 1819, the son of Duke Adolph of Cambridge, the sixth son of King George III; field-marshal commander-in-chief of the British army.

III. Princess *Augusta*, sister of the preceding, born July 19, 1822; married, June 28, 1843, to Grand-duke Friedrich Wilhelm of Mecklenburg-Strelitz.

IV. Princess *Mary*, sister of the preceding, born Nov. 27, 1833; married, June 12, 1866, to Prince Franz von Teck, born Aug. 27, 1837, son of Prince Alexander of Würtemberg. Four children: 1. Victoria, born May 26, 1867; 2. Albert, born Aug. 13, 1868; 3. Franz-Josef, born Jan. 9, 1870; 4. Alexander, born April 14, 1874.

ROYAL SUPPORT.—The civil list of the Queen consists in a fixed Parliamentary grant, and amounts to much less than the incomes of previous sovereigns. Under George I this sum amounted at times to £1,000,000 sterling, but in 1777 the civil list of the King was fixed at £900,000, and the income over and above that sum from the hereditary possessions of the crown passed to the treasury. Under William IV the civil list was relieved of many burdens, and fixed at £510,000.

It is established by law (1 & 2 Vict., ch. 2), that during her Majesty's reign all the revenues of the crown shall be a part of the consolidated fund, but that a civil list shall be assigned to the Queen.

In virtue of this act, the Queen has granted to her an annual allowance of £385,000, of which the lords of the treasury are directed to pay yearly £60,000 into her Majesty's privy purse; to set aside £231,260 for the salaries of the royal household; £44,240 for retiring allowances and pensions to servants; and £13,200 for royal bounty, alms, and special services. This leaves an unappropriated surplus of £36,300, which may be applied in aid of the general expenditure of her Majesty's court. The Queen has also paid to her the revenues of the duchy of Lancaster, which in the year 1888 amounted to £86,285, and the payment made to her Majesty for the year was £50,000.

On the consolidated fund are charged likewise the following sums allowed to members of the royal family:—£25,000 a year to the Duke of Edinburgh; £25,000 to the Duke of Connaught; £8,000 to the Empress Victoria of Germany; £6,000 to Princess Christian of Schleswig-Holstein; £6,000 to Princess Louise, Marchioness of Lorne; £6,000 to Princess Henry (Beatrice), of Battenberg; £3,000 to the Grand-duchess of Mecklenburg-Strelitz; £5,000 to Princess of Teck, formerly Princess Mary of Cambridge; £12,000 to George, Duke of Cambridge; and £6,000 to Princess Helena of Waldeck, Duchess of Albany.

The Prince of Wales, the heir-apparent to the crown, has (by 26 Vict., ch. 1) settled upon him an annuity of £40,000, and by an act passed in 1889 receives £36,000 annually in addition for the support and maintenance of his children. The Prince of Wales has besides as income the revenues of the duchy of Cornwall, which in the year 1888 was £66,922, exclusive of £866 of arrears, the sum paid to the Prince being £61,971. In the year 1884 the income from the duchy of Cornwall was £103,133, exclusive of £10,133 for arrears; in 1889 the income from the duchy was £104,188, exclusive of £6,113. The Princess of Wales has settled upon her the annual sum of £10,000, to be increased to £30,000 in case of widowhood.

CONSTITUTION AND GOVERNMENT.—The Queen holds the crown both by inheritance and election. Her legal title rests on the statute of 12 & 13 Wm. III, ch. 3, of the English laws, in which it was declared that the succession to the crown of Great Britain and Ireland was settled on the Princess Sophia of Hanover, and the "heirs of her body being Protestants."

The supreme *legislative* power of the British Empire is granted by the Constitution to Parliament. The powers of Parliament are politically controlling not only within the United Kingdom, but also in the colonies and dependencies. The Parliamentary authority extends to all "ecclesiastical, temporal, civil and military" matters, as well as to altering the Constitution of the realm. Parliament is the highest court of law.

The present form of Parliament, which dates from the middle of the 14th century, is that of two houses of legislature, the House of Lords and the House of Commons.

For the order of rank or precedence in all the departments of government under the prevalent conventional rules in English society, see an exhaustive article on PRECEDENCE, Britannica, Vol. XIX, pp. 660–68.

THE HOUSE OF LORDS.—The House of Lords consists of peers who hold their seats—1. By virtue of hereditary right; 2. By creation of the sovereign; 3. By virtue of office—bishops of the English established church; 4. By election for life—Irish peers; and 5. By election for duration of Parliament—Scottish peers.

The number of peers named on the "roll" in 1890 was 551, 12 of whom were recorded as minors.

About two-thirds of these hereditary peerages were created in the present century. Excluding the royal and ecclesiastical peerages, the four oldest existing peerages in the House of Lords date from the latter part of the thirteenth century, while five go back to the fourteenth and ten to the fifteenth century. In 1888 two new peerages were created, one in 1889 and one in 1890. There are besides five peeresses of the United Kingdom in their own right, and three Scotch peeresses, and 18 Scotch and sixty-three Irish peers who are not peers of Parliament.

The crown is not restricted in its power of creating peers, and this power has been liberally used to fill up the House of Lords. In consequence of certain provisions of the Act of Union, limiting the right of election of the Scottish representative peers to the then existing peers of Scotland, it is understood that the sovereign cannot create a new Scottish peerage, and such peerages are in fact not created except in the younger branches of the royal family, though extinct or forfeited peerages may be restored. The sovereign is restricted to the creation of one new Irish peerage on the extinction of three of the existing peerages; but when the number of Irish peerages are reduced to 100, then, on the extinction of one peerage, another may be created.

SPEAKER OF THE HOUSE OF LORDS.—The lord high chancellor, who is appointed by mere delivery of the "great seal" to him by the sovereign, and who is the principal legal adviser of the crown, is by prescription speaker of the House of Lords, and may act in that capacity even though he be not a peer. He is by virtue of his office a privy councillor, and as the first existing great officer of state he takes precedence of all but royal dukes and the archbishop of Canterbury. He presides, if present, when the House of Lords is sitting as an appellate court. He is president of the chancery division of the high court and of the court of appeal, and is one of the judicial committee of the Privy Council. In the absence of the sovereign he reads the Queen's speech at the opening and prorogation of Parliament, and he is always one of the commission for giving the royal assent to bills. He is visitor of all hospitals of royal foundation, the general guardian of all infants, idiots and lunatics, and has the general supervision of all charitable trusts. His patronage is very extensive. He nominates the puisne judges and county court judges; and, except for Lancashire, he appoints the county magistrates, generally accepting the nominations of the lords-lieutenant and the borough justices. He is the patron of twelve canonries and over six hundred livings. On retiring from office he receives a pension of £5,000 a year, but in such a case he commonly assists the lord chancellor and the lords of appeal in ordinary in the transaction of the judicial business of the House of Lords. While in office he receives a salary of £10,000—£4,000 as speaker of the House of Lords and £6,000 as judge. His attorney-general receives a salary of £7,000 and fees (in 1886–87 £5,100), and the solicitor-general a salary of £6,000 and fees (in 1886–87 [illegible]).

The House of Commons.—The Lower House of Parliament consists of knights of the shire, or representatives of counties; of citizens, or representatives of cities; and of burgesses or representatives of boroughs, all of whom vote together. The Representation act of 1884 and the Redistribution of Seats act of 1885—the former extending to householders in counties the suffrages which previously had been conferred upon householders and lodgers in *boroughs*, while the latter made a new division of the United Kingdom into county and borough constituencies. Thus a uniform household and lodger franchise was conferred on counties and boroughs. The Representation act of 1884 also introduced a "service franchise," and placed the three kingdoms on a footing of equality as regards electoral qualifications. The new Reform bill has added nearly three million of electors to the roll, and there is now one elector to about every six of the population. The present total number of members is 670, against 652 who sat before the passing of the Redistribution act. The classified lists showing the relative representation of England, Scotland and Ireland in the Lower House of Parliament from the counties, boroughs, and Universities in 1891 are as follows:

Territorial.	Co.	Bor.	Univ.
England	253	237	5
Scotland	39	31	2
Ireland	85	16	2
Total	377	284	9

All elections for members of Parliament must be by secret vote and ballot—an act being passed annually to this effect.

The sole qualification required to be a member of Parliament is to be twenty-one years of age. All clergymen of the church of England, ministers of the church of Scotland, and Roman Catholic clergymen are disqualified from sitting as members; all government contractors, and all sheriffs and returning officers for the localities for which they act are disqualified both from voting and from sitting as members. No English or Scottish peer can be elected to the House of Commons, but non-representative Irish peers are eligible.

In order to preserve the independence of the members of the Lower House of Parliament, it was long since enacted that if any member shall accept any office of profit from the crown, his election to Parliament shall be void, and a writ for a new election must issue; but he is eligible for reelection if the place be "not a new office created since 1705."

Speaker of the House of Commons.—On the first day of the meeting of a new Parliament members of the House of Commons are summoned from their own chamber to the House of Peers, where her Majesty's pleasure is signified by the lords-commissioner that they shall proceed to the choice of some proper person to be their speaker. On their return the Commons proceed to the election accordingly, the clerk acting the while as chairman. On the following day the speaker-elect, with the House, is summoned to the House of Peers, and one of the lords-commissioner signifies her Majesty's approval of the choice made by the Commons. The speaker then, in the name and on behalf of the Commons, lays claim to their ancient and undoubted rights and privileges, which being confirmed he and his fellow-members return to their own chamber and the ceremony of taking the oath is proceeded with, he being the first to go through it. The speaker may hold office until a dissolution. Should the office become vacant during a session, the new speaker then elected is presented for the royal approbation, but does not claim the privileges of the House. This great officer has a residence in the palace of Westminster, and receives a salary of £5,000 per annum; he ranks as first commoner, and is usually awarded upon retirement a pension of £4,000 and a peerage. There has been no contested election for speaker since 1839.

The Cabinet Ministry.—The Executive Government of Great Britain and Ireland is vested nominally in the crown; but practically in a committee of ministers, commonly called the cabinet, whose existence is dependent on the possession of a majority in the House of Commons.

The member of the cabinet who fills the position of first lord of the treasury is, as a rule, the chief of the ministry; at present it is the foreign secretary who is prime minister. It is at the premier's recommendation that his colleagues are appointed; and he dispenses the greater portion of the patronage of the crown. His salary is that of the chair or office which he holds as head of a department. The present premier (1891) is foreign secretary, receiving £5,000.

The present cabinet (June, 1891) consists of the following members: Secretary of State for Foreign Affairs; Lord High Chancellor;† Lord President of the Council;‡ Chancellor of the Exchequer; Secretary of State for the Home Department;* Secretary of State for War;* First Lord of the Treasury;* Secretary of State for the Colonies;* Secretary of State for India;* First Lord of the Admiralty;§ Lord Chancellor for Ireland; Chief Secretary to the Lord-Lieutenant of Ireland;‖ Chancellor of the Duchy of Lancaster;‡ President of the Board of Trade;‡ Lord Privy Seal;‡ President of the Local Government Board;‡ President of the Board of Agriculture‡ (Board created in 1889)—a total cabinet membership in 1891 of 17.

Although the cabinet ministry is not the offspring of any formal election, it is virtually dependent upon the House of Commons, as an adverse majority in that body on any of its acts requires its immediate resignation. As its acts are liable to be questioned at any time in such manner as to require immediate explanation, it is deemed necessary that its members should be also members either of the Upper or Lower House.

The following is a complete list of the premiers, or heads, of all the cabinet administrations of the British government from accession of the house of Hanover to 1891, with the dates of their appointments:

Prime Ministers.	Dates of Appointment.	
Robert Walpole	Oct. 10,	1714
James Stanhope	April 10,	1717
Earl of Sunderland	March 16,	1718
Sir Robert Walpole	April 20,	1720
Earl of Wilmington	Feb. 11,	1742
Henry Pelham	July 26,	1743
Duke of Newcastle	April 21,	1754
Earl of Bute	May 29,	1762
George Grenville	April 16,	1763
Marquis of Rockingham	July 12,	1765
Duke of Grafton	August 2,	1766
Lord North	Jan. 28,	1770
Marquis of Rockingham	March 30,	1782
Earl of Shelburne	July 3,	1782
Duke of Portland	April 5,	1783
William Pitt	Dec. 27,	1783
Henry Addington	March 7,	1801
William Pitt	May 12,	1804
Lord Grenville	Jan. 8,	1806
Duke of Portland	March 13,	1807
Spencer Perceval	June 23,	1810
Earl of Liverpool	June 8,	1812
George Canning	April 11,	1827
Viscount Goderich	August 10,	1827
Duke of Wellington	Jan. 11,	1828
Earl Grey	Nov. 12,	1830
Viscount Melbourne	July 14,	1834
Sir Robert Peel	Dec. 10,	1834
Viscount Melbourne	April 18,	1835
Sir Robert Peel	Sept. 1,	1841
Lord John Russell	July 3,	1846
Earl of Derby	Feb. 27,	1852
Earl of Aberdeen	Dec. 28,	1852
Viscount Palmerston	Feb. 8,	1855
Earl of Derby	Feb. 26,	1858
Viscount Palmerston	June 18,	1859
Earl Russell	Nov. 6,	1865
Earl of Derby	July 6,	1866
Benjamin Disraeli	Feb. 27,	1868
William Ewart Gladstone	Dec. 9,	1868
Benjamin Disraeli (Earl of Beaconsfield)	Feb. 21,	1874
William Ewart Gladstone	April 28,	1880
Marquis of Salisbury	June 24,	1885
William Ewart Gladstone	Feb. 6,	1886
Marquis of Salisbury	August 3,	1886

Of the present cabinet ministry those marked with an asterisk (*) receive £5,000; †, £10,000; ‡, £2,000; §, £4,500; ‖, £8,000; ¶, £4,425. The Lord-Lieutenant of Ireland, formerly a member of the cabinet, but now a cabinet officer, receives a salary of £20,000.

SESSIONS OF PARLIAMENT.—Parliament is summoned by the writ of the sovereign issued by advice of the Privy Council, at least thirty-five days previous to its assembling. On a vacancy occurring in the House of Commons while Parliament is sitting, a writ for the election of a new member is issued upon motion in the House. If the vacancy occurs during the recess, the writ is issued at the instance of the speaker.

It has become customary, during recent years, for Parliament to meet in annual session extending from the middle of February to about the end of August. Every session must end with a prorogation, and by it all bills which have not been passed during the session fall to the ground. The royal proclamation which summons Parliament in order to proceed to business must be issued fourteen days before the time of meeting. A dissolution is the civil death of Parliament. It may occur by the will of the sovereign, or, as is most usual, during the recess, by proclamation, or finally by lapse of time, the statutory limit of the duration of the existence of any Parliament being seven years. Formerly, on the demise of the sovereign, Parliament stood dissolved by that event, but this was altered in the reign of William III to the effect of postponing the dissolution till six months after the accession of the new sovereign while the Reform act of 1867 settled that the Parliament "in being at any future demise of the Crown shall not be determined by such demise."

Both Houses of legislature must be prorogued at the same time. The prorogation takes place either by the sovereign in person, or by commission from the Crown, or by proclamation. The Lower House appears at the bar, and if the sovereign be present the speaker reports upon the labors of the session; the royal assent is then given to bills of the closing session, and a speech from the sovereign is read; whereupon the chancellor prorogues the Parliament to a certain day. Parliament resumes business, however, as soon as it is summoned by royal proclamation on a certain day, which may be at a date earlier than the original date of prorogation appointed. Should the term of prorogation elapse, and no proclamation be issued, Parliament cannot assemble of its own accord.

The following is a table of the duration of Parliaments of the United Kingdom during the present century:

Parliament.	When met.	When dissolved.	Existed. Y	M	D
1st	Sept. 27, 1796	Jan. 29, 1802	5	4	3
2nd	Aug. 31, 1802	Oct. 24, 1806	4	1	25
3rd	Dec. 15, 1806	April 29, 1807	0	4	15
4th	June 22, 1807	Sept. 29, 1812	5	3	7
5th	Nov. 24, 1812	June 10, 1818	5	6	16
6th	Aug. 4, 1818	Feb. 29, 1820	1	6	25
7th	April 23, 1820	June 2, 1826	6	1	9
8th	Nov. 14, 1826	July 24, 1830	3	8	10
9th	Oct. 26, 1830	April 22, 1831	0	5	28
10th	June 14, 1831	Dec. 3, 1832	1	5	20
11th	Jan. 29, 1833	Dec. 30, 1834	1	11	1
12th	Feb. 19, 1835	July 18, 1837	2	5	0
13th	Nov. 14, 1837	June 23, 1841	3	7	9
14th	Aug. 11, 1841	July 23, 1847	5	11	12
15th	Sept. 21, 1847	July 1, 1852	4	8	11
16th	Nov. 4, 1852	Mar. 21, 1857	4	4	11
17th	April 30, 1857	April 23, 1859	1	11	23
18th	May 31, 1859	July 6, 1865	6	1	6
19th	Feb. 6, 1866	July 31, 1868	2	5	25
20th	Dec. 10, 1868	Jan. 26, 1874	5	1	16
21st	Mar. 5, 1874	Mar. 24, 1880	6	0	17
22nd	April 29, 1880	Nov. 18, 1885	5	6	20
23rd	Jan. 12, 1886	June 26, 1886	0	5	14
24th	Aug. 5, 1886	Pres't sess'n			

AREA AND POPULATION OF THE BRITISH EMPIRE BY COUNTRIES.—The following figures are from the official census returns of 1881—the latest published at the date of sending these pages to press, June, 1891:

Name of Country.	Area in Sq. Miles.	Population.
Great Britain and Ireland	121,115	[illegible]
Indian Empire, etc.	[illegible]	[illegible]
Other Eastern Possessions	104,441	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Africa	[illegible]	[illegible]
West Indies, etc.	[illegible]	[illegible]
European Possessions	121	[illegible]
Totals	[illegible]	[illegible]

Whittier's Almanack (London, 1891), referring to these figures, says: "If to these figures we add the recent 'Annexations,' 'Influences,' or perhaps the truer and more expressive word 'grabbings,' in Africa, the area will be extended to [illegible] sq. miles, and population to 304,004,000."

The area and population of the divisions of the United Kingdom in 1881 were as follows:

Subdivisions.	Area in Sq. Miles.	Population.
England	50,823	24,613,926
Wales	7,363	1,360,513
Scotland	30,417	3,735,573
Ireland	32,583	5,174,836
Isle of Man	220	53,558
Channel Islands	75	87,702
Army, Navy, and Seamen abroad		215,374
Totals	121,481	35,241,482

Of the total population, 17,254,109 were males, and 17,987,373 were females. In England and Wales the decennial increase was 14.36; in Scotland 11.18; in Ireland, a decrease of 4.40; in the other Islands, a decrease of 2.34.

In England the density of population per square mile was 484; in Wales, 184; in Scotland, 122; in Ireland, 159.

In 1890 the emigration from the United Kingdom to British North America was 31,930; to the United States, 233,571; to Australasia, 21,604; total, 287,105.

Education and Religion.—Elementary education is now compulsory in the United Kingdom, and in 1890 it was made free in Scotland. On April 1, 1890, there were in England and Wales 2,274 school boards embracing a population of 16,481,753. England and Wales reported in 1890 a total of 58 Universities; Scotland, 6; Ireland, 3; total, 67; with 1,263 teachers, and 23,648 students. The total grants to primary schools in Great Britain (for examination and attendance of scholars) in 1890 was £5,162,307.

In England the Protestant Episcopal continues to be the established church, but all other churches are fully tolerated, and civil disabilities do not attach to any class of British subjects. There are 2 archbishops and 31 bishops. At the last census the population claiming membership in the State church was estimated at about 13,500,000, leaving about 12,500,000 to other creeds.

There are many Protestant dissenting religious bodies, the most numerous being Methodists of various branches, Independents or Congregationalists, Baptists, and Presbyterians. The Methodists reported about 14,000 chapels with 760,000 members; the Independents, 360,000 members; the Baptists, 3,700 chapels with 300,000 members. There are recorded in Great Britain 180 different religious denominations.

The number of Roman Catholics in England and Wales in 1887 was estimated at 1,354,000, with one archbishop and 14 bishops. In December, 1890, there were 1,335 Roman Catholic chapels and stations, with 2,478 officiating clergy.

The number of Jews in Great Britain and Ireland in 1883 was estimated at 70,000, of whom 40,000 resided in London.

The number of parishes of the established (Presbyterian) church in Scotland in 1890 was 1,342, with 1,663 chapels and stations and about 1,700 clergy. The number of Scotch Presbyterians not members of the established church is also large. The Free church in 1890 reported a total of 1,165,000. There are also Baptists, Independents, Methodists, and Unitarians. The Episcopal church in Scotland reported 7 bishops, 286 churches, 266 clergy, with an adhering population of about 80,000.

The Roman Catholic Church in Ireland in 1890 was under the supervision of 4 archbishops, and 23 bishops. In 1881 the census showed a total Roman Catholic population of 3,963,891.

The Church of Ireland (Protestant Episcopal) had in 1889, 1,500 churches, with 620,000 members.

There were also in Ireland at the census of 1881, 470,734 Presbyterians, 48,839 Methodists, 6,210 Independents, 4,879 Baptists, 3,645 Quakers or Friends, and 472 Jews.

Revenue and Expenditures.—The Budget for the year ending March 31, 1891, reported the estimated government income at £90,406,000 and the expenditures at £86,627,000. The sources of income and the branches of expenditure are shown in the following recapitulatory lists:

Sources of Income, 1891.

Customs	£20,695,199
Excise	25,282,635
Stamps	15,476,124
Property taxes	16,279,125
Postal	10,747,304
Telegraphs	2,612,329
Crown lands	507,511
Suez Canal shares	279,155
Miscellaneous	3,416,063
Total income	£95,326,195

Branches of Expenditure, 1891.

National debt charges	£25,000,000
Interest on railway bonds, etc	214,000
Naval defense fund	1,430,000
Other consolidated fund charges	1,661,000
The army	17,728,000
The navy	13,787,000
Civil services	15,661,000
Collections and inland revenue	2,668,000
Postoffice service	5,548,000
Telegraph service	2,247,000
Packet service	683,000
Total expenditure	£86,627,000

Of the amount received from customs in 1890, the sum of £9,214,626 was for duties on tobacco; £4,490,694 for duties on tea; and £5,985,707 for duties on liquors. Of the receipts from excise the sum of £24,960,043 was for spirits, beer, and license duties, making a total government income in 1890 from spirits, liquors, and license duties of £30,945,750 or over $150,000,000.

The item "property taxes" embraces the following: "Land tax," £1,065,537; "house duty tax," £1,978,596; and the "income and property tax," £13,234,992; a total of property taxes of £16,279,125. As English statisticians regard the first four items of income recorded above as "taxes," the total income from taxes in the United Kingdom in the year ending March 31, 1890, must be set down at £77,733,083, or about $388,000,000. This is nearly five-sixths of the total income of the United Kingdom.

The national expenditures fall substantially under three categories: (1) The consolidated fund charges (£28,289,524), mainly applied on the national debt; (2) the army and navy (£31,203,152), and (3) the civil service, including expense of collection of revenue (£26,500,638), for year ending March 31, 1890.

The income tax is regarded as the most important of the direct taxes. This tax since 1881 has been from *5d.* to *8d.* per pound. In 1881 the rate was *6d.*; in 1882, *5d.*; in 1883, 6½*d.*; in 1884, *5d.*; in 1885, *6d.*; in 1886 and 1887, *8d.*; in 1888, *7d.*; in 1889 and 1890, *6d.* Since 1877 only incomes of and over £150 are charged, and with an abatement of £120 on those under £400.

The National Debt.—The national debt was greatest at the peace of Paris, 1815. The increase during the war with Napoleon had been £323,386,-044. At the commencement of the Crimean war in 1854 it was £769,082,549; during that war, about three years, it grew to £808,108,722, an increase of £39,026,173. On March 31, 1890, the debt was £689,-944,026. The *net* total of the national debt, after deducting assets and balances, was at that date £679,783,889, or about $3,308,069,445.

THE BRITISH ARMY.—During the year ending March 31, 1891, the army of the United Kingdom consisted of 7,475 commissioned officers; 991 "warrant" officers; 15,958 sergeants; 3,670 drummers, trumpeters, etc.; and 125,381 rank and file; a total of 153,483 men of all ranks—an increase of 1,201 over the previous year.

The official returns for 1890 showed a register of 12,470 officers and men in the cavalry; 17,584 in the artillery; 5,370 engineers, 68,682 infantry and special corps; and 821 in miscellaneous establishments.

The maintenance of a standing army in time of peace without the consent of Parliament is forbidden by the bill of rights of the United Kingdom. Parliament must act on this question every year. There are two royal military academies or colleges—at Woolwich and Sandhurst.

The above figures include only those of the standing army. In addition there were four classes of reserves, or auxiliary forces, viz.: reserves, 63,980; militia, 141,395; yeomanry, 14,086; volunteers, 260,627. These with the standing army at home, and a force of 72,429 in India, make a grand total of 696,048 officers and men.

The daily pay of the staff and officers and also of the regimental lists is shown by the subjoined table, as furnished in the official reports of 1891:

Lieutenant-General, £[illegible] 10s.; Major-General, £3; Brigadier-General, £2 10s.; Colonel on Staff, £2 and £2 10s.; Deputy-Adjutant and Quartermaster-General, £2; Assistant ditto, £1 [illegible]s.; Deputy Assistant ditto, [illegible]s.; Brigade-Majors, Senior Aides-de-Camp, and Assistant Military Secretaries, 21s.; Aides-de-Camp, 1[illegible]s. and 18s.; Staff-Captains, 1[illegible]s.; Garrison and Camp Quartermasters, [illegible]s. [illegible]d. to 15s.

REGIMENTAL DAILY PAY (BRITISH ESTABLISHMENT).

	R. Horse Artillery.	Royal Artillery. (Field.)	Royal Engineers.		Household Cavalry.	Line Cavalry.	Foot Guards.	Infantry.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.	s. d.
Colonel		26 0	26 0				26 9	
Lieutenant-Colonel.	24 9	18 0	18 0		23 6	21 6	2[illegible] 0	18 0
Major	18 6	16 0	1[illegible] 0		15 6	15 0	15 6	13 7
Captain	15 0	11 7	11 7		13 6	1[illegible] 0	11 7	11 7
Lieutenant	8 10	6 10	6 0		9 0	7 8	6 6	6 6
Second Lieutenant..	7 8	5 7	5 7		6 8	6 8	5 3	5 3
Adjutant	17 6	14 1	2 6†		12 6	15 6	10 0	14 1
Riding-Master.	10 6	9 6	9 6		10 6	10 6		
Quartermaster..	10 6	9 6	9 6		10 6	10 6	9 0	9 0
			*	**				
Sergeant (Corporal) Major	6 0	5 10	6 0	6 0	5 10	5 4	5 2	5 0
Bandmaster	6 0	6 0		6 0	5 6	5 6	6 0	5 0
Quartermaster-Sergeant (Corporal Major)	4 4	4 2	5 [illegible]	4 6	4 6	4 2	4 0	4 0
Sergeant (Corporal) Instructor	4 2	4 0			3 3	3 3	3 3	3 3
Battery Sergeant-Major, etc. Q. M. Sergt.	4 4	4 2						
Armourer Sergeant (Corporal)				4 6	4 6	4 6	4 6	4 6
Troop and Company Sergt. (Corporal) Major			4 4	3 9	4 0	3 10		
Farrier Quartermaster Sergeant (Corpl.)	4 [illegible]	4 3	4 6		4 [illegible]	4 0		
Wheeler Quartermaster Sergeant	3 11	3 6						
Collar-maker and Saddler Q. M. Sergt. (Corpl.)	3 11	3 [illegible]			4 0	3 8		
Orderly-room Sergeant (Corporal).	2 8	2 8			3 0	2 8	2 [illegible]	2 6
Sergt. (Corpl.) Trumpeter, Sergt. Bugler	[illegible] 4	[illegible] 2		4 6	3 2	2 8	2 6	2 4
Sergt. (Corporal) Cook	[illegible] 4	[illegible] 2		3 4	[illegible] 0	2 8	2 6	2 4
Sergeant (Corporal) of Horse	[illegible] 4	3 2	[illegible]	3 [illegible]	[illegible] 0	2 8	2 6	2 4
Sergt. (Corp.) Farrier and Carriage Smith	[illegible] 9	[illegible] 7	8 8		3 4	2 10		
[illegible] Sergeant (Corporal)					[illegible] 0	2 8		2 6
Kettle-drummer, Sergeant-Drummer					2 4		2 6	2 4
Corporal, Artificer, Lance-Sergeant ..			2 11				[illegible] 2	[illegible] 0
Corporal	2 8	2 [illegible]	2 9	2 6	2 8	2 0	1 9	1 8
Bombardier, Second Corporal	2 [illegible]	2 [illegible]	2 [illegible]	2 2				
Collar-maker, Wheeler, Saddler, Artificer	2 [illegible]	2 [illegible]	1 11	1 11	2 0½	1 9½		
Shoeing and Carriage Smith	2 2	2 0			2 [illegible]	1 8		
Trumpeter, Bugler, Drummer and Fifer	[illegible]	1 [illegible]	1 4	1 [illegible]	1 11	1 1	1 2	1 1
Gunner, Sapper, Private	1 [illegible]	1 [illegible]	1 4	1 [illegible]	1 9	1 2	1 1	1 [illegible]
Driver	1 [illegible]	1 2½	1 4					

* Mounted. ** Dismounted. † Additional to regimental pay.

THE BRITISH NAVY.—The navy of the United Kingdom is a perpetual establishment, and the statutes under which it is governed have been fixed with precision. We have stated above that for the army the first vote of Parliament sanctions the number of men to be maintained; the second, the charge for their pay and maintenance. For the navy, no vote is taken for the number of men; the first vote is for the wages of the stated number of men and boys to be maintained, and, though the result may be the same, this distinction exists both in practice and principle.

The number of seamen and marines provided for the naval service in the estimates for 1889–90, and also for the previous year, was as follows:

Branches of service.	1888–89	1889–90
For the fleet (including Indian troop-ships):		
Officers and seamen	39,557	41,730
Boys (including 1,300 under training)	5,089	4,514
Marines afloat and on shore	12,766	13,874
For the coast guard	4,000	4,200
Officers for various services	988	1,082
Total, all ranks	62,400	65,400

Included in the number of 41,730 seamen of the fleet were 13 flag officers, and 2,584 commissioned officers, on active service. Provision was also made for 19,700 men of the royal navy reserves, 2,210 seamen and marine pensioner reserves, and 2,000 naval artillery volunteers.

The following table is taken from the official returns:

The total cost of the addition is calculated at £22,669,000. Of the armored turreted battle ships, three, the *Inflexible*, the *Trafalgar* and the *Nile*, have each a tonnage of nearly 12,000, and an armor thickness of 20 to 24 inches. The *Inflexible* is 320 feet long and 75 feet breadth, with a total weight of 3,275 tons.

Class of Ships.	No. ships afloat Jan. 1, 1889.		Proposed standard in 1894.	
	Number.	Tonnage.	Number.	Tonnage.
Armored.				
Battle ships, first class	17	165,330	30	333,950
" " second class	15	97,010	17	115,010
" " others	6	55,660	6	55,660
Coast defense ships	12	37,230	12	37,230
Cruisers, first class	12	76,650	12	76,650
" second class				
" others				
Total armored	62	431,880	77	618,500
Protected.				
Cruisers, first class			11	84,150
" second class	10	39,000	51	169,625
" third class	18	36,900	24	46,880
" others				
Torpedo dépôt ships			1	6,620
Torpedo ram	1	2,640	1	2,640
Total protected	29	78,540	88	309,915
Unprotected.				
Cruisers, second class	10	40,470	10	40,470
Corvettes	1	1,970	1	1,970
Sloops	17	17,870	19	20,210
Gun vessels	8	6,302	8	6,302
Torpedo cruisers	10	17,320	10	17,320
Torpedo gunboats	4	2,125	31	21,970
Gunboats	62	21,326	71	31,571
Torpedo boats, first class	80	4,178	86	4,578
" " second class	51	612	61	732
Despatch vessels	2	3,350	2	3,350
Torpedo dépôt ship	1	6,400	1	6,400
Special service ships	14	9,419	14	9,419
Miscellaneous	22	34,382	22	34,382
Total unprotected	282	168,724	336	198,634
Total	373	679,144	501	1,127,049

Commerce and Internal Communication.—The United Kingdom is classed as a free-trading country, the only duties levied being chicory, cocoa, coffee, dried fruits, plate, spirits, tea, tobacco and wine, the bulk of all the levies being spirits, tobacco, tea and wine. In 1889 the total imports were valued at £427,637,595; the duties levied were on goods valued at £30,078,748, or about 7 per cent. of the total imports. The total imports in 1890 were estimated at £420,885,695.

In 1889 the railway mileage aggregated 19,943 miles; on Jan. 1, 1890, there were in England and Wales 14,034 miles; in Scotland, 3,118 miles; and in Ireland, 2,791 miles.

In April, 1890, the telegraph mileage aggregated 31,440 miles in length, with 190,027 miles of wire, including 17,211 miles of private wire.

For the statistics of the colonies and dependencies of Great Britain, see those countries severally.

Supplemental Historic Outline.—The historic record in the Ninth Edition of Britannica closed with the events of 1875. The following is an abbreviated outline of the principal later events:

Queen of England proclaimed "Empress of India," 1876.

Cyprus taken possession of by Great Britain, 1878.

Upper Burmah entirely annexed to Great Britain, December 31, 1885.

Gladstone ministry resigns (succeeded by Lord Salisbury's cabinet), August 8, 1885.

Salisbury ministry defeated (succeeded by Gladstone ministry), January 26, 1886.

Great Socialist riot in London, February 8, 1886.

In general elections Gladstone defeated by Conservatives and Unionists, July 20, 1886.

Gladstone resigned and was succeeded by Lord Salisbury, July, 1886.

Socotra Island in Indian Ocean annexed to Great Britain, November 22, 1886.

Destructive storm throughout Great Britain, December 8, 1886.

British government introduced a new Coercion bill for Ireland, March 28, 1887.

Cyprus ceded to England by Turkey, June 1, 1887.

Queen Victoria's jubilee celebrated, June 19-25, 1887.

Parnell commission began its sittings in London, September 17, 1887.

Bill legalizing marriage with deceased wife's sister passed, April 18, 1888.

Henry M. Stanley and Miss Tennant married in Westminster Abbey, July 12, 1890.

Emperor of Germany visited Queen Victoria, August 4, 1890.

Heligoland transferred to Germany, August 9, 1890.

British torpedo cruiser *Serpent* wrecked (173 lives lost), November 10, 1890.

Parnell re-elected party leader, resulting in withdrawal of 44 M. P.'s, who elected McCarthy, November 25–Dec. 6, 1890.

Conference of Irish leaders at Boulogne, France, December 30, 1890.

Prince Albert Victor, Duke of Clarence and Avondale, eldest son of the Prince of Wales, and presumptive heir to the throne, died January 21, 1892.

GREAT FALLS, a village in Somersworth township, Stafford county, N. H., on Salmon River. It is a business center of York county, Me., and its prosperity largely arises from its cotton mills, seven being operated here. The village contains a woolen mill, bleachery and foundry.

GREAT FISH RIVER (1), in Cape Colony, Africa, rises in the Sneeuwberg Mountains, and after a general southeasterly course of 230 miles enters the Indian Ocean. The Midland railway, which connects Port Elizabeth and Port Alfred with Kimberley, skirts part of the river. (2) Great Fish River, or Back's River in North America, enters an inlet of the Arctic Ocean in 95° W. long., after passing through Lake Pelly. Sir George Back traced its course to the ocean.

GREAT KANAWHA, called New River in the upper part of its course, rises in the Blue Ridge of North Carolina, and is an affluent of the Ohio River. It has a course of 450 miles through West Virginia, and is navigable to a fall 30 miles above Charleston, W. Va., and about a hundred miles from its mouth.

GREAT PEDEE RIVER rises in North Carolina, flows south-southeast into South Carolina, and enters Winyaw Bay in Georgetown county. It is navigable 150 miles. Its chief tributaries are the Little Pedee and the Waccamaw.

GREAT SLAVE LAKE lies in the Canadian Northwest Territory. Its greatest length is about 300 miles, and its breadth 50 miles. By the Slave River it receives the surplus waters of Lake Athabasca, and it discharges by the Mackenzie River into the Arctic Ocean.

GREECE, kingdom of the Hellenes. Area, 25,041 sq. miles. Population (in 1890), 2,187,208. Capital, Athens, with a population of 114,355. For the geography, history and productions of Greece, see Britannica, Vol. XI, pp. 80-153. The territory detached from Turkey, consisting of most of Thessaly and a strip of Epirus, was added to Greece by a treaty with Turkey, executed under pressure of the Great Powers—June 14, 1881. The kingdom, excluding these, is divided into 17 nomarchies. In 1889 the area and population were as follows:

Nomarchies.	Area English square miles.	Population 1890.	Pop. per sq. mile 1890.
NORTHERN GREECE.—			
Attica and Bœotia.	2,472	257,764	104
Phocis and Phthiotis	2,044	136,470	67
Acarnania and Ætolia	3,013	162,020	54
PELOPONNESUS.—			
Argolis and Corinth.	1,442	144,836	100
Achaia and Elis	1,901	210,713	111
Arcadia	2,020	148,285	73
Messenia	1,221	183,232	150
Laconia	1,679	126,888	75
ISLANDS.—			
Eubœa and Sporades.	2,216	103,442	47
Cyclades	923	131,508	142
Corfu.	431	114,535	266
Zanthe (Zakynthos)	277	44,070	160
Cephalonia (Kephalionia)	302	80,178	265
THESSALY.—			
Arta	395	32,890	83
Trikalla.	2,200	143,143	65
Larissa.	2,478	168,034	68
Total	25,041	2,187,208	87

King and Royal Family.—Georgios I, born Dec. 24, 1845, the second son (Wilhelm) of Prince Christian of Schleswig-Holstein-Sonderburg-Glucksburg, present king of Denmark; elected king of the Hellenes by the national assembly at Athens, March 18 (30), 1863; accepted the crown through his father, the king of Denmark, acting as his guardian, June 4, 1863; declared of age by decree of the national assembly, June 27, 1863; landed in Greece in Nov. 2, 1863; married Oct. 27, 1867, to Queen Olga, born Aug. 22 (Sept. 3), 1851, the eldest daughter of Grand-duke Constantine of Russia, brother of the late Emperor Alexander II.

Children of the King.—I. Prince Konstantinos, heir-apparent, born Aug. 2, 1868; married Oct. 27, 1889, to Princess Sophia, Princess of Prussia. II. Prince Georgios, born June 24, 1869. III. Princess Alexandra, born Aug. 30, 1870. IV. Prince Nicolaos, born Jan. 21, 1872. V. Princess Maria, born March 3, 1876. VI. Prince Andreas, born Feb. 13, 1882. VII. Prince Christopheros, born Aug. 10, 1888.

By decision of the Greek national assembly of May 15, 1863, a civil list of 1,125,000 drachmai (about $200,000), was settled on King Georgios I, to which the governments of Great Britain, France and Russia added 4,000*l.* (or $120,000) each, making the total income of the sovereign of Greece about 52,000*l.* ($260,000) per annum. An annuity of 200,000 drachmai (about $40,000) has been allowed to the heir-apparent since he came of age, in August, 1886.

Movement of Population.—The chief occupations of the people are the following, in percentages of the population, in Greece and Ionian Islands (census 1879): Agriculture, 40 per cent.; shepherds, 9 per cent.; industries, 6.67; servants, 7.75; laborers, 8.11; commerce, 6.37; landed proprietors, 6.10; seafaring, 3.05; army and navy, 4.86; priests, 1.50. In the ceded provinces (1881): Agriculture, 41.95; laborers, 12.32; industries, 10.21; shepherds, 8.18; servants, 7.24; commerce, 6.47; priests, 1.61.

The nationality of Greece is Hellenic. Most of the Albanians who have, at various dates during the last 400 years, migrated into Greece, have become Hellenized. At present there are not more than 90,000 or 100,000 of distinct Albanian nationality in the whole of Greece. These are scattered in small communities, chiefly over Attica; northwards, as far as Thebes; then across the Isthmus of Corinth, throughout the ancient Argolis, in the southern districts of Eubœa, and a few of the neighboring isles. On the other hand, there are large numbers of Greeks in the Ottoman empire, raising the whole Greek nationality to over 8,000,000, as follows: Greece, about 2,200,000; Asia Minor, 2,000,000; Crete, Cyprus and other Ottoman islands, 400,000; European Turkey, 3,500,000; total, 8,100,000.

About one-half of the total population of Greece is agricultural, living dispersed in villages. The principal towns are the following:

Athens (1889)	114,[illegible]	Argos	9,861
Piræus	[illegible]	Pyrgos	8,788
Patras	[illegible]	Argostoli	7,871
Hermoupolis	[illegible]	Calamata	11,000
Corfu	27,000	Chalcis	6,877
Zante	16,280	Spetsai	6,495
Larissa	[illegible]	Hydra	6,446
Tripolis	12,517	Mesolounghi	6,321

Present Religion and Education.—The great majority of the inhabitants of the kingdom are adherents of the Greek Orthodox church. Before the census of 1889 there were 1,902,800 belonging to the Greek Orthodox church; 14,677 other Christians, mainly Roman Catholics; 5,792 Jews; and 24,165 Mohammedans. By the terms of the constitution of 1864, the Greek Orthodox church is declared the religion of the state, but complete toleration and liberty of worship are guaranteed to all other sects. Nominally, the Greek clergy owe allegiance to the patriarch of Constantinople, though he now exercises no governing authority. The Orthodox church has nine archbishops and eight bishops in Northern Greece; six archbishops and six bishops in the Peloponnesus; one archbishop and five bishops in the islands of the Greek Archipelago; and five archbishops and ten bishops in the Ionian Islands. There are 161 monasteries and nunneries, with 2,620 monks and 485 nuns.

All children between the ages of five and twelve years must attend school, but the law is not well enforced in country districts. According to the census of 1879, 86.06 per cent. of males and 23.08 females could read and write. The following are the educational statistics of Greece for 1884: Universities, 1; gymnasia, 33; Hellenic schools, 297; communal schools, 1,741; elementary, 540; private, 81; ecclesiastical, 5; polytechnic, 1; pupils, 144,098. The budget of 1885 (the latest reported, to Jan. 1, 1891), contained an appropriation of 3,000,000 drachmai by the government for higher and middle education.

Revenue and Expenditure.—The budget for 1891 estimates the total revenue at 93,967,720 drachmai, and the expenditures at 91,081,985 drachmai. The total amount of Greek indebtedness in June, 1889, was 623,883,288 drachmai. Of this sum rather less than 9,000,000 drachmai are for small outstanding internal indebtedness. In all accounts since 1882, the drachma is reckoned as equal to one franc.

Army and Navy.—All able bodied males 21 years old are liable to military service, the total period of service being 19 years, of which two years must be passed with the colors, 7 and 8 years in the reserve, and the remainder in the militia or landwehr. The nominal strength of the army in 1890 was 1,961 officers; 5,869 non-commissioned officers; 18,304 rank and file; total, 26,134—a larger number than that of the army of the United States of America.

The navy at the opening of 1890 consisted of two small armor-clads (1,710 tons), carrying two 10-ton Krupp guns in a battery on the upper deck and four 20-pounders, speed 12 knots; and a wood-built vessel, the *Basilissa Olga* (2,060 tons), carrying four 6-ton and two 5 ton guns, speed 10 knots. One steel armor-clad, the *Hydra*, was launched in 1889; it is 6,000 tons, but is yet quite unfinished; another similar vessel is stated to be building in France. There are 28 small torpedo boats and launches, and two Nordenfeldt submarine torpedo boats. Of unprotected vessels there are two corvettes (1,300 and 1,800 tons), two cruisers (1,000 tons each, launched 1884-85); 12 gun-vessels (six built 1881-84, the rest old); four gunboats (1880); three revenue vessels (1884), an old steel yacht, an iron transport, and 17 miscellaneous crafts. The budget for 1889 fixes the strength of the navy at 2,945 officers and men, but the actual number for 1890 was 3,361. The navy is manned partly by conscription from the people of the sea-coast and partly by enlistment. In 1887 the period of service was made two years instead of one.

Internal Communication.—Recently the internal communication by roads has greatly improved; there are now (1890) about 2,000 miles of roads. In May, 1882, the construction of a canal across the Isthmus of Corinth, about four miles, was begun; it is estimated to cost a million sterling; and more than three-quarters of the work is now completed.

Railways were opened in 1890 for a length of 452 miles, while 127 miles were under construction, and 517 miles were projected.

The telegraphic lines, land and submarine, were of a total length of 4,382 English miles, at the end of 1889; length of wire, 5,082 miles. The number of officers was 175. They despatched 678,511 inland telegrams, and 258,127 international, in the year, 1888. Receipts (1888), 1,130,160 drachmai; expenses, 992,320 drachmai.

Of post offices there existed 249 at the end of 1887, and there passed through the post in that year 5,992,098 letters, besides 179,033 post-cards, 6,602,269 samples, journals, and printed matter. The receipts were 1,052,176 drachmai; expenses, 1,237,239 drachmai. The total number of letters, post-cards, samples, newspapers, etc., which passed through the post office in 1888 was 14,319,864, of which 8,961,319 were internal and 5,358,545 international.

GREELEY, the county-seat of Weld county, Colo., midway between Denver and Cheyenne, at the confluence of the waters of the Platte and Cache la Poudre Rivers. It is a trade and educational center, and liquor is forbidden to be sold or given away within the town.

GREELY, Adolphus Washington, Arctic explorer, born in Newburyport, Mass., March 27, 1844, and graduated at Brown High School in 1860. He served as a volunteer through the war of 1861-65; shortly after its conclusion entered the Regular Army as lieutenant, and in 1868 was placed on the Signal Service. In 1881 he was selected to conduct the expedition sent into the Arctic regions for the purpose of carrying on observations in accordance with the international plan arranged at Hamburg in 1879. With a party of twenty-five he sailed from St. John's, Newfoundland, in the *Proteus*, July 7, 1881. He and the six survivors of his party were rescued June 22, 1884, when at the point of perishing from starvation. Two of the party, Lieutenant Lockwood and Sergeant Brainerd, traveled to within 396 miles of the geographical pole, the most northern point hitherto reached. In 1887 Greely was appointed chief of the Signal Service, with rank of brigadier-general. In 1886 he published *Three Years of Arctic Service*. See Polar Regions, Britannica, Vol. XIX, pp. 326–27.

GREEN, Ashbel, D. D., LL. D., born at Hanover, N. J., July 6, 1762, died in Philadelphia, May 19, 1848. He entered the Revolutionary Army in 1778, and served as sergeant until 1782; graduated from Princeton College in 1784; soon after graduating was appointed tutor, and in 1785 became professor of mathematics and natural philosophy. Licensed to preach in 1786, he became pastor of the Second Presbyterian church of Philadelphia the following year; in 1792 was appointed chaplain to Congress; and in 1812 became president of Princeton College. In 1822 he resigned the presidency and removed to Philadelphia. Author of *A History of Presbyterian Missions; Sermons on the Assembly's Catechism;* and other works. He was editor of the "Christian Advocate" from 1822 to 1834.

GREEN, Jacob, son of Ashbel, born in Philadelphia, July 26, 1790, died there Feb. 1, 1841. He graduated at the University of Pennsylvania in 1806; in 1818 became professor of chemistry, experimental philosophy, and natural history at Princeton, and in 1822 professor of chemistry at Jefferson Medical College, which position he held until his death. Author of *Chemical Diagrams; Chemical Philosophy* (1829); *Astronomical Recreations* (1829); *A Syllabus of a Course of Chemistry* (1835); *Trilobites* (2 vols., 1832); *The Botany of the United States* (1833); *Notes of a Traveler* (1831); and *Diseases of the Skin* (1841).

GREEN, Horace, M. D., LL. D., born at Chittenden, Vt., Dec. 24, 1802, died in Sing Sing, N. Y., Nov. 29, 1866. He graduated at the University of Pennsylvania, and at Middlebury College; began practice in Rutland, and afterwards spent several years abroad, studying in the hospitals of Edinburgh, London and Paris. On his return he became professor in the Medical College of Castleton, Vt., and remained there until his removal to New York city in 1850. He was soon afterwards chosen professor of the theory and practice of medicine in the New York Medical College, which position he held until obliged by failing health to resign in 1860. Author of *A Treatise on Diseases of the Air-Passages* (1846); *Pathology and Treatment of Croup* (1849); *Report of A Hundred Cases of Pulmonary Diseases* (1858), and other works.

GREEN, John Richard, an English historian, born at Oxford in 1837, died at Mentone, Italy, March 7, 1883. After being educated at Magdalen College School and Jesus College, he took orders in 1860, and became curate of St. Barnabas church, a poor parish in the east of London. In 1862 he had charge of Hoxton, and in 1865 was made vicar of St. Philip's, Stepney. Overwork during the cholera time in 1866 obliged him to retire, and Archbishop Tait made him librarian at Lambeth. His health remained delicate, and his winters were spent usually on the Continent. He had been a frequent contributor to the "Saturday Review" before, and now he began to work on his *Short History of the English People*, which book he had ready for publication in 1874. This work was received with great enthusiasm all over England. The University of Edinburgh conferred on the author the degree of LL. D. In 1877 Green gathered a number of his essays into a book under the title *Stray Studies*, and in 1882 published a masterly work on *The Making of England*, wherein he went deeply into the foundations of England's greatness. In continuation of this he was preparing another work, to be called *The Conquest of England*, when his labors were cut short by death. In all his writings Green showed a lively imaginative faculty. His characters live, move, and act on each other as in real life. Distant places and times are made to appear distinct and perfectly natural.

GREEN, Samuel Abbott, physician, born at Groton, Mass., March 16, 1830, graduated at Harvard College in 1851, and took his medical degree in 1854. After spending several years in Europe he returned and settled in Boston. At the commencement of the civil war he was commissioned assistant surgeon of the 1st Massachusetts regiment of volunteers; was surgeon of the 24th Massachusetts regiment 1861–64, and for his services in the field during the latter year was brevetted lieutenant-colonel of volunteers. He was city physician of Boston in 1871–80, and was elected mayor in 1882. Author of *A History of Medicine in Massachusetts; Groton During the Indian Wars* (1883); *Groton Historical Series* (20 numbers, 1883–87); and other works. He has also published a large number of papers on scientific and historical subjects.

GREEN, Seth, American pisciculturist, born in Rochester, N. Y., March 19, 1817, died there Aug. 20, 1888. He received a common-school education, and for some years was proprietor of a fish and game market near his home. Having a passion for hunting and fishing, and being a close observer, he became interested in the habits of fish, and from his personal observations conceived the idea of artificial propagation. From that time he turned his attention to methods of increasing and protecting the yield of fish as a business. In 1868 he was appointed one of the fish commissioners of New York, and was soon afterwards made superintendent of fisheries in that State. He was the inventor of important hatching appliances, and the great advancement made in pisciculture is largely due to his efforts.

GREEN, William Henry, D. D., LL. D., born at Groveville, Burlington county, N. J., Jan. 27, 1825, graduated at Lafayette College in 1840, and studied theology at Princeton. Ordained to the Presbyterian ministry in 1848, he became pastor of the Central Presbyterian church of Philadelphia in 1849, and since 1851 has held the professorship of Hebrew and Old Testament literature in Princeton Seminary. He was chairman of the Old Testament company of the American committee of revision. He declined the presidency of Princeton in 1868. Author of *Hebrew Grammar* (1861); *Hebrew Chrestomathy* (1863); *The Pentateuch Vindicated from the Aspersions of Colenso* (1863); *The Argument of the Book of Job Unfolded* (1874); *Moses and the Prophets* (1883); and *The Hebrew Feasts* (1882).

GREENBACK PARTY, a political party organized in 1876, and the outgrowth of the Granger and Labor Reform movements. See Political Parties of the United States, in these Revisions and Additions.

GREEN BAY, a city and county-seat of Brown county, Wis., situated at the head of Green Bay, and on the right bank of Fox River, at its mouth, 65 miles north-northeast of Fond du Lac and 113 miles north of Milwaukee. It is on three railroads, and has a good harbor and great facilities for trade and navigation. Large quantities of lumber are procured in Brown county, and exported from Green Bay. This city has extensive iron-works, and also several saw mills and factories. Population in 1860, 2,275; 1870, 4,666; 1880, 7,464; 1890, 9,069.

GREENBRIER MOUNTAINS, a ridge in West Virginia lying northwest of the main Alleghanies. They are about 2,000 feet in height.

GREENBRIER RIVER, a river of West Virginia. It rises in the Allegheny Mountains in the northeastern part of the State, and flows southwest, entering the Great Kanawha River in Summers county, near Hinton. It is about 175 miles in length.

GREENCASTLE, a city, railroad center, and county seat of Putnam county, Ind. Block coal, timber, sandstone, limestone, and some iron ore found in the vicinity. There are excellent schools, and De Pauw University is located here. Among the manufactures are iron and nails.

GREENCASTLE, a post-borough of Franklin county, Pa., 63 miles south of Harrisburg. It has agricultural machine works, a woolen mill, and a high school.

GREEN COVE SPRINGS, the county-seat of Clay county, Fla., on St. John River, 30 miles south of Jacksonville. It is thought to be the "Fountain of Youth" referred to in Spanish and Indian legends. It contains a large sulphur spring, whose waters are efficacious in rheumatic troubles.

GREENE, a village of Butler county, Iowa, on the Burlington, Cedar Rapids and Northern Railroad, 35 miles northwest of Cedar Falls. It has a good graded school, and several churches and grain warehouses.

GREEN EARTH, a mineral of a green color and earthy character, often found in the vesicular cavities of crystalline igneous rocks, sometimes also disseminated through highly decomposed basic eruptive rocks. It consists principally of silica, alumina, magnesia, and protoxide of iron. *Glauconite* is the name given to the green earth which is not infrequently met with in sedimentary rocks. In such rocks glauconite occurs in the form of grains, which in many cases are the casts of minute shells. There is also a green earth used as a pigment by painters in water-colors, who know it by the name of *Mountain Green*. For their use it is mostly brought from Monte Boldo, and from Cyprus.

GREENE, GEORGE WASHINGTON, grandson of Gen. Nathaniel Greene, born at East Greenwich, R. I., April 8, 1811, died there Feb. 2, 1883. He was educated at Brown University, resided in Europe from 1825 till 1847, and was United States consul at Rome from 1837 to 1845. Returning to this country, he was appointed professor of modern languages at Brown University. In 1852 he removed to New York and devoted himself to literature. In 1872 he became professor of history at Cornell. Author of *Historical Studies* (1850); *Biographical Studies* (1860); *Historical View of the American Revolution* (1865); *A Short History of Rhode Island* (1877); and other works.

GREENE, SAMUEL STILLMAN, LL. D., born at Belchertown, Mass., May 3, 1810, died in Providence, R. I., Jan. 24, 1883. He graduated at Brown University in 1837; was the first superintendent of public schools in Springfield, Mass.; instructor in English and grammar high-schools of Boston, 1842–49; and first agent of the Massachusetts board of education. He became superintendent of public schools in Providence, R. I., in 1851, and was at the same time called to the professorship of didactics in Brown; was professor of mathematics and civil engineering in that University, 1855–64; and of mechanics and astronomy from 1864 until his death. Professor Greene was president of several educational societies, and author of *Analysis of the English Language* (1848), and of a series of English grammars.

GREENEVILLE, the county-seat of Greene county, Tenn., 75 miles northeast of Knoxville. It was the home of President Andrew Johnson. Greeneville and Tusculum College is near the village.

GREENFIELD, the county-seat of Hancock county, Ill., 21 miles east of Indianapolis. It contains an expensive school building, and manufactories of flour and furniture.

GREENFIELD, the capital of Hancock county, Ind., situated on the Columbus, Chicago and Indiana Central Railroad, 21 miles east of Indianapolis. It has large flouring-mills, planing-mills, a furniture factory, and graded school.

GREENFIELD, the capital of Adair county, Iowa, situated on a railroad about 20 miles from Creston.

GREENFIELD, the county-seat of Franklin county, Mass., located in the valley of the Connecticut. It is an important market for cattle, sheep, and butter, and has manufactories of children's carriages, bolt-cutting machines, and planes. A soldiers' monument is here and also a young ladies' seminary.

GREENFIELD, a railroad junction of Highland county, Ohio, situated in the southwestern part of the State, and on a branch of the Scioto River.

GREEN ISLAND, a railroad junction of Albany county, N. Y.; is an island lying in the Hudson River between Troy and West Troy, with which places it is connected by bridges. Machinery, castings, iron, and many railroad cars are here manufactured.

GREENLEAF, HALBERT S., of Rochester, N. Y., a manufacturer, born in Guilford, Vt., April 12, 1827. He received a common school and academic education, was a justice of the peace in 1856, and served as private and officer in the Union army during the civil war. In politics he is a Democrat, and was elected a Representative from the thirtieth Congressional district of New York to the 48th Congress. In 1890 he was elected from the same district to the 52d Congress.

GREEN MOUNTAINS, a range of the Appalachian system of mountains, extending through Vermont from Canada to Massachusetts. The highest point, Mount Mansfield, has an altitude of 4,430 feet. Other summits are Killington Peak, 4,221 feet, and the Camel's Hump, 4,188 feet in height. The mountains are mostly covered with forests of pine, hemlock, fir, spruce, and other trees, and contain iron, marble, copper, and some gold. Parts of the southern extension of this range, known as Hoosac or as Taconic Mountains, traverse the western part of Massachusetts and enter Connecticut and New York.

GREENOUGH, RICHARD SALTONSTALL, brother of Horatio, born in Jamaica Plains, Mass., April 27, 1819, and educated at the Boston Latin School. He began his career as sculptor in Paris, returned to the United States and resided for several years in Newport, R. I., but since 1874 has spent most of his time in Europe. He has been particularly successful as a sculptor of portrait busts. Among his works are a bronze statue of Franklin, executed in 1853, and placed in the City-hall Square of Boston; a marble statue of Gov. Winthrop, finished in Florence, 1855–56; the *Boy and the Eagle*, owned by the Boston Athenæum; a *Carthagenian Woman; Elaine; Circe;* and a bust of Shakespeare, from the Chandos portrait.

GREENPORT, a village of Suffolk county, N. Y., the eastern terminus of the Long Island Railroad, 95 miles from Brooklyn. It has ship-yards, and the people are chiefly employed in fishing and coasting. On account of its bathing and fishing facilities it is a favorite summer resort.

GREEN RIVER, a river of Kentucky, which rises near the center of the State, pursues a tortuous northwesterly course, and enters the Ohio River about 6 miles above Evansville, Ind. It passes near the mouth of the Mammoth Cave, and traverses the western coal-field of Kentucky. Its length is estimated at 350 miles, and it is navigable at high water 200 miles by means of locks and dams.

GREEN RIVER, a branch of the Colorado. It rises in Western Wyoming and pursues a generally southward course into Utah, uniting with Grand River near lat. 38° 16′ N., and long. 110° W. Its entire length is estimated at 750 miles, but it is not of much importance for navigation. Winding through the Great American Desert, bordered by cliffs two or three hundred feet in height, the depth of its cañons gradually increases, and for scores of miles it runs more than 7,000 feet beneath the surface.

GREENS, the common name of all varieties of kale or cabbage (*Brassica oleracea*), which do not boll, and of which the leaves are used for the table as boiled vegetables. Young unboiled cabbages, and shoots from the stocks of cabbages, are often also called greens. The leaves of German greens are very much curled. This herb is either sown in spring and planted out soon after, or it is sown in autumn and planted out in the spring.

GREENSAND, a term applied to a variety of sandstone containing considerable glauconite, a silicate of iron and potash, which imparts to it a greenish color. The greensand of Europe is divided into the Upper Greensand, belonging to the Upper Cretaceous, and the Lower Greensand, belonging to the Lower Cretaceous period (see Britannica, Vol. X, pp. 357–59). It is an important formation in the United States, and is in some localities extensively mined for fertilizing purposes. It is often called *marl*.

GREENSBORO, the county-seat of Hale county, Ala., located near the cane-brake region, which before the civil war was noted for its productiveness. Southern University, under Southern M. E. church control, is located here.

GREENSBORO, the capital of Greene county, Ga., situated on the Georgia Railroad, 87 miles from Augusta. It contains a court-house, several churches and two academies.

GREENSBORO, a city and county-seat of Guilford county, N. C., located 82 miles northwest of Raleigh. It contains spoke and handle manufactories, saw and planing mills, and agricultural machine-works. Much fruit is raised in the vicinity, and considerable of it is dried and shipped further south. A Methodist female college is located here.

GREENSBURG, a city and county-seat of Decatur county, Ind., situated 47 miles southeast of Indianapolis. There are quarries here where fine stone is obtained and shipped. Among the manufactures are flour, woolen goods, furniture and carriages. The city has a pork-packing establishment and a foundry.

GREENSBURG, the county-seat of Westmoreland county, Pa., 31 miles east of Pittsburgh. Grain, wool, coke and farming products are shipped from this point.

GREEN SNAKE, a name applied to two different kinds of harmless grass-snakes of the United States, *Cyclophis vernalis*, common in the Middle and Northern States, and *Cyclophis æstivus*, which inhabits the Middle and Southern States. They are slender in form, and of a bright green-color.

GREEN'S POND, a town situated on an island of the same name, north of the entrance to Bonavista Bay, Newfoundland. It is a port of entry, and has importance as a fishing and sealing station.

GREENUP, the capital of Greenup county, Ky., situated on the Eastern Kentucky Railroad, and on the Ohio River, about 20 miles from Portsmouth, Ohio. There are several iron furnaces near the village, and coal is mined in the vicinity.

GREENVILLE, a city and county-seat of Butler county, Ala., 45 miles south of Montgomery. It has two colleges, a shingle factory, a boot and shoe factory, and other mills. Cotton and timber furnish the chief industries.

GREENVILLE, the capital of Muhlenburg county, Ky., situated on the Paducah and Elizabethtown Railroad, 92 miles from Paducah. It has a female college, and several tobacco factories.

GREENVILLE, a city and county-seat of Bond county, Ill., 50 miles northeast of St. Louis, Mo. Almira Female College is located here.

GREENVILLE, a city of Montcalm county, Mich., on Flat River, which has two dams at this point, and thus furnishes the abundant water-power utilized in the flour, saw, planing, and shingle mills, and the machine shops and woolen mill.

GREENVILLE, the capital of Washington county, Miss., situated on the Mississippi River, 100 miles from Jackson. It is the western terminus of the Greenville, Columbus and Birmingham Railroad. Considerable cotton is shipped here.

GREENVILLE, a post-borough of Mercer county, Pa., on the Shenango River at the head of the Shenango Valley. It has abundant water-power, a rolling-mill and coal works. Thiel College, under Evangelical Lutheran control, is located here.

GREENVILLE, the county-seat of Darke county, Ohio, on Greenville Creek. It has planing-mills and a furniture factory. In 1793 a fort was built here by Gen. Wayne, and two years later a treaty was here made with over 1,100 Indians.

GREENVILLE, a city and county-seat of Greenville county, S. C. It is a pleasant summer resort, a railroad center and a great manufacturing city, carriages, wagons and cotton being among its productions. The United States court meets here semi-annually. The city is the seat of Furman University and Greenville Female College.

GREENWEED, a name given to certain half-shrubby species of *genista*. Hairy greenweed (*G. pilosa*) is sometimes grown in France on light soils as fodder for sheep.

GREENWICH, a village of Fairfield county, Conn., in the southwestern corner of the State and on Long Island Sound. The famous ride of Gen. Putnam in 1779 took place in this township.

GREENWICH, a village of Washington county, N. Y., situated on a railroad and on the Battenkill River, about 16 miles east of Saratoga Springs, and 30 miles northeast of Troy. It contains several factories.

GREENWOOD, a village of Jackson county, Mo., on the Missouri Pacific Railroad. Lincoln College (United Presbyterian) is located here.

GREENWOOD, FRANCIS WILLIAM PITT, D. D., born in Boston, Mass., Feb. 5, 1797, died in Dorchester, Mass., Aug. 2, 1843. He graduated at Harvard in 1814, studied theology, and in 1818 was ordained and began his ministry in the New South church, Boston. Obliged by failing health to resign in 1820, he spent the following year in Europe, and on his return settled in Baltimore, where he edited the "Unitarian Miscellany" for two years. In 1824 he accepted an invitation to become Dr. Freeman's colleague at King's chapel, Boston, and from 1827 till his death was sole pastor. Dr. Greenwood was an early member of the Boston Society of Natural History, and a frequent contributor to its journal. Author of *Lives of the Apostles* (1827); *Sermons to Children* (1841); *Sermons of Consolation* (1842); and other works.

GREGG, DAVID MCMURTRIE, an American general born at Huntingdon, Pa., in 1833. After graduating at West Point in 1855, he served against the Indians in Oregon from 1858 to 1860 as lieutenant. At the outbreak of the civil war he was made captain in the Sixth cavalry regiment, and in January, 1862, he was appointed colonel of the Eighth Pennsylvania cavalry. He served with distinction in the Virginia peninsular campaign, and was made brigadier-general of volunteers in 1862. From this time on he commanded a division of cavalry, and was engaged at Gettysburg and other important battles. After the Richmond campaign, in which he was engaged with the Second cavalry division, he resigned on Feb. 3, 1865. After his retirement he lived as a farmer at Milford, Del. In 1886 he became commander of the Pennsylvania order of the Loyal Legion.

GREGG, John Irvin, born in Bellefonte, Pa., July 19, 1826, served through the Mexican war, becoming first lieutenant of the 11th infantry in February, 1847, and captain in the following September. At the commencement of the civil war he was chosen colonel of the 5th Pennsylvania volunteers, and in May, 1861, was made captain of the 6th United States cavalry. Appointed colonel of the 16th Pennsylvania cavalry in October, 1862, he commanded a cavalry brigade in the Army of the Potomac from 1863 till 1865. He resigned from the army in 1865, and was brevetted major-general of volunteers, and brigadier-general of the United States Army for distinguished services during the war. He was promoted to be colonel of the 8th United States cavalry in 1868. Retired in 1879.

GREGG, Maxey, born in Columbia, S. C., in 1814, died near Fredericksburg, Va., Dec. 13, 1862. He graduated at the College of South Carolina in 1836, studied law, and was admitted to the bar in 1839. In the war with Mexico, he served as major of the 12th infantry; was a member of the South Carolina State convention in 1861, and of the committee that prepared the ordinance of secession. He commanded the 1st regiment of South Carolina volunteers at the beginning of the civil war, and was subsequently made a brigadier-general. He did gallant service in Virginia, and was killed in the battle of Fredericksburg.

GREGOROVIUS, Ferdinand, a distinguished German historian, born in East Prussia in 1821. He studied theology, but soon devoted himself to poetry and literature. In 1852 he went to Rome, where he subsequently spent most of his time. His great work is the *History of the City of Rome in the Middle Ages* (8 vols., 1859–72; 3d ed., 1875). He has written also an Italian geography and a history of Corsica (1854), Capri, and Corfu; on the graves of the Popes (1857; 2d ed. 1881); on Lucrezia Borgia (1874); on Urban VIII (1879); on Athens (1881); and on the Byzantine Empress Athenias (1882); also a tragedy on the death of Tiberius (1851); and an epic, *Euphorion* (4th ed., 1880).

GREGORY, Daniel Seeley, educator, born in Carmel, Putnam county, N. Y., Aug. 21, 1832. He graduated at Princeton in 1857, studied theology, and after holding various pastorates became in 1871 professor of metaphysics and logic in Wooster University, Ohio, being transferred four years later to the chair of mental science and English literature. In 1879 he became president of Lake Forest University, Ill. Author of *Christian Ethics* (1875); *Why Four Gospels?* (1876); and *Practical Logic* (1881).

GRELLET, Stephen, born of wealthy parents in Limoges, France, Nov. 2, 1773, died in Burlington, N. J., Nov. 16, 1855. He was educated at the military college of Lyons, and at the age of 17 entered the body-guard of Louis XVI. During the Revolution he was taken prisoner and sentenced to be shot, but made his escape to Demerara, and in 1795 came to New York. Formerly a Roman Catholic, he now joined the Society of Friends, and removing to Philadelphia ministered to the sick during the prevalence of yellow fever in 1798. He returned to New York in the following year, and was for a short time engaged in mercantile pursuits, but soon after devoted himself entirely to missionary work. He made a tour through the Southern and New England States and Canada, and in 1807 went to Europe, where he traveled extensively. Returning to New York in 1820, he made a second missionary tour to Europe (1831–34).

GRENADA, a city and county-seat of Grenada county, Miss. It is a business center and has flour, lumber, planing and rolling mills.

GRENADE, a small shell exploded by a time-fuse, about three inches in diameter, of iron or annealed glass, filled with powder, and thrown from the hand. Grenades are chiefly used against the dense masses of troops assembled in the ditch of a fortress during an assault, and then are often rolled over the parapet through wooden troughs instead of being thrown by hand.

GRENADIER: originally, a soldier who was employed in throwing hand-grenades, and then a member of the first company of every battalion of foot, in which the tallest and finest men were placed. This company used to be distinguished by tall bear-skin caps, and held the place of honor; namely, the right when in line and the front when in column. In the British army the name is now only used as the title of the first three battalions of the Foot Guards.

GRETNA GREEN, a village of Dumfriesshire, near the head of the Solway Firth. After the abolition of Fleet marriages, English persons wishing to marry clandestinely had to get out of England, to which alone that act had reference. Thus the practice arose of crossing the border into Scotland, where Gretna Green had by 1771 become "the resort of all amorous couples whose union the prudence of parents or guardians prohibits." The "priest" might be anyone—blacksmith, ferryman, toll-keeper, or landlord—and "church" was commonly the toll-house, where nearly 200 couples were sometimes united in a twelvemonth.

GRÉVY, Jules, ex-president of the French Republic, born in 1807 at Mont-sous-Vaudrez. A prominent jurist, he became a prominent member of the constituent assembly, and opposed the policy of Louis Napoleon as president. From 1871 to 1873 he was president of the national assembly, and from 1876 to 1879 president of the chamber of deputies, in the latter year succeeding Marshal MacMahon as president of the Republic. At the close of the seven-years term of office he was reelected, and two years later resigned, Dec. 2, 1887. The unexpected fall of Monsieur Grévy was indirectly due to the Limousin or "decoration" scandals.

GREWIA, a genus of East Indian tiliaceous trees, yielding good bast for rope making, etc. Some yield timber, and the leaves of others are used as fodder.

GREYLOCK, the chief eminence of Saddle Mountain, Berkshire county, Mass. It rises to a height of 3,600 feet, and is the highest point of land in the State. The sides of the mountain are covered with forests.

GRIERSON, Benjamin Henry, born at Pittsburgh, Pa., July 8, 1826; at an early age removed to Ohio, and was afterwards engaged in business at Jacksonville, Ill. At the beginning of the civil war he served on the staff of Gen. Prentiss; in August, 1861, was made major of the 6th Illinois cavalry, and became colonel in the following spring; brigadier-general of volunteers in June, 1863, he became major-general in May, 1865, colonel of the 10th U. S. cavalry in July, 1866, and in March, 1867, was brevetted brigadier and major-general U. S. Army. He commanded the district of the Indian Territory, 1868–73; from 1875 to 1881 was engaged in exploring parts of New Mexico and Texas, and in campaigns against hostile Indians, and in 1886 was placed in command of the district of New Mexico.

GRIFFIN, a city and county-seat of Spalding county, Ga., 40 miles south of Atlanta. Cotton furnishes the chief industry, and there are factories for the making of furniture and carriages. There is a mineral spring here and the place is a summer resort. Male and female colleges are located here.

GRIFFIN, CHARLES, born in Licking county, Ohio, in 1826, died in Galveston, Texas, Sept. 15, 1867. He graduated at the United States Military Academy in 1847, entered the army as brevet second-lieutenant of artillery, and served during the Mexican war. In June, 1849, he was promoted first-lieutenant, served on frontier duty, and was instructor of artillery at West Point in 1859–61. In the civil war he commanded the West Point battery at Bull Run, and was brevetted major for gallant conduct; in June, 1862, was commissioned brigadier-general of volunteers, and commanded a brigade in the Virginia peninsular campaign, winning distinction at Yorktown, Gaines's Mill, and Malvern Hill. He was present at the second battle of Bull Run; was promoted to the command of a division and engaged in the battles of Antietam and Fredericksburg, and the various battles of the final campaign. As commander of the 5th corps, under Gen. Grant, he was one of the commissioners to carry out the terms of the surrender of Gen. Lee at Appomattox Court-house. In May, 1865, Gen. Griffin was brevetted brigadier and major-general in the Regular Army, was assigned to the command of the district of Maine in the August following; in July, 1866, was made colonel of the 35th infantry, and commanded military districts in Texas and Louisiana.

GRIFFIN, EDWARD DORR, D. D., born in East Haddam, Conn., Jan. 6, 1770, died in Newark, N. J., Nov. 8, 1837. He graduated at Yale in 1790, studied theology, and in 1795 became pastor of the Congregational church at New Hartford, afterwards holding pastorates at Newark, N. J., and Boston, Mass. He was professor of rhetoric in Andover Theological Seminary from 1809 to 1811, and president of Williams College from 1821 to 1836.

GRIFFIS, WILLIAM ELLIOT, D. D., an American author, born in Philadelphia, Pa., Sept. 17, 1843; graduated at Rutgers in 1869, and the following year went to Japan. He was superintendent of education in the province of Echizen in 1871, and held the chair of physics in the Imperial University of Tokio in 1872–74. On his return to this country Mr. Griffis studied theology at New Brunswick, N. J., and at Union Theological Seminary, New York city, graduating from the latter in 1877. He was pastor of the first Reformed church in Schenectady, N. Y., from 1877 till 1886, and in the latter year took charge of the Shawmut Congregational church, Boston, Mass. Author of *Guides to Tokio and Yokohama* (1874; *The Mikado's Empire* (New York, 1876, 5th ed. 1887); *Japanese Fairy World* (1880); *Asiatic History* (1881); *Corea, the Hermit Nation* (1882; *Corea, Without and Within* (1885); *Life of Matthew Calbraith Perry* (1887); and *Honda, the Samurai* (1890).

GRIFFITHS, JOHN WILLIS, naval architect, born in New York city, Oct. 6, 1809, died in Brooklyn, N. Y., April 29, 1882. Early apprenticed to a shipwright, at 19 years of age he laid the lines of the frigate *Macedonian*. He suggested the clipper model of the fast ships built for the China trade; in 1853 he began the construction of a steamer which when completed made the fastest time on record between Havana and New Orleans. In 1858 he was appointed by the Government special naval constructor to build the gunboat *Pawnee*, and in 1872 built the United States ship *Enterprise*. Mr. Griffiths was the originator of the idea of life-boat steamers; and the inventor of a timber-bending machine, iron keelsons for wooden ships, bilge keels to prevent rolling, triple screws for great speed, and improved rivets. His machines received two prize medals at the Centennial exhibition in 1876. Author of *Treatise on Marine and Naval Architecture* (4th ed., 2 vols., 1854), which had an extensive sale in Europe; and *The Progressive Ship-builder's Manual* (1875–76).

GRIGGSVILLE, a city of Pike county, Ill., 4 miles west of the Illinois River. It has manufactories of farm implements, carriages, and flour.

GRIGORIOPOL, a town of Kherson, South Russia, on the left bank of the Dniester, eighty-two miles northwest of Odessa. Its 7,918 inhabitants cultivate tobacco, wine and fruit, and manufacture leather.

GRIMES, JAMES WILSON, statesman, born in Deering, Hillsborough county, N. H., Oct. 20, 1816, died in Burlington, Ia., Feb. 7, 1872. He graduated at Dartmouth College in 1836, and soon afterwards settled to the practice of law in Burlington, Ia., in what was at that time known as the "Black Hawk Purchase," which was attached to the territory of Michigan. After the formation of Iowa Territory, Mr. Grimes was a delegate to its assembly in 1838 and 1843, and in 1852 was a member of the State legislature. Elected governor of the State in 1854, he fostered Free-soil sentiments, addressed a remonstrance to President Pierce against outrages perpetrated in Kansas upon former citizens of Iowa, and secured action upon measures which materially promoted the development of the State. He was elected to the United States Senate as a Republican in 1859, was a delegate to the peace convention in 1861, and in 1865 was reelected to the Senate. As a member of the committee on naval affairs he became a recognized authority on matters pertaining to the navy, and was the first in the Senate to suggest the introduction of iron-clad vessels. Mr. Grimes was compelled by failing health to resign his seat in the Senate in 1869.

GRIMKÉ, SARAH MOORE, born in Charleston, S. C., Nov. 6, 1792, died at Hyde Park, near Boston, Mass., Dec. 23, 1873. Becoming convinced of the evils of slavery, she left her home and in 1821 went to Philadelphia, where she became one of the most prominent members of the Anti-Slavery Society and an advocate of woman's rights. She lectured in New England, and afterwards taught in the school of her sister's husband, T. D. Weld, in Belleville, N. J. Author of an *Epistle to the Clergy of the Southern States* (1827, which was considered one of the most effective anti-slavery documents of the day; and *Letters on the Condition of Women and the Equality of the Sexes*.

GRIMKÉ, THOMAS SMITH, LL. D., born at Charleston, S. C., Sept. 26, 1786, died near Columbus, Ohio, Oct. 11, 1834. He graduated at Yale College in 1807, studied law in Charleston, and attained distinction at the bar. As a member of the State Senate he made a notable speech in support of the general government on the tariff question, and an argument on the South Carolina test-oath question. He was a strong advocate of the temperance cause, a distinguished member of the American Peace Society, and a fine classical scholar. Author of *Addresses on Science, Education and Literature* (1831).

GRINNELL, a city of Poweshiek county, Iowa, 120 miles west of the Mississippi River. It is the seat of Iowa College, and has a foundry, flour mills, and a glove factory.

GRINNELL, Henry, born in New Bedford, Mass., in 1799, died in New York city, June 30, 1874. He graduated at the academy in his native place in 1818, and going to New York became a clerk in a commission house. In 1825 he was made a partner in the firm of Grinnell, Minturn & Co., retiring from business in 1852. He was greatly interested in Arctic exploration, and in 1850 fitted out two vessels at his own expense to aid in the search for Sir John Franklin and his companions. He also contributed freely to subsequent expeditions. Mr. Grinnell was throughout life a generous advocate of the interests of sailors, and was the first president of the American Geographical Society.

GRINNELL, Moses Hicks, brother of Henry, born in New Bedford, Mass., March 3, 1803, died in New York city, Nov. 24, 1877. He was educated at private schools and at the Friends' Academy, and in 1818 entered a New York counting-house. He became a member of the firm of Fish & Grinnell in 1825; was a member of Congress, 1839–41; collector of the port of New York, 1869–70, and president of the chamber of commerce in 1843. He contributed toward Dr. Kane's Arctic expedition of 1853, and was a liberal supporter of the national cause during the civil war.

GRINNELL LAND, a barren mountainous Polar tract on the west side of Kennedy channel, the northern continuation of Smith's Sound. It was discovered by Dr. Hayes of Kane's expedition in 1854, and named after Henry Grinnell, of New York, who had fitted out the expedition. It was thoroughly explored by Greely in 1882. North and south it is covered with ice caps; between them lie valleys that are free of snow in summer and support herds of musk oxen and the usual Arctic fauna. In the interior he discovered Lake Hazen, 60 miles long, and two ranges of mountains, one containing a peak, Mount Arthur, 5,000 feet high.

GRIPING, or Gripes, a popular name for all painful affections of the bowels, whether attended with constipation or diarrhea. When pains of this kind are spasmodic they are termed colic. The action of purgative medicine is often attended by more or less griping pain, which may be averted in certain cases by the careful choice of the medicine, or by the combination of it with carminatives, or with a little opium.

GRIPPE, La. See Influenza, in Britannica, Vol. XIII, p. 73; also, in these Revisions and Additions.

GRIQUAS, a South African race of half-castes, the offspring of Hottentot and Bush-women by colonists of Dutch descent. They form a distinct community in a region known as Griqualand, annexed to Cape Colony in 1874. Many of the Griquas are considerably civilized, have adopted the Christian religion, and are successful agriculturists and cattle-breeders.

GRISCOM, John Haskins, M. D., born in New York city, Aug. 14, 1809, died there April 28, 1874. He graduated from the medical department of the University of Pennsylvania in 1832; was professor of chemistry in the New York College of Pharmacy from 1836 to 1840, and in 1843 became visiting physician of the New York hospital. Author of *Animal Mechanism and Physiology* (1839); *Uses and Abuses of Air* (1850); *Prison Hygiene* (1868); and other works. He also contributed largely to the medical journals.

GRISEBACH, August Heinrich Rudolph, a German botanist, born at Hanover in 1814, died May 9, 1879. He studied botany and medicine at Göttingen and Berlin; was employed by the government in 1839 to explore the flora of Turkey; traveled extensively in pursuit of this mission, and in 1841 was appointed professor of botany at Göttingen and director of the botanical garden. He published *Reise durch Rumelien* (2 vols., 1841); *Spicilegium Floræ Rumelicæ* (2 vols., 1843–45); *Ueber die Bildung des Torfs* (1846); and *Die Vegetationslinien des nordwestlichen Deutschlands* (1846), etc

GRISI, Giulia, a celebrated singer, born at Milan in 1810, died at Berlin in 1869. Her fame spread rapidly over Europe; in 1832 she appeared in Paris in *Semiramis*, where the purity, melodiousness and volume of her voice, as well as her classical beauty of features, secured general admiration. Bellini's *Puritani* and other operas were written for her, but *Norma* always remained her greatest part. London was the scene of her grandest and most successful performances; and here she married, in 1836, the Marquis de Melce, after whose death she became in 1856 the wife of the tenor, Mario, with whom she sang in America.

GRIS-NEZ CAPE, a headland in the French department of Pas-de-Calais, opposite Dover, and the point of land nearest to the English shore, the distance being barely 20 miles. About equally distant from Calais on the northeast and Boulogne on the south, the cape marks the dividing line between the North Sea and the English Channel. It is surmounted by a light-house.

GRISWOLD, Alexander Viets, D. D., born at Simsbury, Conn., April 22, 1766, died at Boston, Mass., Feb. 15, 1843. He first studied law, but, disliking the profession, prepared for the ministry, and was ordained in 1795. He had charge successively of the parishes of Plymouth, Harwinton, and Litchfield, Conn., and in 1804 accepted a call to the rectorship of St. Michael's church, Bristol, R. I. In 1811 he was consecrated first bishop of the eastern diocese of the Protestant Episcopal church, and on the death of Bishop White in 1836 became the presiding bishop. He published *Discourses on the Most Important Doctrines and Duties of the Christian Religion* (1830); *The Reformation and the Apostolic Office* (1843); and various special sermons and addresses.

GRISWOLD, Rufus Wilmot, D. D., born at Benson, Vt., Feb. 15, 1815, died in New York city, Aug. 27, 1857. In early life he traveled in the United States and Central and Southern Europe; was apprenticed to a publisher, but tiring of the business studied theology, and became a successful minister of the Baptist denomination. Leaving the ministry for journalism, he edited "Graham's Magazine," Philadelphia, from 1841 till 1843; was afterwards associate editor of several weekly papers in Boston and New York city, and in 1852 became editor of the "International Magazine." His works include *Poets and Poetry of America* (1842); *Poets and Poetry of England in the 19th Century* (1845); *Washington and the Generals of the Revolution*, in connection with other writers (1847); *Sacred Poets of England and America* (1849); and a number of other works. He also complied *Curiosities of American Literature*, edited the first American edition of Milton's prose works, and was one of the editors of the works of Edgar A. Poe.

GRISWOLDVILLE, a village of Jones county, Ga., on the Central Railroad, 10 miles from Macon. Before the civil war it was noted for extensive manufacture of cotton-gins. Here a sharp engagement occurred between the Confederate and Union forces, Nov. 22, 1864.

GRODEK, a town of Austrian Galicia, 20 miles from Lemberg, in the center of a flax-growing region. Population (1880), 10,116; nearly one-third Jews.

GROOTE EYLANDT (Dutch, "Great Island"); an uninhabited island on the west side of the Gulf of Carpentaria, in North Australia. It is surrounded by reefs, and its interior is hilly. In extreme length and breadth it measures about 40 miles each way.

GROS-VENTRE INDIANS. See INDIANS, AMERICAN, in these Revisions and Additions.

GROSS, SAMUEL DAVID, M. D., born near Easton, Pa., July 8, 1805, died in Philadelphia, May 6, 1884. He graduated at Jefferson Medical College in 1828, in 1835 became professor of pathological anatomy in the Cincinnati Medical College, Ohio; in 1840 accepted the professorship of surgery in the University of Louisville, Ky., and in 1850 was chosen Dr. Mott's successor in the University of New York. Six years later he became professor of surgery in Jefferson Medical College, Philadelphia, which position he held until within two years of his death. Dr. Gross was a member of the Royal Medical Society of Vienna; of the Royal Medico-chirurgical Society of London, and of the British Medical Association. He was president of the American Medical Association in 1867, and president of the International Medical Congress held in Philadelphia in 1876. He received the degree of D. C. L. from the University of Oxford, England, and that of LL. D. in this country. He commenced in early life to contribute to medical literature, and was the author of a number of well-known professional works.

GROSSULARIACEÆ, or RIBESIACEÆ, a sub-order of *Saxifragaceæ*, including about a hundred species, mostly all palæarctic or nearctic.

GROTTA DEL CANE ("Grotto of the Dog"), a small cave near Naples, in the vicinity of Lake Agnano and of Puzzuoli, contains carbonic acid gas with 77 per cent. of carbonic acid. This cave was known to the ancients. It derives its name from the practice of introducing into it small dogs, which are soon almost deprived of life by the gas that, owing to its density, clings to the floor of the cave; but they recover upon being restored to the open air.

GROTTE, LE, a town of Sicily, in the province of Girgenti. Population, 8,775, mostly employed in the sulphur works of the district.

GROUND-ANNUAL: in the law of Scotland, an annual payment made for land. It is little known where the law allows the constitution of a feu-duty. Thus, when a vendor sells his land, and instead of taking a lump sum for the price prefers a sum by way of a perpetual annuity or rent, he conveys the land in fee to the disponee or purchaser subject to this ground-annual, which is the burden on the lands transferable and extinguishable like other real burdens. The vendor is then called the ground-annualer, and if the ground-annual is not paid he is entitled, as a remedy, to poind the ground—that is, seize all the goods whether of the owner or his tenants, which are found on the lands, and pay himself, and raise action of mails and duties against the tenant, or he may sue the debtor.

GROUND DOVE, a dove or pigeon, which lives chiefly upon the ground. In the United States it is one of several small pigeons of the genus *Columbigallina*, especially *C. passerina* of the Southern States. It is less than seven inches long, has short broad wings and tail, and naked tarsi. The plumage of the male is varied with tints of purplish-red and grayish olive, the female is gray in color. It usually nests on the ground.

GROUND IVY (*Glechoma hederacea*), a plant of the natural order *Labiatæ*, a native of Britain and other parts of Europe, growing in hedges, etc., in a dry soil, and naturalized in America. It has a creeping stem, kidney-shaped crenate leaves, and axillary blue flowers growing in threes. A tea prepared from the leaves is in great repute among the poor in many places, and the plant is supposed to be stimulant, aromatic, and of use in pectoral complaints. The leaves were formerly used in England for clarifying and flavoring ale.

GROUNDLING (*Cobitis tænia*), the spinous loach, a little cyprinoid fish resembling the loach, from which it is distinguished by a forked erectile spine beneath the eye, and by its more compressed form. It is rare and very local in Britain, frequenting the muddy parts of rivers, habitually keeping close to the bottom. The genus is known to include only two other species.

GROUND PARRAKEET, one of several Australian parrots, living mainly upon the ground, and belonging to the genus *Pezoporus*, or the genus *Geopsittacus*.

GROUND SQUIRREL, one of the various species of burrowing rodents of the genera *Tamias* and *Spermophilus*, especially applied in the United States to the Eastern striped squirrel or chipmunk, *Tamias striatus*. The genus *Spermophilus* includes the prairie squirrel and many allied Western species, commonly called gophers.

GROVE, SIR GEORGE, an English author, born in 1820. He was trained as an engineer, and erected in the West Indies the first two cast-iron light houses built. He was next employed on the Chester general station and the Britannia tubular bridge. From 1849 to 1852 he was secretary of the Society of Arts, and to the Crystal Palace company from 1852 to 1873. He was knighted in 1883 on the opening of the Royal College of Music, Kensington Gore, of which he was made director by the Prince of Wales. He assisted Dean Stanley in some of his works on the Bible and the East, and was founder of the Palestine Exploration Fund. He was an editor of "Macmillan's Magazine," a contributor to Smith's *Dictionary of the Bible*, and an editor (and part author) of the great *Dictionary of Music and Musicians*.

GROVE, SIR WILLIAM ROBERT, an English lawyer and physicist, born in 1811. In 1835 he was called to the bar; in 1871 was raised to the bench, receiving knighthood in 1872; and in 1875 became a judge in the high court of justice. He retired from the bench in 1887. In 1839 he invented the powerful voltaic battery known by his name, and from 1840 to 1847 was professor of natural science at the London Institute. He has contributed extensively to scientific journals, and published several very important lectures. He was president of the British Association in 1866.

GROW, GALUSHA A., born at Ashford, Windham county, Conn., Aug 31, 1824, graduated at Amherst College in 1844, studied law, and was admitted to the bar in 1847. He was member of Congress from Pennsylvania in 1851, and represented his district for twelve successive years. Elected as a Democrat, he severed his connection with his party on the repeal of the Missouri compromise. During his period of office he rendered important services on various committees, and was Speaker of the House in 1861-63. He was a delegate to the National Republican conventions of 1864 and 1868.

GROWLER (*Grystes salmonoides*), a fish of the perch family, abundant in many of the rivers of North America. It attains a length of two feet, and is much esteemed for the table. It is of an olive color. The genus *Grystes* has small scales, and only fine villiform teeth. Nearly allied is the genus *Oligorus*, including the valuable murray cod (*O. macquariensis*), which may attain a length of three feet and a weight of a hundred pounds, and a

New Zealand coast form, the hapuku (*O. gigas*), also valuable as a food-fish.

GRUB, the name generally applied to the worm-like larvæ of insects when they have a distinct head but no legs, as bees and some beetles. The economic importance of many grubs, especially those of some beetles, is well known.

GRUNDY CENTER, the capital of Grundy county, Iowa, situated on a railroad, about 22 miles from Cedar Falls.

GRUNDY, FELIX, born in Berkeley county, Va., Sept. 11, 1777, died in Nashville, Tenn., Dec. 19, 1840. He was educated by Dr. Joseph Priestly at Bardstown Academy, studied law, and achieved a great reputation as a criminal lawyer. He was chosen a member of the Kentucky constitutional convention in 1799, was a member of the legislature from 1800 till 1806; in the latter year was appointed a judge of the supreme court of errors and appeals, and in 1807 became chief justice. This position he soon after resigned, removing to Nashville, Tenn. He was a member of Congress (1811-15), United States Senator (1829-38), and Attorney-General in Van Buren's Cabinet. In 1840 he resigned his position in the cabinet and was reelected to the Senate.

GUACHOS, a name given to descendants of the early Spanish colonists and native Indians, inhabiting the pampas of South America. They live in mud huts, and are solely occupied in rearing cattle.

GUADALUPE RIVER rises in the southern part of the State of Texas, and flows in a southeast direction, emptying its waters into Espiritu Santo Bay. Its length is estimated at about 200 miles.

GUADALUPE-Y-CALVO, a town of Mexico, situated in a mountainous district in the State of Chihuahua. It derives importance from the rich silver-mines in its vicinity. Population, 10,000.

GUANARE, the capital of the State of Zamora, in Venezuela. It stands on a river of the same name, and has a population of 10,300.

GUANO, or VILLA GUANO, a town of Ecuador, province of Chimborazo, situated on the Rio Guano, 100 miles southwest of Quito. It produces various manufactures. Population, 9,000.

GUAPORÉ, a navigable river of South America, rising in Brazil, and for some distance forming the boundary between Bolivia and Brazil. It unites with the Mamore to form the Madeira.

GUARANTY, a term in international law applied to the promise given by the third power of a treaty to aid in case of the violation of its provisions by either of the others. It requires that the degree and amount of aid promised shall be given unless the promisee decline to receive it. The promiser differs from a surety in not being bound to make good a debt, but only to do his best to induce the party owing it to make payment. See Britannica, Vol. XI, p. 236.

GUARDAFUI, CAPE, the most eastern point of the African continent, and the extremity of an immense promontory (the Somali country), stretching seaward in an east-northeast direction, and washed on the northwest by the Gulf of Aden and on the southeast by the Indian Ocean. The cape is in 11° 50′ N. lat., and 51° 14′ E. long.

GUARDIAN: in law, the legal representative and custodian of infants, that is, persons under the age of 21, and various species are distinguished. *Guardian by nature* is rather a popular than a legal term, especially when used with reference to a father or mother, who are often called guardians by nature. In its technical sense, it is confined to an ancestor, who is said to be guardian of his heir-apparent. *Guardian by nature*, is the name given in English law to a father, or after his death to the mother, who as such, has the custody and control of children under the age of 14. *Guardian in socage* is the name anciently given to the next of blood. *Guardian ad litem* is a person appointed by a court of justice to defend an action brought against an infant. See INFANT, Britannica, Vol. XIII, pp. 1-3.

GUATEMALA. The last presidential election in this republic began on Jan. 10, 1892. The results in the capital up to the 17th gave 1,182 votes to General Reina Barrios, 532 to Senor Enriquez Barrios, 341 to Senor Lainflesta, and 241 to Doctor Montufar. It is seen that in the capital the candidature of the General Barrios was the most favorably received. The "Diario de Centro-America" affirmed meanwhile that, in the other parts of the republic, Senor Don Francisco Lainflesta was getting an immense majority of votes. The elections in the city of Guatemala have gone on in perfect quiet, and we have not seen either that there have been any disturbances in the Departments. Some days before the elections Senor Lainflesta issued a manifesto, declaring that he would accept only the votes given freely and spontaneously in his favor. This declaration was evidently intended as an answer to those people who pretended that some official pressure might be exercised over the election in the interest of Senor Lainflesta, as against General Reina Barrios, the nephew of the late Dictator Rufino Barrois, killed in 1885, at the battle of Chachualpa, when he tried to force Salvador and the other small Republics into a Central American Union, under the direction of Guatemala.

GUELPH, a post-town of Ontario, Canada, county-seat of the county of Wellington, on the Speed, at a railway junction, 48½ miles west of Toronto. The Speed here falls about 30 feet, furnishing water-power to several large mills and factories. The town has also manufactories of iron castings, machinery, sewing-machines, musical instruments, leather, agricultural implements, soap and candles, boots and shoes, and wooden-ware. Guelph is an inland port of entry. Population in 1886, 10,216.

GUELPHIC ORDER, an order of knighthood for Hanover, instituted by George IV, when prince-regent, in 1815. It is a military and civil order, and is unlimited in numbers.

GUERANDE, a town of France, in the department of Loire-Inférieure, near the sea. It contains a mediæval church, and has manufactories of salt and linen. Population, 6,912.

GUERARA, a town of Algeria, in the oasis of Wady-Mzab, 42 miles from Gardaia. It is the rendezvous for the tribes of the desert to buy and sell horses, sheep, and asses, and to exchange ivory, gold dust, and ostrich feathers for cottons, woolens, silk, and cutlery. Population estimated at 12,000.

GUERICKE, HEINRICH ERNST FERDINAND (1803-78), a German theologian belonging to the Old Lutheran school. He was professor at Halle, and is the author of a *Handbuch der Kirchengeschichte* (1833); of a *Christliche Symbolik* (1839); and of a *Lehrbuch der Christlichen Archäologie* (1847).

GUERRERO, VICENTE, President of Mexico, born in Tixtla, Mexico, in 1783, died in Cuilapam, Feb. 14, 1831. He took part in an insurrection in 1809; subsequently gained several victories over the Spaniards, and in 1818 became a leader of the patriotic troops. In 1829 he was declared President of Mexico. He was soon afterwards deposed in favor of Santa Anna and fled to the south, but was afterwards captured and shot.

GUERRILLA, properly an armed band carrying on an irregular, unauthorized warfare on occasions of invasion or civil war, but now commonly an individual member of such a band. The word first came into popular use in Spain, where it was applied to the bands of peasants and shepherds who opposed Napoleon's armies in 1808–14; and they were active partisans of the Carlist cause in the civil wars of Spain. The name was brought to Spanish America, and thence introduced into the United States. In the late civil war there were numerous guerrillas in the border States.

GUESS, GEORGE, or SEQUOYAH, a Cherokee half-breed, inventor of the Cherokee alphabet, born about 1770, died in San Fernando, Northern Mexico, in August, 1843. He knew no language but his own, and was only known as an ingenious silversmith previous to his invention of the alphabet. This alphabet is considered to be the most perfect one ever devised, and consists of eighty-five characters, each representing a single sound. It has been employed in printing with complete success. Guess went with his tribe beyond the Mississippi, and emigrated with other Indians to Mexico in 1842.

GUEUX, or "THE BEGGARS," the name assumed by the confederated nobles who opposed the introduction of the Inquisition into the Low Countries by Philip II. of Spain. Forming themselves into an association, they presented a formal protest to the regent, Margaret of Parma. They represented the national feeling of the country, and maintained a long and vigorous contest against the despotic proceedings of Philip, but were compelled to succumb to superior force. "The Beggars of the Sea" seriously harassed the Spanish fleet, and succored besieged places along the coast. Their capture of Briel in April, 1572, was the beginning of the war which terminated in the independence of the Netherlands in 1648.

GUIANA, or GUAYANA, a region of South America comprised between the Orinoco and Amazon Rivers (see Britannica, Vol. XI, pp. 249–55). The name is now usually confined to the European provinces, British Guiana, Cayenne, or French Guiana, and Surinam, or Dutch Guiana. Guiana was the "El Dorado" of Sir Walter Raleigh, and formerly supposed to be rich in gold. Gold is still found in the interior, in the Sierra Parime, but the true wealth of Guiana lies in its fertile soil and its boundless capabilities in regard to tropical produce. Much of the interior is still unexplored.

BRITISH GUIANA has an area of 109,000 square miles, and a population (1891) of 282,066. In 1889 there were 81,000 acres under cultivation, as follows: Sugar, 78,110 acres; village acres, 12,833; and 92 cattle farms. The exports and imports for five years (1885–89) were as follows:

Goods.	1885.	1886.	1887.	1888.	1889.
	£	£	£	£	£
Exports	[illegible]	[illegible]	[illegible]	2,021,7[illegible]	2,3[illegible]9,141
Imports	[illegible]	[illegible]	[illegible]	[illegible]	1,[illegible]779

The chief exports in 1889 were: Sugar, £1,914,141; rum, £[illegible]; molasses, £[illegible]; timber, £18,975; gold, [illegible] oz., valued at £[illegible]. The chief imports were: Flour, £[illegible]; rice, £[illegible]; pork, £[illegible]; butter, £[illegible]; lumber, £[illegible]. In 1889 there were 21 miles of railway, [illegible] miles of post-office telegraphs, and a telephone exchange in Georgetown of 230 miles with 200 subscribers.

CAYENNE, or FRENCH GUIANA, has an area of 46,697, and a population of 26,502. The capital and chief city is Cayenne. The exports to France amount to about $3,750,000 annually. Cayenne was selected as a station by the Royal Astronomical Society as a point of observation of the total solar eclipse, Dec. 21 and 22, 1889.

SURINAM, or DUTCH GUIANA, has an area of 46,060 square miles, and a population (1889) of 57,365. The capital and chief city is Paramaribo, with 27,752 inhabitants. The superior administration and executive authority is in the hands of a governor, assisted by a council composed of the governor as president, the attorney-general as vice-president, and three members, all nominated by the king. The colonial states form the representative body of the colony. Four members are chosen every year by the governor; the others by electors, in proportion of one in 200 electors. Entire liberty is granted to the members of all religious confessions. The local revenue is derived from import, export and excise duties, taxes on houses and estates, personal imposts, and some indirect taxes. A subvention from the mother-country is necessary. For 1890 the estimated revenue was 13,408,130 guilders, and the expenditures 1,647,153 guilders. The following table shows the value of imports and exports during the years 1885–89:

Year.	Imports.	Exports.
1885 ..	4,808,603 guilders.	3,113,270 guilders.
1886	4,[illegible]714 "	[illegible] "
1887	5,[illegible]2,621 "	[illegible] "
1888	4,[illegible],840 "	[illegible],677 "
1889	4,[illegible] "	3,521,867 "

In 1888 sugar was produced on 17 plantations of 1,668 hectares to the amount of 6,206,553 kilogrammes. Cacao on 83 plantations and 370 small properties of 8,787 hectares, to the amount of 1,543,019 kilogrammes. The other productions were bananas, 516,799 bundles; coffee, 5,560 kilogrammes; cotton, 720 kilogrammes; rice, 15,197 kilogrammes; fruits, 186,812 kilogrammes; rhum, 315,306 litres; and melasse, 1,104,389 litres. The export of gold in 1888 was 1,029,777 grammes, valued at 1,410,795 guilders. The declared value since the beginning of the gold industry (1876) to the end of 1888 is 11,347,572 guilders.

GUIANA BARK, FRENCH, the bark of *Portlandia hexandra*, also called *Coutarea speciosa*, a tree of the natural order *Cinchonaceæ*, with opposite ovate leaves, and corymbs of very large purple flowers, a native of Guiana. The bark is esteemed a very powerful febrifuge.

GUIDES, in military affairs, are usually persons drawn from the country in which an army is operating, one or more being sent with every detachment of troops. A guide should be intelligent, experienced in the topography of the country, and faithful. As, however, guides must on many occasions be drawn from a hostile population, their conduct is always watched with the utmost jealousy, death being the punishment for the least departure from trustworthiness.

GUIGNIAUT, JOSEPH DANIEL, a French scholar and antiquary, born at Paray-le-Monial, May 15, 1794, died in Paris, March 12, 1876. In 1818–22 he held the position of *maître des conférences* in history at the normal school, and the corresponding chair in Greek letters, 1826–28. He was chosen to the Academy of Inscriptions in 1837; in 1847 received the cross of an officer of the Legion of Honor, and in 1862 became honorary professor of history, commander of the Legion of Honor, and perpetual secretary of the Academy of Inscriptions. He wrote much upon Greek literature and antiquities.

GUILANDINA, a genus of shrubs of the natural order *Leguminosæ*, suborder *Cæsalpineæ*. *G. bonduc* and *G. bonducella* are the best known species. Both are natives of the warm parts of the East Indies, Arabia, Africa and South America. The shell of the seed is remarkable for its flinty hardness. The kernel is very bitter. Ground to powder and mixed with black pepper, it is administered in India in ague; mixed also with castor-oil it is applied externally in hydrocele. The roots in Amboyna are considered a good tonic.

GUINEA FOWL. See Britannica, Vol. XI, p. 264; also POULTRY, Vol. XIX, pp. 646–47.

GULES (*gueules*), the French heraldic term for "red," is the plural of *gueule*, "the mouth," Lat. *gula*, the term by which the color red is known in heraldry.

GULFWEED (*Sargassum*), a genus of seaweeds (*Algæ*), of the sub-order *Fucaceæ*, of which two species are found in immense quantities in some parts of the Atlantic, Pacific and Indian Oceans. They are tropical plants, although sometimes carried by winds and currents to northern coasts. The frond is long, and is furnished with distinct stalked nerved leaves, and simple axillary stalked air-vessels. The receptacles are linear, in small axillary clusters or racemes. The gulfweed is generally found floating, but there is reason to think that it is at first attached to the bottom of shallow parts of the sea. Where the Gulf Stream is deflected from the banks of Newfoundland eastward, and sends off its northern branch toward the Azores, is situated the *Sargasso Sea*, where the quantity of floating seaweed is often such as to impede the progress of ships.

GUM-BOIL, an abscess near the root of a tooth, usually discharging itself toward the mucous membrane of the gum, but sometimes making its way more deeply towards the skin, and if allowed to burst there causing considerable deformity. Gumboils should be treated in the first instance by protection against cold and external injury, and free washing of the mouth with hot water; but as soon as the presence of matter can be ascertained, it is usually a good practice to give vent to it by a pretty free incision. Complete cure follows the removal of the tooth at the root of which the inflammation has begun. If the abscess threaten to burst through the skin, extraction of the tooth is imperative.

GUMMING (in vegetable pathology, *Gummosis*), a disease which attacks the plum, cherry, peach, and other stone-fruit trees, often proving fatal to the tree. Recent observations seem to prove that the cause of the disease is a fungus named *Coryneum Beijerinckii*. The mycelium of the fungus develops a ferment which transforms the cell-walls, starch granules, and other contents of the cells into gum. The fungus cannot penetrate sound, healthy bark; there must be some wound or abrasion before the germ-tubes can enter the cellular tissues in which alone they can spread; probably insects are the chief agents in carrying the contagion from tree to tree. Wounds as soon as they are observed should be coated with a thick paste of quicklime or coal-tar. Gummed branches should be cut away without delay and burned, and the wounds dressed at once with coal-tar.

GUM-PLANT (*Grindelia robusta*). This plant is one of a genus of the order *Compositæ*, named in honor of Dr. Grindel, a German botanist. It inhabits the dry regions of the American continent from the Mississippi River to the Pacific coast. There are about 25 species of *Grindelia*. Some are found as far north as the Saskatchewan, in the British possessions, while Patagonia seems to be the limit on the south. The chief home of the gum-plant seems to be in Texas and Mexico. It has a pappus composed of 2 to 8 rigid, hornlike awns, which are early deciduous. The leaves are rather thick, and often covered by a viscid exudation, or gum. California has four species of this genus. In medicine it has gained popularity in the West as a remedy for poisoning by species of *Rhus*, as the poison-oak of California, and in asthma and bronchitis.

GUM-TREE, a name applied in the United States to various important trees. The sour gum, black-gum, pepperidge, or tupelo (*Nyssa multiflora*), is a large tree producing a firm timber, which is used for hat-blocks, windmill shafts, hubs, etc. The *Nyssa capitata* bears a sour edible fruit. The *Nyssa uniflora* and *aquatica* have soft light wood, and their roots are used somewhat as substitutes for cork. The *Liquidambar styraciflua*, the sweet gum, is a large tree with star-like leaves. The firm and fine-grained wood is used in furniture-making. It yields a balsamic resin, called American storax. *L. orientale* and *L. altingia* also yield storax, and the latter has a hard, heavy, fragrant red timber. Gum-trees are common in nearly every quarter of the globe.

GUNBOAT, a small boat armed with one or more guns of heavy caliber. It is capable of running close inshore or up rivers, and has little chance of being hit by a larger vessel at the long range which the carrying power of its guns enables it to maintain. Gunboats in their more modern form are all small mastless vessels mounting one large gun in the bow, and propelled by an engine with single or twin screws. The gun is pointed by means of the helm or the screws, and the gunboat is in fact a floating gun-carriage. At the beginning of the century the United States had over 250 of these vessels; but the "gunboat" system was soon abandoned.

In a wider sense all the naval vessels armed with guns may be called "gunboats." For the last 30 years iron-clad war ships have been built with ever-increasing thickness of armor, and—in competition therewith—the guns used on these ships are made more powerful year after year, in order to penetrate the armor. At first, all the armor was made of iron plates.

UNITED STATES NAVY.—From 1862 till the close of our civil war a large number of armored gunboats were in this country. The *Galena* was armored with 2½-inch iron plates, and on the *New Ironsides* the armor consisted of 4½-inch plates. In the world-famed *Monitor* the hull was of iron. Its side armor consisted of five 1-inch plates, the deck was formed of two 1-inch plates, and the turret was made up of 11 thicknesses of 1-inch plate. The iron-clad gunboats *Comanche*, *Catskill*, *Jason*, *Lehigh*, *Montauk*, *Nahant*, *Nantucket*, *Passaic*, *Weehawken*, and *Patapsco* came next. The Southern Confederacy built the *Merrimac*, noted for her fight with the *Monitor;* the *Atlanta* and the *Tennessee*. The *Atlanta* was converted from an iron-hulled steamer. To carry the additional weight of her armor, logs were secured to her sides and iron plates fastened to these logs. A central citadel with sloping sides carried the battery. The *Tennessee* was a similar vessel. Her armor on the side of the casemate was in three thicknesses of 2-inch iron plate. In 1864, two monitors then being built for the Confederacy were seized by the United States, and subsequently sold to the British government.

Since the close of the war the building of gunboats for the United States Navy has been most vigorously carried on, especially during the last few years. We take the following data from a report of the Secretary of the Navy dated Nov. 26, 1890. He says, in substance, that, since March 4, 1889, nine new vessels, which were at that time in various stages of progress, have been completed and put in commission. These are the *Chicago*, *Yorktown*, *Petrel*, *Charleston*, *Baltimore*, *Cushing*, *Vesuvius*, *Philadelphia* and *San Francisco*. During the coming winter four more would be added to the list; namely, the *Newark*, *Concord*, *Bennington* and *Miantonomoh*. Of the other vessels which had been authorized prior to March, 1889, the following four monitors were at that time more or less advanced: the *Puritan*, *Amphitrite*, *Monadnock*, and *Terror*; and the *Maine* had been fairly begun. Thirteen other gunboats and armored cruisers, which had been authorized from 1886 to March, 1889, were well advanced in construction, two of which, the *Texas* and *Monterey*, were nearly ready for launching.

Of torpedo boats there is only the *Cushing* placed in commission. She is built of steel, and has developed a speed of 23 knots. A second torpedo boat has been authorized. Twenty more torpedo boats like the *Cushing*, which stands near the head of her class, ought to be built and equipped with effective torpedoes.

To illustrate the extensive use of torpedo boats by foreign nations, the Secretary subjoins the following list of torpedo boats built, building, or projected in 1890 by the governments here named: France 210, England 206, Germany 180, Italy 152, Russia 143, Austria 61, Greece 51, Holland 50, Denmark 34, China 32, Norway and Sweden 31, Turkey 30, Japan 24, Spain 15, Brazil 15.

On June 30, 1890, the Congress of the United States authorized the construction of three first-class sea-going battle-ships. They are required to be built within three years. Their names are: the *Indiana*, the *Massachusetts*, and the *Oregon*. As fighting ships they are calculated to eclipse any ship now used for coast-line defense. Their batteries are the heaviest and most effective of any ship afloat or projected. Although there are now ships of greater size in existence, yet none of them has greater power or efficiency than these three battle-ships.

Protected Cruiser No. 12, of 7,300 tons displacement, was authorized by the same act of Congress and will be finished by May 19, 1893. This vessel will have a sea-speed and a coal endurance hitherto unknown in ships of war. She will be a match for the swiftest trans-Atlantic liner afloat to-day, so that no merchant vessel that she meets can escape from her. Her armament will be 3 rifled guns, 8 rapid-firing guns, 18 machine guns, and 6 torpedo tubes. The heavy protective deck, 4 inches thick on the slopes and 2½ inches elsewhere, covers her vital parts completely.

The navy of the United States contained on July 1, 1890, sixty-five war vessels and 402 armament guns.

The Iron-Clad Fleet of Great Britain was increased while Sir E. J. Reed was chief constructor of the British navy, 1862–69. At and since that time a large number of armored ships were constructed. Twelve battle ships and 82 cruisers and gunboats are completing or building at present, 29 of which are already launched. Seven of the battle ships under construction are of 14,000 tons, displacement. These include the *Royal Sovereign*, *Royal Oak*, *Revenge*, *Resolution*, *Repulse*, *Renown* and *Ramillies*.

The British Navy is, in "Hazell's Annual," 1891, given as comprising 9 battle-ships of 10,000 tons and upward; 12 battle-ships of 9,000 to 10,000 tons; 8 battle-ships of 8,000 to 9,000 tons; 8 battle-ships of 6,000 to 8,000 tons; 8 coast-defense ships of 3,000 to 6,000 tons; and 10 harbor-defense ships of 1,000 to 5,000 tons; 12 armored cruisers of 5,000 to 9,000 tons; and 9 protected and 59 unprotected cruisers.

This array of vessels shows that the British navy is a very formidable one. In fact, it presents the most powerful naval equipment of any nation in the world. Great Britain has at present 203 armored and unarmored ships and 183 gunboats.

The initiation in armored naval construction was, however, taken by France. During the Crimean war Napoleon III ordered the construction of floating batteries protected by iron armor. Five of these batteries were launched in 1855. Each carried 16 guns. The armor consisted of 4½-inch iron plates fastened to an oak backing 2⅔ feet thick. They were successful in quickly silencing some forts at Sebastopol. After some experiments with iron armor France constructed the iron-clad *Couronne*, *La Gloire*, and two other vessels of like design. In 1865 the French built the iron-clad *Ocean*, protected at the water-line with 8-inch armor on 32½-inch oak backing. Her armament consisted of four 23-ton guns and four 15½-ton guns. Three other ships, the *Richelieu*, *Colbert* and *Trident*, plated with 9-inch armor, were built in 1868–69.

After the Franco-German war, France decided to construct 16 first-class, 12 second-class, and 20 coast-service vessels, all of steel. The *Redoutable* was first begun. She was armored with 14-inch plates, and carried six 23-ton guns. The *Dévastation* has an armor of 15 inches, and carries four 12¾-inch guns in the central armored battery; two 10½-inch guns are mounted on half-turrets, and six 5½-inch guns are distributed along the upper deck. She was begun in 1876. The *Admiral Duperré*, begun the same year, is larger than the *Dévastation*. She has an iron belt 21½ inches thick, and an armored deck. On her upper deck are four armored barbettes, each carrying a 48-ton gun. Besides these guns, there are fourteen 5½-inch rifles between decks, and 20 Hotchkiss machine guns.

The second class sea-going iron-clads are represented by the *Duguesclin*, of a similar type with the *Admiral Duperré*, though smaller.

The first-class coast-defense vessels are represented by the *Tonnerre*. She has a complete armored belt, and is covered by an armored deck, above which rises a revolving turret at the fore-end, mounting two 10½-inch guns.

The second-class coast-service vessels, such as the *Tempête*, are much the same, only of less displacement and draught. Previous ships had been armed with a great number of light guns. The new guns being much heavier, they were fewer in number, and could be protected with a smaller area of armor, though the armor was of a thickness corresponding with the size of the guns.

The French Navy contains at present 70 armored ships and gunboats, and 184 unarmored ships and gunboats.

The Italian Navy comprises at present 61 armored and unarmored ships and 26 gunboats. Five of her first-class warships are of tonnages from 12,000 to 15,000. These are the *Italia*, *Lepanto*, *Re Umberto*, *Sicilia*, and *Sardegna*. The *Italia* is the largest warship in the world. Of the smaller ones, the *Duilio*, *Dandolo*, *Lauria*, *Morosini*, and *Doria* have a displacement of 11,000 tons.

Germany has 54 armored and unarmored ships, and 54 armored and unarmored gunboats. Excepting the *König Wilhelm*, the two most powerful ships of the German navy are the iron-clads *Kaiser* and *Deutschland*. They are constructed after the designs of Sir E. J. Reed, and are protected by armor-belts of steel. Each carries 15 guns. The *König Wilhelm* carries 29 guns made of Krupp's hammered steel. Her armor is 12 inches thick. The turret-ships *Friedrich der Grosse* and *Preussen*, have each two turrets, with armor of the thickness of 9 and 10 inches. They carry 6 guns each.

THE AUSTRIAN NAVY contains 30 armored and unarmored ships, and 27 unarmored gunboats, while the Russian navy has 89 armored and unarmored ships, and 54 armored and unarmored gunboats. The Russian circular iron-clads are an interesting but not very successful type of vessels. Many of them carry turrets.

GUNDUCK, or GANDAK, a river of India, rises at the foot of the Dhawalagiri, traverses Nepaul and Bengal, and flows into the Ganges opposite Patna. It is about 400 miles in length, and the lower portion is serviceable for irrigation and boat traffic.

GUNNISON, the capital of Gunnison county, Col., situated on a river of the same name. It is a railroad junction, and is connected by branch roads with Crested Butte and with Baldwin mines.

GUNNY-BAGS, bags made of a coarse jute fabric, and largely exported from India to various parts of the world. American cotton is largely packed in these. They are manufactured at a low price, hence the great demand for them. The name gunny is applied to the cloth as well as to the made-up bags. About 1850 the peasant hand-looms of Lower Bengal met the demand for Indian-made gunny-bags. At the present time the number made at the great steam factories, of which there are now twenty-three in India, far exceeds what is produced by hand-looms. In India gunny-bags are employed for agricultural and internal trade purposes, but many are also sent out of the country filled with grain and other produce. Cloth and bags of the same kind are made in Dundee, Scotland.

GUNS AND GUNNERY. See Britannica, Vol. XI, pp. 297-315. In speaking of guns we understand the large pieces of ordnance called cannons. Modern guns and armored ships have been mostly developed during and since our late war. The 300-pounder rifled Parrot gun and the 450-pounder smooth-bore Rodman gun were produced during the war. The latter had a bore of 15 inches, was 16 feet long, and weighed 20 tons. In 1886 a gun weighing 115 tons was produced, which throws an elongated projectile of 2,300 pounds, weight to a distance of nine miles. This was constructed by Alfred Krupp, in Essen, Prussia. He and Sir William Armstrong, of Newcastle, England, constructed most of the heavy ordnance now used in Europe. Guns weighing 120 tons, and one of the latest even 139 tons, were constructed at Krupp's works since 1886. The last-mentioned gun discharges a projectile of 2,314 pounds, which penetrates wrought-iron plates nearly 4 feet in thickness when fired by a charge of 1,069 pounds of prismatic powder. For a description of this powder and the mode of its manufacture, see Britannica, Vol. XI, p. 329. Still larger guns, capable of firing shells weighing over a ton, are projected by Krupp's successor.

The Krupp guns are now all "built up" by shrinking red-hot steel hoops over a central tube of crucible steel. There is a single layer of hoops around the tube for guns below 9-inch caliber; while the guns of 9-inch caliber and upwards have two layers of hoops protecting the after-parts. The tubes and hoops are forged without weld. The chambers of the guns are slightly larger than the bores. Their rifling consists in shallow grooves, widening a little toward the breech of the gun. Sir J. Whitworth's guns are made of tubes of fluid-compressed steel, over which massive steel hoops are forced either by hydraulic pressure or by shrinkage.

In Sir William Armstrong's system of gun-making, wrought-iron coils are shrunk over a central tube and over one another, so that the central tube is strongly compressed and the outer coils in a state of tension. Wrought iron being twice as strong in the direction of the fiber as across it, the hoops made up of wrought iron bars welded together can resist great circumferential strains.

GATLING'S CAST-STEEL GUN.—Dr. Gatling has invented a new steel gun, which he claims will be far superior to the built-up gun, and can be made at half the cost. The patents consist of making guns cast from the highest grade of steel to shape around a central core. This central core is utilized for the purpose of cooling the casting from the interior while the exterior is still hot. The cooling process thus begins from the interior and works out, directly the reverse of the ordinary way. The metal is forced, as it were, from the interior outwardly, thereby avoiding the creation of a hard, resisting arch on the exterior of the casting, at which point the full intensity of the high-power force exercised by the exploding ingredients within the gun exerts itself. It makes the interior of the gun, where the greatest strain is felt, the toughest and hardest part, and the soft and spongiest part the exterior, which thus acts somewhat after the manner of a cushion. This is directly the reverse of the old style guns, in which the spongiest part is on the interior. Another important point is the method in which the metal is cast. A revolving motion is given it, which makes the grain spiral.

With regard to "quick-firing guns," we insert the following article from "Engineering:"

QUICK FIRING GUNS.—The application of the "quick-firing" principle to guns which may fairly be classed as armor-piercing will probably do more to govern the tactics of naval commanders in any war which may arise in the immediate—if not the distant—future than any other phase of production of warlike *matériel*. For service on shore it has been said that "By the aid of quick firing guns and the position finder we are enabled to carry out the ideal system of defense; viz., few guns in dispersed emplacements concealed by natural features. The system has long been advocated by Sir Andrew Clarke, and it is difficult to see how any further opposition can consistently be offered to it."

For the protection of mine fields the quick firing gun would be invaluable, indeed, the authority we have just quoted considers the operations of sweeping, creeping, or countermining might be rendered absolutely impossible by the fire of quick firing guns. "The only reliable defense against an assailant's in-shore squadron," continues Captain Stone, "will be the extensive employment of quick firing guns of sufficient caliber not merely to annihilate landing or boarding parties, or to send a torpedo boat to the bottom but equal to the task of putting a gunboat *hors de combat*, and either wrecking her or making it possible for the active harbor defense to capture her."

The use of shells charged with explosives more powerful than gunpowder has given additional importance to these projectiles of smaller natures and with the increased development of higher explosives a corresponding development of shell fire may be anticipated. This has already taken effect in the science of war ship design and naval constructors are now looking with less favor on large unarmored surfaces, and indeed the older battle ships with comparatively thin armor, which a year or so ago were considered all but obsolete, are now considered as of some importance in view of the development of quick-firing guns and high explosive shells.

The part which the Elswick firm has taken in the introduction of quick-firing guns is well known. We give two views of a quick-firing gun, of which the following is a description:

This weapon is the 4.7 in. simultaneous loading breech-loading gun, caliber 4.724 in., or 12 cm., firing a shell of 45 lb., with 12 lb. of P. or S. powder. The gun is entirely of steel, its total length 16 ft. 2 in., length of bore 40 calibers and weight 42 cwt.

The breech is closed on the interrupted screw system, and to render the closing and opening more easy and rapid, the breech block is formed in two steps, both of which have portions of an interrupted screw on their surfaces, the threads on one step standing longitudinally opposite to the blank spaces on the other. This is well shown in Fig. 12, the breech block being there swung back. The breech block swings rapidly into place, and is secured by a small turning movement. The gun is fired by electricity. In the base of the cartridge case is screwed an electric primer, against which presses an insulated steel pin, carried in the axis of the breech block. This pin is in communication with the electric wires, which carry the current to fire the primer, only when the breech block is closed, and secured by turning the lever downward against the rear of the block. The circuit is closed, and the charge fired by pulling the trigger of a pistol handle arranged in a convenient position close to the sights.

In case of the failure of the electrical firing gear, each gun is also fitted with a percussion lock, the electric primer in the base of the cartridge is replaced by a percussion primer of the same form, and the steel pin, which in the former case supplied the electrical contact, now serves as a firing needle. The percussion firing gear also has a safety appliance to prevent the charge being fired till the breech is closed and locked. In this manner all danger of accidental discharge is avoided and complete security gained. The gun is mounted in a rocking slide in which it can only move in the direction of recoil. Fixed to this rocking slide is a combined spring and hydraulic buffer arrangement, which serves both to check the recoil and also to run the gun out again after discharge. An arm projects downward from the breech of the gun, and is attached by a nut to the rear of the hydraulic recoil press. The gun itself has no trunnions, but slides in the rocking slide to the extent of the recoil, which is only 9 inches.

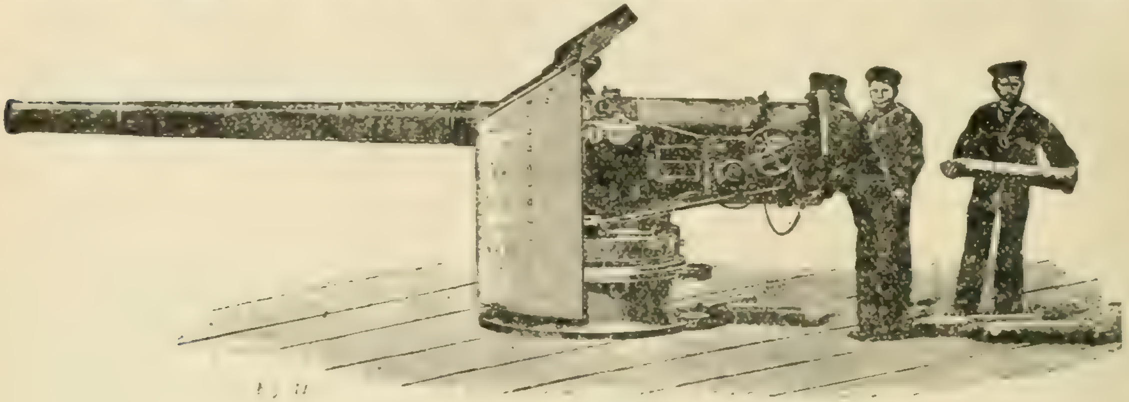


Fig. 11

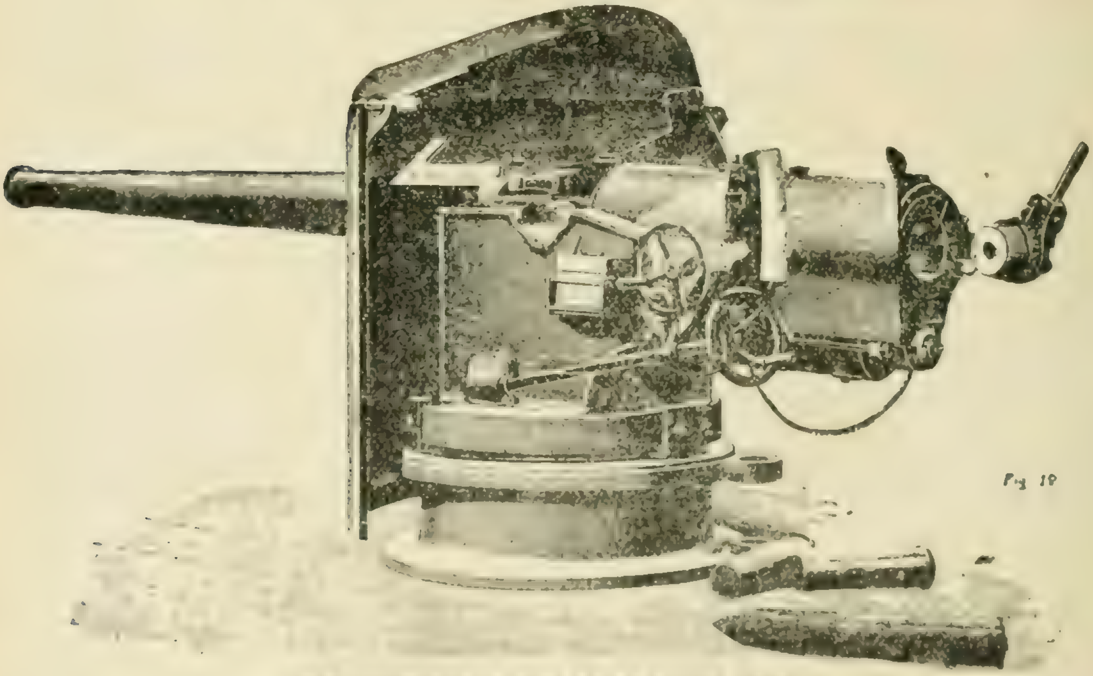


Fig. 12

THE ARMSTRONG 4.7 INCH QUICK-FIRING GUNS.

The action on firing is as follows. The gun slides back within the rocking slide, the recoil being transmitted by the arm to the recoil press, where it is absorbed; the spring in the second cylinder is at the same time compressed.

As soon as the recoil is absorbed the spring begins to act, and pushes the gun back along the rocking slide to its first position. The lower part of the mounting is formed by a strong transverse steel plate or transom, which rigidly supports the mounting and at the same time forms a substantial protection or shield to the base of the structure and the men working behind it. Above this is a light steel shield, covering the detachment from rifle fire, the upper portion being arranged to hinge back so as to admit of a more extended view when using the gun at night.

The under carriage is carried on live rollers running on a [illegible] great for loss of training, which [illegible] by means of a [illegible] rigidly connected to the under carriage or by a worm wheel training gear, worked by a hand wheel at the sighting or firing post. [illegible] on the bed plate is provided, so as to fix the [illegible] at any desired point of training. The elevation and de[illegible] require very little power, as the [illegible] and [illegible] are accurately balanced on their trunnion [illegible]. The rack and pinion gear for this purpose is worked by an elevating hand wheel close to the training-wheel, and [illegible] sighting or firing position.

[illegible] specially to the quick firing guns [illegible], however, [illegible] cartridge [illegible] separately.

The [illegible] or, at any rate, the [illegible] of the Hotchkiss, [illegible]. The Hotchkiss [illegible], however, [illegible] projectile of 6 lb., [illegible] torpedo boats and un[illegible]. This class of gun [illegible] could hardly be used with effect against [illegible] which could be dignified with the name of [illegible].

The [illegible] gun has been described as that which possesses [illegible] for firing shells with [illegible] charges, while it could, when re[illegible] with great rapidity to repel a flotilla of attacking vessels.

[illegible] compared with the weapons we are now considering. With the 4.7-in., 5.5-in., and 6-in. guns the projectiles [illegible] or even [illegible] lb. The rate of fire has been found in actual practice to be from six rounds per minute with the 6-in. gun to fourteen rounds per minute with the 4.7-in. gun. If we compare the rate of fire of these guns with that obtained from the ordinary breech-loading guns in the service, we find that some experiments carried out on [illegible] by the admiralty gave ten rounds in 47 seconds from the 4.7-in. quick firing gun, while the 5-in. ordinary breech-loader took [illegible] minutes 7 seconds to discharge the same number of rounds.

It is unnecessary to dwell on the advantages of rapidity of fire in action. It was [illegible] which contributed so much in times past to naval victories.

In this epoch of [illegible], however, we must depend on the brains of our inventors rather than the muscles and nerves of our seamen to give like results; although we by no means wish to say that the day for nerve and muscle is past. Indeed, the value of cool and disciplined courage was never more apparent in the past than it will be in the next great naval war.

Hardly any superiority in *personnel* could compensate for the disadvantage in [illegible] of a gun requiring over five minutes for what another would accomplish in 47 seconds; and it is obvious, therefore, that we must have quick-firing guns in spite of minor objections that may be raised against them, such as difficulties on account of smoke—when smokeless powder is not used—or in getting the ammunition to the gun with sufficient rapidity.

Naval authorities have not been slow to acknowledge the advantages of the new principle, and large orders for the navy for 4.7-in. and 6-in. guns have been given to the Messrs. Armstrong, the results of which are very plainly visible just now in the Elswick shops.

We have already described the mechanism of this gun, but there are some points in the design put forward by the makers to which attention may be called. By the interrupted screw system of breech-closing two advantages are secured. First, the action of opening and closing the breech is much simplified, as the breech piece need not be withdrawn before swinging away; and, secondly, the coned shape of the breech screw enables it to take hold, not only of the inner surface of the metal of breech piece or jacket, but also distributes the engagement, and therefore the strain and support, through a considerable thickness of the gun.

The breech screw is further arranged so that the threads of the small end of the cone correspond longitudinally with the [illegible] spaces of the larger end, and *vice versa*, so that the strain and support are also distributed throughout the whole circumference of the breech screw, instead of, as formerly, half the circumference being lost by the interrupted spaces. [illegible] the labor of training and elevating is reduced to a minimum. A shoulder crutch and a pistol trigger is provided, and the piece can be handled by a single man with the same ease as the small Hotchkiss 6-pounder.

The [illegible] is so arranged that the man aiming can alter the position of the gun up to the very instant of firing, and also [illegible] of the gun working and sighting gear during the action, discharge, or throughout any number of rounds. Naval officers will not be slow to appreciate the advantage secured by this arrangement under the varying conditions of action at sea.

The carriage allows the gun to recoil always in the line of fire, and the fixings and deck are thus to a large extent relieved of the ordinary recoil strains. After discharge the gun returns instantly and automatically to firing position. A [illegible] shield of steel, 1½ in. thick, is provided in front, and protection is thus given to the men serving the gun.

In the ammunition the principle of the ordinary rifle cartridges has been extended to these guns, the projectile and powder charge forming only one piece. The powder is put into a solid drawn brass cartridge, in the mouth of which the projectile is fixed, so that the whole can be handled together. A great saving of time and labor is thus effected, and the incidental advantages of increased safety and the immunity of the powder from climatic deterioration are also secured. To the fact of the projectile and charge being thus placed in the gun at the same time is due the title of "simultaneous loading" which has been applied to these guns. To the improvement in the ammunition the quick rate of firing is very largely to be attributed. The solid drawn cartridge cases, owing to their great size, have presented difficulties in manufacture, but these have been now surmounted, and it is found in practice that they can be fired as many as ten times over without need of reforming.

In apportioning the ammunition for these guns, penetrating shell will constitute a very large proportion of the whole equipment.

Side by side with the improvement in the guns and mountings have gone new discoveries and developments of gun powder. That specially designed for use in these guns is practically smokeless—an inestimable advantage where rapid firing is an essential—and the hanging smoke which makes good aiming impossible is thus almost entirely avoided. The pressures obtained with it are very uniform, and the velocities very high, ranging up to 2,450 ft. or 2,500 ft. per second.

One of the principal reasons that led to so large an employment of quick firing guns in naval services was the necessity of being able to cope instantly and effectually with the attack of torpedo boats. The very high rate of speed possessed by the modern torpedo boat, while increasing its powers of offense, has at the same time diminished the risk of its being hit. It not only remains a much shorter time exposed to fire when making its attack, but its rapid motion necessitates a great alteration of aim between each round fired at it, and a corresponding likelihood of error.

Suppose a torpedo boat to be sighted at a distance of 1,500 yards by a war vessel having a broadside armament of three service 5-in. breech-loading guns, each capable of firing two rounds a minute. It is estimated that the torpedo boat could not hope to discharge a torpedo with much certainty at a longer range than 200 yards; and would, therefore, have to traverse a distance of 1,300 yards under fire before she could begin the attack.

Assuming the speed of a first-class torpedo boat to be twenty knots an hour, which is certainly a high figure, the time occupied in traversing 1,300 yards would be, roughly speaking, two minutes. The war vessel, therefore, armed with a broadside of three 5-in. guns, each firing two rounds per minute, would be able to discharge twelve shots at the torpedo boat before there was a chance of her being torpedoed. If, however, in lieu of the three service 5-in guns, she was armed with three of the improved Armstrong 4.7-in. 45 pounders, she could in the same time fire no less than seventy-two shots, each gun being capable of firing twelve shots a minute.

Besides the advantage of being able to fire six times as often, there is the collateral one of a very slight alteration of aim being required in one case and a very considerable one in the other. Between the rounds of the 5-inch breech-loading gun, the torpedo boat would move 340 yards, and the aim would have to be correspondingly altered; while between the rounds of the 45-pounder gun she would only move thirty yards, and a very slight alteration would be required, and a successful shot could thus be instantly repeated.

But although it was the torpedo boat which first gave such an impetus to the introduction of the quick-firing gun, the weapon has been so largely developed in the progress of time that it now holds a much higher position, and cannot fail to play an important part in encounters between important war vessels in the future.

DYNAMITE GUNS.—Concerning the dynamite guns which form the equipment of the fast cruiser *Vesuvius*, we append the following remarks: An official test of these guns was made under the direction of Commodore Goodrich in November, 1889, and the commodore reported that the test was successful beyond anticipation. According to an account in the "Army and Navy Gazette," by one who has been present at the test, these trials have demonstrated that the *Vesuvius* can fire 30 shells—all she can carry—without stopping to fill the air reservoirs. The shells were about 7 feet long, and 10 inches in diameter, holding 200 pounds of explosive gelatine, and weighing respectively 483, 504 and 505 pounds. The performance of these guns as to range and rapidity of flight of the projectiles was nearly twice as great as was demanded by the contract.

The eye-witness concludes by saying, "A vessel that can deliver and explode three tons of high-class dynamite a distance of a mile with any approach to accuracy is a most formidable agent for attack and defense."

GÜNTHER, ALBERT CHARLES LEWIS GOTTHILF, a German-British naturalist and author, born in 1830. In 1858 he became connected with the zoological department of the British Museum, and since 1875 has been director of that department. He is the author of many valuable works on fishes, reptiles, and batrachians, and from 1864 to 1870 edited the *Record of Zoological Literature*.

GURLEY, RALPH RANDOLPH, born at Lebanon, Conn., May 26, 1797, died at Washington, D. C., July 30, 1872. He graduated at Yale in 1818; went to Washington, and was there licensed to preach as a Presbyterian. He was agent and secretary of the American Colonization Society from 1822 till his death, and was one of the founders of Liberia. He delivered addresses throughout the country in the interests of the society, went to England and visited Africa three times. He was for a long time editor of "The African Repository." Author of *Life of Jehudi Ashmun* (1839); *Mission to England* on behalf of the American Colonization Society (1841); and *Life and Eloquence of Rev. Sylvester Larned* (1844).

GURNEY, JOSEPH JOHN (1788–1847), an English philanthropic Quaker. In 1818 he became a minister of the Society of Friends, and then devoted his life to the prosecution of benevolent enterprises, including the prison reforms of his sister, Mrs. Elizabeth Fry. Among his numerous works are *Notes on Prison Discipline* (1819); *Observations on the Religious Peculiarities of the Society of Friends* (1824); and *A Winter in the West Indies* (1840).

GURNEY, SIR GOLDSWORTHY (1793–1875), an English chemist and inventor. In 1822 he lectured on chemistry at the Surrey Institute. Among his important inventions are the lime light, the magnesium light, the Bude and the oil-gas light, a high pressure steam-jet and the tubular boiler, and a steam carriage. His high-pressure steam-jet was subsequently used to ventilate coal mines, and in 1849 to exhaust the poisonous gases of the sewers of London. In 1852 he took charge of ventilating the new house of Parliament, and accomplished it by methods of his own. He was knighted in 1863.

GUROWSKI, ADAM, COUNT, born at Kalisz, Poland, Sept. 10, 1805, died at Washington, D. C., May 4, 1866. Expelled from the gymnasia of Warsaw and Kalisz for participating in revolutionary demonstrations, he continued his studies at German Universities. In 1825 he returned to Warsaw, assisted to organize and took part in the unsuccessful revolution of 1830, and at its close escaped to France. In 1835 he published *La Vérité sur La Russie*, which was favorably received by the Russian government, and he was recalled and employed in the civil service. In 1844 he went to Heidelberg, and devoted himself to study; afterwards he lectured in the University of Berne, Switzerland, spent some time in Italy, and in 1849 came to the United States. He was translator in the State Department at Washington from 1861 to 1863. Among his works published in the United States are: *Russia as It Is* (1854); *The Turkish Question* (1854); *A Year of the War* (1855); *America and Europe* (1857); *Slavery in History* (1860); and *My Diary*, notes on the civil war (3 vols., 1862–66).

GUTHRIE, JAMES, born in Nelson county, Ky., Dec. 5, 1792, died in Louisville, March 13, 1869. He was educated at Bardstown, Ky., studied law, and in 1820 commenced practice in Louisville. He was a member of the State legislature from 1827 to 1840, and was president of the convention that framed the present constitution of the State; was secretary of the United States Treasury in 1853–57, and United States Senator in 1865–68.

GUTHRIE, SAMUEL, chemist and inventor, born at Brimfield, Mass., in 1782, died at Sackett's Harbor, N. Y., Oct. 19, 1848. He invented and first manufactured a lock which took the place of the old flint-lock in fire-arms, and was one of the original discoverers of chloroform. His process of producing chloroform, which he termed "spirituous solution of chloric ether," was tested by the elder Silliman at Yale College in 1831, and a committee of the Medico-chirurgical Society of Edinburgh awarded him the merit of having first published an account of its effects as a diffusible stimulant.

GUTTIFERÆ, or CLUSIACEÆ, a natural order of exogenous plants, consisting of trees and shrubs, natives of tropical countries, generally secreting an acrid yellow resinous juice. A few are epiphytes. The leaves are opposite, destitute of stipules, leathery and entire. This order is allied to *Hypericineæ*. It contains about 150 known species, the greater part of them South American. The resinous secretions of some are valuable, and a few species afford valuable timber. The flowers of some are very fragrant; those of *Messua ferrea* are found in a dried state in every bazaar in India, and used as a perfume. The fruit of some is very highly esteemed.

GUYOT, ARNOLD, geographer, born in Switzerland in 1807, died at Princeton, N. J., Feb. 8, 1884. He took the degree of Ph. D. at Berlin in 1835; was the colleague of Agassiz at Neuchatel in 1839–48, and in the latter year accompanied him to America. He delivered a course of lectures at Lowell Institute, Cambridge, which were translated and published as *Earth and Man*, in 1853; in 1854 was appointed professor of physical geography and geology at Princeton, which position he occupied until his death, being for some time senior professor. He had the management of the meteorological department of the Smithsonian Institution, where he delivered several courses of lectures, and in connection with which he published *Meteorological and Physical Tables* (revised ed., 1884). His other works include: *A Treatise on Physical Geography* (1873); *Creation, or the Biblical Cosmogony in the Light of Modern Science* (1884); and a number of valuable biographical memoirs.

GUYSBOROUGH, a seaport town, capital of Guysborough county, N. S., situated near the head of Chedabucto Bay, about 120 miles east-northeast of Halifax. It has a commodious harbor, and important industries of fishing and gold-mining. It is also the seat of a large academy.

GUY'S HOSPITAL, London, England, was founded by Thomas Guy (see Britannica, Vol. XI, p. 341), who leased from the governors of St Thomas's hospital, a large piece of ground for a term of 999 years, at a ground-rent of £30 a year. The hospital admitted its first patient in 1725, a few days after the death of its founder. In 1829 Mr. Hunt bequeathed to the hospital £190,000, and additional bequests to the amount of £10,000 have since been received. There was at first room for about 400 patients; now 700 can be accommodated. The yearly average of patients is over 5,000; the out-patients relieved may amount to above 80,000. The annual income is about £40,000. Students enter the hospital for study, attending clinical practice, lectures, etc., and paying annual fees. A library and valuable museums are attached to the hospital. New wards, with tall towers for ventilation, were built in 1852, and a chemical laboratory in 1872. A dental school for complete instruction in dental surgery and mechanics and a residential college for the accommodation of fifty students and the junior medical staff have recently been added. In the chapel is a fine marble statue of Guy, by Bacon, which cost $5,000. Sir Astley Cooper, the eminent surgeon, is buried in the chapel.

GUZMAN-BLANCO, ANTONIO, born in Caracas in 1830, was banished for his share in political disturbances, and, after taking a prominent part in two invasions, became vice-president of Venezuela in 1863. Driven from office in 1868, he headed a revolution which restored him to power in 1870, and for many years he was virtual dictator of the country, though not continuously occupying the position of president. In 1889, however, popular discontent was aggravated by reports of corrupt contracts made in Paris; and Blanco, who was then acting as envoy to all the European powers, was practically deposed by Congress, which refused to accept the resignation of his former *protégé* and present rival, Dr. Rojas Paul.

GWIN, WILLIAM MCKENDREE, born in Sumner county, Tenn., Oct. 9, 1805, died in New York City, Sept. 3, 1885. He received a classical education, took his degree of M. D. in 1828 at Transylvania University, and removing to Clinton, Miss., obtained an extensive practice. He was appointed United States Marshal for the district of Mississippi in 1833, and in 1840 he was elected to Congress as a Democrat. In 1849 he removed to California, where he took an active part in favor of the formation of a State government. He was elected United States Senator for the long term; was reëlected, and served till March 3, 1861. In 1863 he went to Paris, and becoming interested in a scheme to colonize Sonora, Mexico, with Southerners, spent the two following years in an unsuccessful attempt to carry out his plan. He afterwards returned to his home in California, and continued to take an active part in politics.

GWINNETT, BUTTON, born in England about 1732, died in Georgia, May 27, 1777. He received a good education, was for a time engaged in mercantile pursuits in Bristol, England; emigrated to Charleston, S. C., and in 1770 purchased a plantation on St. Catherine's Island, Ga., and engaged in agriculture. He took an active part in the political questions of 1775, was elected a representative to the General Congress in 1776, and signed the Declaration of Independence. He was reëlected for the ensuing year, was appointed a member of the State government, and president of the provincial council. His death resulted from a duel with Gen. McIntosh, fought May 15, 1777.

GYMKHANA, a Hindoostanee word, meaning "variegated sports," used in the United States to indicate a peçuliar kind of pony races. Pony racing as an organized sport was introduced into the United States in 1890, and at once became very popular. In the first year of its existence eight association races meetings were held in New York and New Jersey, and at these the gymkhana races furnished a great deal of amusement. Although the American gymkhana consists only of pony races, the conditions are somewhat novel. Thus, in one, called a "saddling and dressing race," the ponies are held in position by the grooms, while beside them on the turf are the saddles, and the coats and waistcoats of the riders. When the starting signal is given, the grooms let go the horses' heads, and the riders are required to saddle and girth the rearing animals, and put on and button up their coats and waistcoats before getting away. In another, the "cigar and umbrella race," each rider is supplied with a cigar, a box of sulphur matches and a brightly colored umbrella. Each must light his cigar and raise his umbrella after the starting signal is given, and before mounting, and the winner must finish with his cigar alight and with his umbrella still open and uninjured. In the "egg and spoon race," each rider is required to carry an egg in a large wooden spoon from start to finish. If he drops the egg he must return to the starting point, secure a fresh egg, and start anew. In one of these races contested on Long Island in 1890, the winner dropped no less than six eggs, winning the race with the seventh. In the "manikin race," the manikins are men of straw, with pale canvas faces, weighing eighty pounds each. After the starting signal is given each rider must pick up a manikin, mount with him, and carry him to the finish. In the "polo ball and bucket race," each contestant at various places along the course drops a polo ball into a bucket being required to drop a ball into each bucket before passing to the next. In the "ball and mallet race," each rider is required to drive his ball from start to finish as in polo. But perhaps the most amusing of all the gymkhana races is the "ginger beer and bath bun race," in which, after the starting signal is given, each contestant rides up to a high table upon which a bottle of ginger beer and a hard dry bun are placed for each rider, who must eat the bun and drink the beer before proceeding with the race.

GYMNOCLADUS, a genus of trees of the natural order *Leguminosæ*, sub-order *Cæsalpineæ*. *G. Canadensis* is a North American tree, found both in Canada and over a great part of the United States, attaining a length of fifty to sixty feet, with upright branches and a rough bark. The leaves of young trees are very large, three feet long, bipinnate, and armed with thorns. The flowers are white, in short spikes, the pods five inches long by two broad. It is sometimes called the *Kentucky Coffee-tree*, because the seeds were formerly roasted and ground as coffee in Kentucky. It grows well in Britain. The wood is used both by cabinet-makers and by carpenters. It has very little sap-wood. The pods, preserved like those of the tamarind, are said to be wholesome and slightly aperient.

GYMNODONTS, a group of plectognath fishes, distinguished by having teeth united into an ivory-like substance resembling a beak. The different species are eccentric in form; most of them can distend themselves into a more or less globular shape. Some are covered with spines or prickles, and in others the body is truncated behind. The group contains several families, as *Tetrodontidæ*, *Diodontidæ*, *Molidæ*, etc.

GYMNOGENS, Lindley's term, now obsolete, for the Gymnosperms.

GYPSUM. See Britannica, Vol. XI, p. 351.

GYPSY-WORT (*Lycopus Europæus*), sometimes also called water horehound, a perennial plant of the natural order *Labiatæ*. It is a tall erect branching plant, slightly hairy, with a creeping root-stock. It is found in Britain, on the Continent, in Russian and Central Asia, and North America, and is regarded as a febrifuge and stringent. It dyes a permanent black. The bugle-weed of North America (*L. virginicus*) has more powerfully astringent properties.

H

HABAKKUK—HÆMATEMESIS

HABAKKUK, Old Testament prophet. See Britannica, Vol. XI, p. 356.

HABIT AND REPUTE, a phrase used in Scotch law to denote something so notorious that it affords strong and generally conclusive evidence of the facts to which it refers. The best-known example of this is where a man and woman cohabit as husband and wife, and are reputed by the neighbors to be married, in which case the law of Scotland accepts the cohabitation and the proof of public opinion as evidence that a marriage has been contracted by the parties by the interchange of consent. In England no such doctrine prevails, and the marriage would have to be proved in the usual way, if called in question, by a suit which directly raises such question. There is also in Scotland an application of the doctrine of habit and repute to persons when convicted of stealing; for if the individual is a habit and repute thief—that is, a notorious thief—the repute that the accused gets his livelihood or supplements it by thieving is technically an aggravation of the offense, and may be charged and proved as such.

HABITATION: in Roman law, a servitude by which a person could only use a house as a habitation or dwelling-house, and for no other purpose.

HACKBERRY, fruit of the nettle-tree; sometimes called "sugar-berry." See Britannica, Vols. XI, p. 360; XVII, p. 360.

HACKENSACK, a railroad center and the county-seat of Bergen county, N. J., located on the Hackensack River, 13 miles from New York. It has several factories, gas, and water works.

HACKETTSTOWN, a railroad junction of Warren county, N. J., situated on the Musconetcong River. It contains the Newark, M. E. Conference Seminary, a car manufactory, foundries and several carriage manufactories.

HACKLÄNDER, FRIEDRICH WILHELM VON, German novelist and comedy writer, born at Burtscheid, near Aix-la-Chapelle, Nov. 1, 1816, died at Munich, July 6, 1877. He commenced his literary career with the publication of *Bilder aus dem Soldatenleben* (1841), and three years later followed up his success with *Das Soldatenleben im Frieden* (9th ed., 1883). He accompanied Baron von Taubenheim on his travels to the East, and in 1843 was appointed private secretary to the crown-prince of Würtemberg, with whom he traveled in the succeeding years. In March, 1849 he went to Italy, and was present with Radetzky's army during the campaign in Piedmont. From 1859 he lived chiefly in Stuttgart. The best of his longer novels are *Handel und Wandel* (1850); *Eugen Stillfried* (1852); and *Namenlose Geschichten* (1851). His best comedies are the *Geheimer Agent* (1850), which has been performed throughout Germany, and translated into several European languages; and *Magnetische Curen* (1851).

HADDAM, one of the county-seats of Middlesex county, Conn., on the west bank of the Connecticut River. It has extensive granite quarries.

HADDOCK, a species of codfish. See Britannica, Vols. XI, p. 369; XII, p. 691.

HADDON HALL, an old English baronial mansion, the seat successively of Avenells, Vernons, and the Rutland family. It stands on a slope overlooking the Wye in Derbyshire, 23 miles north-northwest of Derby. The styles of architecture range from Norman to the 16th century. Reference is made to it in Scott's *Peveril of the Peak*.

HADES, the Greek name for the under-world. See Britannica, Vols. VIII, p. 536; XX, p. 114; XIV, p. 646.

HADROSAURUS, the name given to a very large Dinosaurian of the cretaceous epoch, whose remains have been found in the United States, especially in New Jersey.

HAECKEL, ERNST HEINRICH, a German naturalist, born at Potsdam, Feb. 16, 1834. He studied natural science and medicine at Würzburg, Berlin, and Vienna, and soon became distinguished for his enthusiasm and originality in zoölogical studies. After working for a time at Naples and Messina, he became a privatdocent in the University of Jena in 1861, a professor *extraordinarius* in 1862, and an ordinary professor of zoölogy in 1865. In this position he has remained, working indefatigably in his zoölogical institute, and by his lectures rendering the University a very famous school for biological science. Haeckel has devoted his life to applying the doctrine of evolution, and has brought forward many interesting facts in support of the theory. The most important of his numerous systematic works are: *Die Radiolarien* (1862); *Die Kalkschwämme* (1872); *System der Medusen* (1879); and his contributions to the *Challenger Reports* on *Deep-Sea Medusæ* (1882); *Siphonophora* (1888); and *Radiolaria* (1887). Among general works may be noted *Generelle Morphologie* (2 vols., 1866); and *Perigenesis of the Plastidules* (1876). His most important expository works are his *Natural History of Creation* (*Natürliche Schöpfungsgeschichte*, 1868); *The Evolution of Man* (*Anthropogenie*) (1874); and lectures on development and evolution, *Gesammelte Populäre Vorträge auf dem Gebiete der Entwickelungslehre* (1878–79).

HÆHNEL, ERNST JULIUS, a German sculptor born at Dresden in 1811. He studied architecture, but in 1830 he went to Munich and became a sculptor. Being recalled to his native city in 1838, he made many sculptures for the new theater there. Among these are the statues of Sophocles, Aristophanes, Molière and Shakespeare, and a bas-relief of Bacchus. Afterwards he prepared a statue of Beethoven, now in Bonn; a statue of Charles V, for the University in Prague; and for the new museum at Dresden he made six statues: Alexander the Great, Lysippus, Michel Angelo, Dante, Raphael, and Peter von Cornelius. After 1858 he made statues of the four Evangelists for the cathedral tower in Dresden, an equestrian statue of Prince Schwartzenberg for Vienna; a bronze statue of Leibnitz for Leipsig; and many other statues for his native city. Hähnel has been a member of the academy at Dresden since 1842, and a professor since 1848.

HÆMATEMESIS (Gr. *haima*, "blood," and *emesis*, "vomiting"), the ejection of blood from the stomach by vomiting. Its most common causes are gastric ulcer, congestion of the stomach or the neighboring portions of the alimentary canal, and certain conditions of the blood, as in yellow fever, purpura, and sometimes in typhus.

HÆMATOZOA (Gr. *haima*, "blood," and *zoon*, an "animal"), parasites occurring in the blood. See PARASITISM, Britannica, Vol. XVIII, pp 258–71.

HÆMODORACEÆ, an order of monocotyledons, consisting of herbaceous plants with fibrous roots and sword-shaped leaves, differing from *Iridaceæ* in habit, and in having the stamens six in number, or, if only three, opposite to the petals. There are about 50 known species, chiefly natives of America, South Africa and Australia. Some of them have beautiful liliaceous flowers. A red color exists in the roots of some; hence the name blood-root has been given to them. In this order are ranked the vellozias, or tree-lilies.

HÆMOPTYSIS, expectoration of blood. See PHTHISIS, Britannica, Vol. XVIII, p. 857.

HÆRETICO COMBURENDO, DE, an old writ in English ecclesiastical law for burning a heretic. See Britannica, Vol. XI, p. 737.

HAGGAI. See Britannica, Vol. XI, p. 370; Vol. XIII, p 418.

HAGGARD, HENRY RIDER, English novelist, born at Bradenham Hall, Norfolk, June 22, 1856, and educated at Ipswich Grammar School. At the age of nineteen he accompanied Sir Henry Bulwer to Natal as his private secretary, and subsequently served in a similar capacity under Sir Theophilus Shepstone, commissioner to the Transvaal. On his return to England he settled down to a literary life. He published *Cetewayo and His White Neighbors* (1882); *Dawn* (1884); and *The Witch's Head* (1885). The publication of *King Solomon's Mines* (1886) won for him great popularity, which was further increased by the appearance of *She* in 1887. *Jess*, *Allan Quatermain*, *Maiwa's Revenge*, *Mr. Meeson's Will*, *Cleopatra*, *Allan's Wife*, and *Eric Brighteyes*, are among Mr. Haggard's recent writings.

HAGEN, HERMANN AUGUST, a Prussian entomologist, born in 1817. In 1840 he received a medical degree from the University at Königsberg, and later studied in Paris, Berlin and Vienna. He devoted much attention to entomology, and in 1834 published a paper on *Prussian Odontata*. For some time from 1843 he practiced medicine at Konigsberg, and for three years was the first assistant at the surgical hospital. From 1863 to 1867 he was vice-president of the city council. In 1870 he was made professor of entomology at Harvard University, Cambridge, Mass. He has written upwards of four hundred articles on scientific subjects.

HAGERSTOWN, a city and the county-seat of Washington county, Md. It lies in the fertile Cumberland valley, 86 miles west of Baltimore. It is the terminus of the Shenandoah Valley Railroad and of a branch of the Baltimore and Ohio system. The Cumberland Valley Railroad and the Western Maryland Railroad run through the town. Hagerstown has a fine court-house, a jail, and an academy of music; also a free library, public water works, banks, hotels, churches, seminaries and public schools. Several newspapers are published here. This town is a local center of high social refinement, the population being mostly of American birth, many of German descent. The chief manufactures are furniture, wheels, doors, sashes, castings, farm tools, brooms, cigars and fertilizers. Population in 1890, 11,698. See Britannica, Vol. XI, p. 370.

HAHN-HAHN, IDA MARIA LOUISA FREDERIKA GUSTAVA, COUNTESS, a German author, born at Tressow, Mecklenburg-Schwerin, June 22, 1805, died at Mainz, Jan. 12, 1880. At the age of twenty-one she married a relative; was divorced three years later, and subsequently traveled much in Europe and the East. In 1850 she embraced Roman Catholicism, and two years later entered a convent at Angers. The best known of her novels are *Gräfin Faustine*, *Ulrich* and *Clelia Conti*. Her later writings were on religious subjects.

HAIMHALDARE, an old Scotch law term, meaning to recover one's goods and bring them home again—now disused.

HAIMURA (*Erythrinus macrodon*), a large fresh-water fish of Guiana. It measures from 3½ to 4 feet in length; its flesh is well flavored, and at times it forms the principal article of food with the Indians. It is very voracious. The jaws are powerful, and the teeth are large and can inflict serious wounds.

HAIR GRASS (*Aira*), a genus of grasses having delicately panicled inflorescences, bearing spikelets with two unequal glumes and two perfect flowers, each with two thin membranous bracts, of which the outer is generally awned. The species are natives of temperate and cold climates. Five species are natives of Britain, and are chiefly found in situations where the soil is unfertile. The tufted hair-grass, or tufted grass (*A. cæspitosa*), common in better pastures and meadows, is a beautiful grass when in flower. It attains a height of 2 to 4 feet, and is sometimes used for thatching ricks of hay or corn. It grows luxuriantly in moist situations, and indicates a badly drained soil. This grass is sometimes sown to form cover for game, particularly hares.

HAIR-POWDER, a pure white powder made from pulverized starch, scented with violet or some other perfume, and in the 17th and 18th centuries largely used in England for powdering over the head. The fashion became universal among the higher and middle classes, and by ladies as well as gentlemen. To make the powder hold, the hair was usually greased with pomade, and accordingly the fashion was extremely troublesome. An act of Parliament fixed that the powder should be made from starch alone, and on November 20, 1746, fifty-one barbers were fined £20 each for keeping hair-powder not made from starch. In 1795 a tax was put on hair-powder, and it was not repealed until 1869. At the time of its abolition it was paid by about 800 persons, and yielded a revenue of about £1,000 a year.

HAIR-TAIL, a long thin sea-fish. See Britannica, Vol. XI, p. 377.

HALDEMAN, SAMUEL STEHMAN (1812–80), an American naturalist. From 1837 to 1842 he was engaged on the Pennsylvania geological survey, and during that time prepared five annual reports. In 1842–43 he was engaged in delivering lectures on zoölogy at the Franklin Institute in Philadelphia, and in 1851 was made professor of natural sciences in the University of Pennsylvania. In 1855 he became professor in Delaware College. From 1869 to his death he was professor of comparative philology in the University of Pennsylvania. Besides many articles on philology, conchology, entomology, geology, chemistry, and palæontology, he published *Fresh-Water Univalve Mollusca of the United States* (1840); *Zoölogical Contributions* (1842); *Elements of Latin Pronunciation* (1851); *Tours of a Chess Knight* (1865); *Affixes in their Origin and Application* (1865); *Rhymes of the Poets* (1868); *Pennsylvania Dutch* (1872); *Outlines of Etymology* (1877); and *Word-Building* (1881).

HALE, BENJAMIN (1797–1863), an American educator. In 1822 he was licensed to preach as a Congregationalist, and in 1823 became tutor in Bowdoin, but subsequently became principal of the Gardiner Lyceum. From 1827 to 1835 he was professor of chemistry and mineralogy at Dartmouth;

from 1836 to 1858 he was president of Hobart College, Geneva, N. Y., resigning in the latter year on account of feeble health. He wrote *Introduction to the Mechanical Principles of Carpentry* (1827); and *Scriptural Illustrations of the Liturgy* (1835).

HALE, Edward Everett, an American author and Unitarian divine, born in 1822. He was licensed to preach in 1842; from 1846 to 1856 was pastor of the Church of the Unity in Worcester, Mass., whence he was called to the South Congregational (Unitarian) church in Boston. He has been a constant contributor to periodical literature, and has edited the Boston "Daily Advertiser," the "Sunday-School Gazette," the "Christian Advertiser," the "Old and New," and the "Lend a Hand;" a *Record of Progress and Journal of Organized Charity*. Besides numerous other writings he has published *The Rosary* (1848); *Margaret Percival in America* (1850); *Sketches of Christian History* (1850); *Letters on Irish Emigration* (1852); *If, Yes, and Perhaps* (1868); *Ten Times One is Ten* (1870); *Our New Crusade* (1875); and *The Kingdom of God* (1880).

HALE, Eugene, a United States Senator, born in 1836. He was admitted to the bar in 1857; was for nine successive years county attorney for Hancock county, Maine; was a member of the State legislature in 1867, 1868 and 1880; and was a member of the 41st, 42d, 43d, 44th, and 45th Congresses. He was elected to the United States Senate as a Republican; took his seat March 4, 1881, and was re-elected in 1887. His term of service expires March 3, 1893.

HALE, John Parker (1806–73), an American statesman. He was admitted to the bar in 1830, and in 1832 was elected to the New Hampshire legislature. From 1834 to 1841 he was United States district attorney, and from 1843 to 1845 was a member of Congress. In 1847 and again in 1855 he was United States Senator, and in 1865 was minister to Spain. In 1852 he was the Free-soil party's candidate for President, and received 157,685 votes.

HALE, Nathan (1755–76), an American soldier. He graduated at Yale in 1773, and then taught school in East Haddam, and later in New London, Conn. At the beginning of the Revolutionary war he enlisted as a volunteer, and became a lieutenant in Col. Charles Webb's regiment. In January, 1776, he was made a captain, and a little later held a similar post in a company in the "Connecticut Rangers." On Gen. Washington's call for a volunteer to enter the British lines and procure intelligence Capt. Hale responded, and disguised as a schoolmaster and loyalist, he visited all the British camps in New York and on Long Island. He obtained the needed information, but when about to return he was arrested and condemned to be executed before sunrise on the next morning. The execution took place in Col. Henry Rutgers' orchard, near the junction of East Broadway and Market Street, New York city. Capt. Hale's last words were: "I only regret that I have but one life to lose for my country."

HALE, Nathan (1784–1863), an American journalist. He was admitted to the Connecticut bar in 1810, and in 1814 became an editor of the "Boston Weekly Messenger." The same year he purchased the "Boston Daily Advertiser," and continued as its chief editor until his death. He was a founder of the "North American Review" in 1815, and of the "Christian Examiner" in 1828, and in 1840 he edited and published the "Monthly Chronicle." For nineteen years he was president of the Boston and Worcester Railroad, and in 1846 was chairman of the commission for introducing water into the city. He was at various times a member of the legislature, and held important offices in various literary organizations. He published *Journal of Debates and Proceedings in the Massachusetts Constitutional Convention* (1821), besides numerous pamphlets on public improvements.

HALE, Sarah Josepha (Buell) (1788–1879), an American authoress. From 1828 to 1837 she edited the Boston "Ladies' Magazine," and when this periodical was united with "Godey's Lady's Book," published in Philadelphia, she became editor of this magazine. In 1877 she retired from editorial work. Mrs. Hale was the author of *Woman's Record, or Sketches of All Distinguished Women from the Creation to the Present Day* (1853); *Northwood* (1827); *Sketches of American Character* (1830), and a number of other useful and entertaining works in prose and verse. Among her fugitive pieces *Mary's Lamb* is one of the most widely known. Her exertions in behalf of the Bunker Hill Monument Fund, her interest in seamen, in foreign missions, and in the higher education of women were untiring and effective. For more than twenty years she advocated the keeping of Thanksgiving Day as a national festival, to be held on the same day throughout the country, as it has been observed since 1864.

HALES, John, M. A., "the Ever-memorable," English divine and critic, born at Bath, April 19, 1584, died at Eton, May 19, 1656. At the age of thirteen he entered Corpus Christi College, Oxford, obtained a fellowship at Merton College in 1605, and in 1612 became professor of Greek in his University. In 1618 he went to the Hague as chaplain to the ambassador, Sir Dudley Carleton, for whom he made a report of the proceedings at the famous Synod of Dort. He was there converted to Arminianism, and was subsequently appointed to a canonry at Windsor. The Puritan supremacy deprived him of this office and reduced him to poverty. Hales was one of the oldest of what is now called the Broad Church school—a rare example of a profound student without pedantry, a ripe theologian with an altogether untheological clearness of mind and directness of phrase. His writings were collected and published as the *Golden Remaines of the Ever-memorable Mr. John Hales, of Eton College* (1659).

HALÉVY, Joseph, a French orientalist, born at Adrianople, Turkey, in 1827. He studied the Semitic languages, and afterwards taught Hebrew in Adrianople and Bucharest. He became widely known through his Hebrew poems. The *Alliance Israelite Universelle* commissioned him in 1868 to examine the condition of the Fallashas of Abyssinia, which he did. His report attracted much attention. In 1869 the French government sent him to the southwestern part of Arabia, called Yemen (Arabia Felix of the Romans), to explore it archæologically. Here he deciphered 68 inscriptions. He has published several volumes on oriental antiquities and epigraphy.

HALÉVY, Léon, a French poet and dramatist of Jewish extraction, born at Paris, in 1802, died at St.-Germain-en-Laye, Sept. 3, 1883. He was educated at the Charlemagne Lyceum, where he became a proficient Greek scholar. Afterward he was a follower of Saint-Simon; assisted the latter in founding "Le Producteur;" issued the *Poésies Européennes*; wrote a *Résumé de l'Histoire des Juifs*; and in 1838 the *Histoire Résumée de la Littérature Française*. From 1837 to 1853 he was employed in the bureau of historic monuments in the department of public instruction. In 1855 he published the *Fables Nouvelles*, and in 1861 finished *La Grèce Tragique*. Besides, he published numerous poems, novels, tales, and translations from ancient and modern languages. His dramatic works cover a wide field. They include the tragedies *Le Czar Démétrius*, and *Electra*, the comedy *Le Duel*, and many dramas.

HALEVY, Ludovic, born at Paris, Jan. 1, 1834, and in 1861 became secretary to the Corps Legislatif. He first became known as the writer of the librettos to Offenbach's burlesques: *Orphée aux Enfers* (1861); *La Belle Hélène* (1865); *La Vie Parisienne* (1866); *La Grande-Duchesse de Gérolstein* (1867); *Les Brigands* (1870). He wrote, besides, a large number of vaudevilles and comedies, among them *Le Réveillon* (1868); *Froufrou* (1869); *Tricoche et Cacolet* (1872); *La Petite Mère* (1880). His *Madame et Monsieur Cardinal* (1873) and *Les Petits Cardinal* (1880) are humorous sketches of Parisian theatrical life. In 1882 he published the charming idyllic story, *L'Abbé Constantin*, which was followed by *Criquette* and *Deux Mariages* in 1883. Halévy was admitted to the Academy in 1886. In many of his plays he had the collaboration of H. Meilhac.

HALF-BLOOD, related through one parent only. When two persons have the same father, but not the same mother, they are called brothers or sisters consanguinean; when they have the same mother only, they are called brothers and sisters uterine.

HALFORD, Sir Henry, an English physician, born at Leicester, Oct. 2, 1766, died in London, March 9, 1844. He was educated at Rugby and Oxford, took his degree of M. D. in 1791, and three years later settled in London, where he became very popular. He was made a baronet in 1809, and was court-physician throughout the greater part of his career. Author of *Essays and Orations* (1831); *The Deaths of Some Eminent Persons* (1835); and *Nugæ Metricæ* (1842).

HALF-PAY, an allowance given in the British army and navy to commissioned officers who are not actively employed, and corresponds to the French *demi-solde*. In the navy officers are appointed to a ship to serve for the period during which she is in commission. At the end of that period, or if promoted or otherwise removed from her, they are placed on half-pay until again called upon to serve. In the army permanent half-pay, first granted in 1698, was abolished in 1884, retired pay being substituted for it. Under the provisions of the royal warrant of 1887 lieutenant-colonels who have held command for four years are placed on temporary half-pay (11 s. a day) until promoted. Majors of seven years' regimental or five years' staff service in that rank may claim promotion to half-pay lieutenant-colonelcies; and these or any officers of lower rank may be placed on the half-pay of their rank while incapacitated through illness, or as a punishment for inefficiency. Seconded officers are those who are extra-regimentally employed, but whose names remain on the rolls of their regiments, additional officers being appointed in their places. On the termination of such employment they are absorbed into the regiment as soon as vacancies occur in their proper rank. Officers on retired pay are liable to be called upon to serve in case of national peril or great emergency.

HALL, Asaph, an American astronomer, born in 1829. From 1857 to 1862 he was assistant in the Observatory of Harvard University, and then became aid in the United States Naval Observatory in Washington. He has been connected with all the important astronomical expeditions sent out under the United States Government since 1863, and has won great distinction by his discovery of the moons of Mars, which he named Deimos and Phobos (Terror and Fear). Prof. Hall is a member of numerous scientific societies, both in this country and in Europe.

HALL, Darwin S., an American Congressman, born in 1844. In 1866 he settled in Minnesota, and in 1869 and 1871 was elected county auditor of Renville county. He edited the Renville "Times" for several years, and was clerk of the district court in 1873 and 1877. In 1876 he was elected to the legislature; was appointed register of the United States land office at Benson in 1878 and 1882, and was chosen to the State Senate in 1886 for a term of four years. He was elected to the 51st Congress as a Republican.

HALL, Dominick Augustine (1765–1820), an American jurist. He was district judge of Orleans Territory from 1809 to 1812, and, when Louisiana was admitted to the Union, became one of its United States judges. He remained in the United States court until his death.

HALL, James, an American palæontologist, born in 1811. From 1832 to 1836 he was assistant professor of chemistry and natural sciences at the Rensselaer polytechnic institute, and then became professor of geology. In the same year he was appointed assistant geologist of the geological survey of New York, and in 1837 was made State geologist in charge of the fourth district. He made his full report on the survey in 1843, and was then placed in charge of the palæontological work. In 1855 he was State geologist of Iowa, and in 1857 of Wisconsin. In 1866 he was appointed director of the New York State museum, still retaining the office of State geologist. He has written numerous important reports on geological and palæontological subjects.

HALL, John, an Irish-American Presbyterian clergyman, born in 1829. He was licensed to preach in 1849, and engaged in missionary labor in the west of Ireland. In 1852 he became pastor of the First Presbyterian church at Armagh, and in 1858 of St. Mary's, Dublin. In 1867 he visited the United States as a delegate from the general assembly of the Presbyterian church in Ireland to the Presbyterian churches in the United States, and the same year was summoned to take charge of the Fifth Avenue Presbyterian church in New York. For several years he was chancellor of the University of the City of New York, resigning in 1891 because of the pressure of other duties. He is the author of *Family Prayers for Four Weeks* (1868); *Papers for Home Reading* (1871); *Familiar Talk to Boys* (1873); *Questions of the Day* (1873); *Foundation Stone for Young Builders* (1880); and *A Christian Home; How to Make and How to Maintain It* (1883).

HALL, Lyman (1725–90), a Signer of the Declaration of Independence. In 1752 he settled in Sunbury, Ga., and acquired a large medical practice. He was a member of Congress from 1775 to 1780, and governor of Georgia in 1783. He was a member of the pre-Revolutionary conventions held in Savannah in 1774 and 1775.

HALL, Newman, an English clergyman, born in 1816. From 1842 to 1854 he was pastor of the Albion Congregational church in Hull, and then went to London to take charge of Surrey Chapel, Blackfriar's road. In 1867 and again in 1873 he visited the United States, lecturing in the principal cities. Dr. Hall's publications include: *The Christian Philosopher* (1849); *Italy, the Land of the Forum and the Vatican* (1853); *Lectures in America* (1868); *Sermons and History of Surrey Chapel* (1868); *From Liverpool to St. Louis* (1869); *Prayer, its Reasonableness and Efficacy* (1875); *The Lord's Prayer* (1883); and *Songs of Earth and Heaven* (1885).

HALL, Samuel Carter, author and editor, born at Geneva Barracks, County Waterford, Ireland, May 9, 1800, died March 16, 1889. In 1822 he went to London, studied law, and became a reporter for the "New Times." In 1825 he established the "Amulet," which he edited for several years; afterwards succeeded the poet Campbell as editor of the

"New Monthly Magazine," and did other journalistic work before founding the "Art Journal," which he edited from 1839 till 1880. He was an industrious worker and skillful compiler, the joint works written and edited by Mr. and Mrs. S. C. Hall exceeding 500 volumes. Among these were: *Ireland* (1841–43); *The Book of Gems; British Ballads*, one of the fine-art books of the century; and *Baronial Halls*. In 1880 he received a civil-list pension of £150 a year.

HALL, S. C., Mrs., (Anna Maria Fielding,) an Irish author, born in Dublin Jan. 6, 1805, died Jan. 31, 1881. At fifteen years of age she went to London, where her education was completed, and in 1824 married Samuel Carter Hall, whom she assisted in many of his works. She established a reputation of her own by her *Sketches of Irish Character* (1828); *Uncle Horace* (1837); *Lights and Shadows of Irish Character* (1838); *Marian* (1839); *Midsummer Eve* (1843); *The Whiteboy* (1845); and numerous shorter stories. She also contributed to the "Art Journal" and other periodicals, edited the "St. James's Magazine" for a year, and wrote various books for the young. She assisted in the formation of the Governesses' Benevolent Institution, and the Nightingale fund, the latter resulting in the endowment of a training-school for nurses.

HALL, Sir John B., K. C. M. G., a New Zealand statesman, a member of Parliament since 1856 and premier, 1878–82. He was a member of the Federal conference held in Melbourne, Australia, in Feb., 1890.

HALLAMSHIRE, an ancient manor of the West Riding of Yorkshire, with Sheffield for its capital. It now gives name to a parliamentary division.

HALLÉ, Sir Charles, pianist, born in 1819, near Elberfeld, Germany. He studied chiefly in Paris. The revolution of 1848 drove him to London, where he soon came prominently into notice. He subsequently settled in Manchester as a classical pianist. Hallé has edited *Classical Composers*, and has done much for the culture of a high description of music. He was knighted in 1888.

HALLIWELL-PHILLIPPS, James Orchard, F. R. S., an English antiquary and philologist, born at Chelsea in 1820, died at Brighton, Jan. 3, 1889. He studied for a time at Cambridge, and in 1839 began his long career as editor and publisher of old English authors and manuscript texts. His earlier work embraced plays, ballads, popular rhymes and folklore, chap-books, and English dialects, but he gradually came to concentrate himself upon Shakespeare alone. In 1872 he succeeded to the property of Thomas Phillipps. This wealth he made use of in the accumulation of an unrivaled collection of Shakespearean books, manuscripts, and rarities of every kind, in the entertainment of scholarly visitors, and in gifts of valuable books to Edinburgh University, Stratford, and Birmingham. Among his works are: *Shakespeariana* (1841); *A History of Freemasonry* (1842); *Dictionary of Provincial and Archaic Words* (1844–45); and *Outlines of the Life of Shakespeare* (1848).

HALMALILLE (*Berrya ammonilla*), a tree of the natural order *Tiliaceæ*, closely allied to the linden tree of Europe; a native of Ceylon, valued for its light timber, which is thought to resist the attacks of marine worms.

HALORAGIACEÆ, or Haloragéæ, a natural order of exogenous plants, closely allied to *Onagraceæ*. There are about seventy known species, herbaceous or half-shrubby, almost all aquatic. The stems and leaves often have large air-cavities; the flowers are generally small.

HALLOWELL, a city of Kennebec county, Me., on the west bank of Kennebec River, two miles south of Augusta. Cotton goods, oil-cloth, carriages, soap and candles are manufactured, and in former times ship-building was carried on. Granite of a superior quality is quarried.

HALSBURY, Hardinge Stanley Giffard, a criminal lawyer of England, born in 1825. He became a queen's counsel in 1865. As such he was engaged in most of the celebrated criminal trials of his time, including the Overend, Gurney and Tichborne cases. In 1875–80 he was solicitor-general. On the accession to office of the Salisbury government in 1885 he was made lord chancellor of England. This is a remarkable exception to the rule of the English bar—that no criminal practitioner ever reaches the woolsack.

HAMBURG, Free City and State of, a republic, constituting a part of the German empire. For its history, government and earlier statistics, see Britannica, Vol. XI, pp. 404–50.

The State reported in the census of Dec. 1, 1885, area of 160 square miles, and a population of 518,620. Included in the census returns were two battalions of Prussian soldiers, forming the garrison of Hamburg. The State consists of three divisions, the population of each of which was as follows on Dec. 1, 1885: City of Hamburg, with suburb, 305,690 (estimate for 1888, 315,033); 15 rural districts (Vororte), 165,737 (estimate for 1888, 201,057); Cuxhaven, Ritzebüttel, etc., 47,193. In the four years from 1867 to 1871 the population of the State increased at the rate of 2.51 per cent. per annum; from 1871 to 1875 at the rate of 3.41; 1875–80 at 3.10, and in 1880–85 at 2.66 per cent yearly. A large stream of emigration, chiefly to America, flows through Hamburg. Of the population in 1885, 252,853 were males and 265,767 females, *i. e.*, 105.1 females per 100 males. There were 13,563 foreigners resident in Hamburg in 1885; of these 3,060 were Austrians, 2,403 Swedish and Norwegians, 1,825 Danes, 1,735 British, 2,674 other Europeans, 1,531 non-Europeans, and 335 unclassified.

The jurisdiction of the Free Port was on Jan. 1, 1882, restricted to the city and port by the inclusion of the Lower Elbe in the Zollverein; and on Oct. 15, 1888, the whole of the city, except the actual port and the warehouses connected with it (population 152 in 1885), was incorporated in the Zollverein. The alterations in the port necessitated by this step have involved an expenditure of six millions sterling, to which the imperial government contributes two millions.

The following table shows the number of emigrants for 1885 to 1889, inclusive, via Hamburg:

Year.	From Hamburg itself.	Total.	Bound for the United States.
1885 ...	[illegible]	69,403	[illegible]
1886 ...	[illegible]	[illegible]	[illegible]
1887 ...	[illegible]	71,097	[illegible]
1888 ...	[illegible]	[illegible]	[illegible]
1889 ...	[illegible]	71,543	68,481

Hamburg is the principal port of Germany. In 1889 the number of ships which entered the port was 8,079, with a tonnage of 4,819,892.

The public debt of Hamburg Jan. 1, 1890, was 236,767,784 marks.

HAMBURG, a village and railroad junction of Fremont county, Ia., situated near the Missouri River, 12 miles from Nebraska City. It has flour mills and a foundry.

HAMBURG, a post-borough of Berks county, Pa., at the foot of Blue Mountain and on the east bank of the Schuylkill River. It has a rolling-mill, foundries, tanneries and steam mills, and several German weekly newspapers are published here.

HAMERTON, Philip Gilbert, an English author, born at Laneside, near Shaw, in Lancashire, Sept. 10, 1834. He began his career as an art-critic by contributing to the "Fine Arts Quarterly," the "Fortnightly" and the "Saturday Review." Since 1869 he has edited the "Portfolio," an art journal which gives special prominence to etchings. Author of *Isles of Loch Awe*, poems (1855); *A Painter's Camp in the Highlands* (1862); *Thoughts About Art* (1862); *Etching and Etchers* (1866); *Contemporary French Painters* (1867); *Wenderholme*, a novel (1869); *The Unknown River* (1870); *The Intellectual Life* (1873); *The Life of Turner* (1878); *The Graphic Arts* (1882); *Landscape* (1885); and *French and English* (1889).

HAMILTON, a city of Hancock county, Ill., opposite Keokuk, Ia., on the Mississippi River, and at the foot of Des Moines Rapids. It is in an excellent fruit region, has abundant water-power, and several manufactories.

HAMILTON, a post-village of Caldwell county, Mo., 50 miles east of St. Joseph. It has machine shops, flouring-mills, and is a shipping point for grain, cattle, horses and hogs.

HAMILTON, a city and capital of Butler county, Ohio, located on both sides of the Miami River. In 1890 more than 800 new houses were completed, with nearly as many more in process of construction. The city controls and operates its own gas and water works, and there is a private gas and electric company. Street cars traverse the principal streets. North of the city the river is turned from its channel into an immense reservoir, which feeds a system of hydraulics, and gives fine power to the factories. The city is connected by four railroads with all parts of the country. There are several national and other banks. The public schools are of a high order, and occupy fine buildings. There is a free library and charitable institutions, such as a children's home and the county infirmary. The county court-house, completed in 1889, is a noble edifice, which cost $300,000. Greenwood cemetery, with its beautiful lake, is well situated. Safe and lock works, stove foundry, buggy factory, carriage factory, Corliss engine works, canning-factory, a hosiery mill, autographic register factory, shop for making laundry machinery, and many others have been established during the last year. The Niles tool shop is well equipped, and the Hamilton tile factory is on a large scale. There are woolen mills, flouring-mills and six paper mills. Population in 1880, 11,000; 1890, 17,519.

HAMILTON COLLEGE. See Colleges, in these Revisions and Additions.

HAMILTON, Frank Hastings (1813–86), an American surgeon. He was licensed to practice medicine in 1833; was chosen professor of surgery in the Western College of Physicians and Surgeons, in Fairfield, N. Y., in 1839; and in 1840 was called to the Medical College in Geneva, N. Y. In 1846 he became professor of the Buffalo Medical College, and in 1859 was elected to fill the chair of principles and practice of surgery in the Long Island College hospital. From 1861 to 1863 he served as surgeon in the army, and attained the rank of lieutenant-colonel. From 1868 to 1875 he was professor of surgery in the Bellevue Hospital Medical College, and was surgeon to the hospital from 1863 to his death. Besides numerous contributions to medical journals, Dr. Hamilton wrote *Treatise on Strabismus* (1844); *Treatise on Fractures and Dislocations* (1860); *Practical Treatise on Military Surgery* (1861); and *The Principles and Practice of Surgery* (1872).

HAMILTON, James (1786–1857), an American statesman. He was admitted to the bar; practiced in Charleston, S. C.; served in the war of 1812 as a major; and for several years was mayor of Charleston. He was several times a member of the legislature, and from 1822 to 1829 was a member of Congress. Subsequently he removed to Texas, and at the time of his death was a United States Senator-elect from that State.

HAMILTON, James (1819–78), an American artist. He was born in Ireland, emigrated to Philadelphia, Pa., and in 1856 began furnishing illustrations for books. He illustrated Dr. Kane's *Arctic Explorations*, the *Arabian Nights*, the *Ancient Mariner*, and other popular works. Among his pictures are *Capture of the Serapis*, *Old Ironsides*, *Wrecked Hopes*, *Egyptian Sunset*, *Morning Off Atlantic City*, and *Moonlight Scene Near Venice*.

HAMILTON, John Church (1792–1882), an American lawyer, son of Alexander Hamilton. He practiced law for a time in New York city, and in 1814 joined the United States Army, but resigned the same year. During his active service he was aid-de-camp to Gen. W. H. Harrison. He wrote *Memoirs of Alexander Hamilton*, and edited his father's *Works*.

HAMILTON, Lord George Francis, an English statesman, born at Brighton in 1845. In 1868, and again in 1874, he was elected to Parliament; became under-secretary for India, and 4 years later succeeded Lord Sandon as vice-president of the Committee of Council on education. In 1885 Lord Salisbury nominated him first lord of the admiralty, which office he holds also under Salisbury's present administration. Lord George is a powerful political speaker.

HAMILTON, Schuyler, an American soldier, son of John Church, born in 1822. He entered the United States Army in 1841; served on the plains; was assistant instructor at West Point; distinguished himself several times during the Mexican war, and from 1847 to 1854 was aid-de-camp to Gen. Winfield Scott. In 1861 he volunteered as a private in the 7th New York regiment; acted as military secretary to Gen. Scott; was commissioned brigadier-general of volunteers; participated in several important undertakings, and was made major-general in September, 1862. On account of feeble health he resigned in 1863. He published a *History of the National Flag of the United States* (1852).

HAMLEY, General Sir Edward Bruce, K. C. B., K. C. M. G., M. P., born in 1824. He served throughout the Crimean war, and in the Egyptian campaign (1882); was commandant of the Staff College 1870–77, and has held other important positions. He has received the Crimean medal with four clasps, the Egyptian war medal, and eight other decorations. In 1854 he produced a charming tale called *Lady Lee's Widowhood*. His *Operations of War*, of which several editions have appeared, is a recognized text-book for military examinations. He has written several other books and pamphlets on various subjects. In 1890 *The War in the Crimea* appeared from his pen. He has represented Birkenhead in Parliament since 1885.

HAMLIN, Hannibal, an American statesman born in 1809. He was admitted to the Maine bar in 1833, and from 1836 to 1840, and again in 1847, was a member of the legislature. In 1842 he was elected to Congress, and reëlected in 1844. In 1848 he was elected United States Senator, but resigned in 1857 to be inaugurated governor. Less than a month later, however, he resigned the governorship to accept a full term in the United States Senate. He held this last position until 1861, when he again resigned and became Vice-President with Mr. Lincoln. His term expired in 1865. Mr. Hamlin was United States Senator from Maine from 1875 to 1881. He died in 1891.

HAMLINE, Leonidas Lent (1797–1867), an American M. E. bishop. For several years he practiced law at the Ohio bar, and in 1828 was united with the M. E. church. Shortly afterward he was licensed to preach, and in 1834 was stationed at Wesley Chapel, Cincinnati. In 1836 he became assistant editor of the "Western Christian Advocate," and in 1841 became editor of the "Ladies' Repository." In 1844 he was elected bishop. He resigned the office in 1852, and, by his own request, was placed on the list of superannuated preachers of the Ohio Conference.

HAMMER-BEAM, a portion of an open timber roof, forming a truss at the foot of the rafter, which gives strength and elegance to the construction.

HAMMER-CLOTH, a cloth which covers the driver's seat in some carriages.

HAMMOND, a railroad center of Lake county, Ind., 20 miles from Chicago. It has large steel works and an extensive slaughter-house.

HAMMOND, James Henry (1807–1864), a United States statesman. He was admitted to the bar in 1828, and in 1830 became editor of the "Southern Times," published at Columbia, S. C. In 1835–36 he was a member of Congress, and from 1842 to 1844 was governor of South Carolina. From 1857 to 1860 he was a United States Senator, retiring on the secession of South Carolina.

HAMMOND, Samuel (1757–1842), an American soldier. He served in the Indian wars of the American colonies, and in the Revolution was present at the battle of Stono Ferry, S. C., at the siege of Savannah, at Blackstocks, at the siege of Augusta, and at the battles of King's Mountain, Cowpens and Eutah. He was twice wounded, and attained the rank of colonel of cavalry. After the war he was appointed surveyor-general of Georgia, and from 1803 to 1805 was a Democrat in Congress. From 1805 to 1824 he was military and civil commandant of Upper Louisiana, and from 1831 to 1835 secretary of State.

HAMMOND, William Alexander, an American physician, born in 1828. He entered the United States Army in 1849 as assistant surgeon, and in 1860 accepted a professorship of anatomy and physiology in the University of Maryland. At the beginning of the civil war he again entered the army, and in 1862 was appointed surgeon-general. In 1867 he became a professor in Bellevue Hospital Medical College, and then a member of the faculty of the University of the City of New York medical department. In 1882 he lectured on diseases of the nervous system in the New York Post-Graduate Medical School. Among his published works are *Physiological Memoirs* (1863); a *Treatise on Hygiene*, with special reference to the military service (1863); *Sleep and Its Derangements* (1869); *Diseases of the Nervous System* (1871); *Lal* (1884); *A Strong-Minded Woman* (1885); *On The Susquehanna* (1887).

HAMMONTON, a village of Atlantic county, N. J., on the Camden and Atlantic and the Philadelphia and Atlantic City railroads, half way between Philadelphia, Pa., and Atlantic City, N. J. Much fruit is grown here, and the village has manufactories of boots and shoes.

HAMPDEN SIDNEY COLLEGE. See Colleges, in these Revisions and Additions.

HAMPTON, a village of Franklin county, Iowa, situated on the Central Railroad of Iowa, 29 miles south of Mason City. It is the county town, and contains a court-house, several churches, and a high school.

HAMPTON, the county-seat of Elizabeth City county, Va., two miles from Fortress Monroe. The principal trade is in oysters, fish, and garden produce. The village contains a famous normal and agricultural school, organized in 1868, for Indians and colored youth. A national cemetery is here, and an asylum for disabled soldiers. The small harbor opens into Hampton Roads.

HAMPTON ROADS, the deep, broad channel opening from Chesapeake Bay into the James River. It was the scene of important operations during the civil war.

HAMPTON, Wade (1754–1835), an American soldier. He served with distinction in the Revolutionary war; was a member of Congress from 1795 to 1797 and from 1803 to 1805, and in the war of 1812 was a major-general. At the time of his death he was the wealthiest planter in the United States, and the owner of 3,000 slaves.

HAMPTON, Wade (1791–1858), an American soldier, son of the preceding. He was a lieutenant of dragoons in 1813, and acting inspector-general and aid-de-camp to Gen. Jackson at New Orleans in 1815. He succeeded to his father's estate.

HAMPTON, Wade, a United States Senator, born in 1818. He served in both branches of the South Carolina legislature; was a member of the Senate when the State seceded; was a member of the Confederate army during the war; was elected Governor of the State in 1876; and again in 1878, and was chosen to the United States Senate in December, 1878. He took his seat in 1879, and in 1884 was re-elected. His term of service expired March 3, 1891.

HANCHINOL (*Heimia salicifolia*), a Mexican plant of the natural order *Lythraceæ*, with lanceolate leaves, and flowers on one-flowered stalks. It is esteemed as a medicine.

HANCOCK, a village of Houghton county, Mich., situated on Portage Lake, opposite Houghton. It is connected with Lake Superior by a ship-canal, is a terminus of the Mineral Range railroad, and derives prosperity from its location in the copper region. The village contains several smelting-furnaces and stamping-mills.

HANCOCK, Winfield Scott (1824–86), an American soldier. See under United States, Britannica, Vol. XXIII, p. 789.

HANDFASTING (in Old English, merely "betrothal;" A.-S. *handfæstan*, "to pledge one's hand"), a custom prevalent at one time in Scotland, by which a man and woman entered into conjugal relations on the strength of a verbal contract of marriage. Persons so handfasted were bound to each other for a twelvemonth and a day, after which they could either separate or be formally married. The custom had its great evils in society; and the clergy, both of the pre-Reformation and the post-Reformation churches, directed many injunctions against it.

HAND-GLASSES, useful implements of gardening, for the protection of tender plants. They are of various kinds; some of them consist of metal frames filled with panes of glass, sometimes large enough to cover tender shrubs.

HANDS, Imposition of, a ceremony which has been employed in ancient and modern religious use as symbolizing the conferring of certain spiritual gifts. In the consecration of Aaron and his sons, they are directed to lay their hands upon the heads of the victims which were to be offered in sacrifice (Ex. xxix. 10, 15, 19). The gift of the Holy Ghost was imparted by the same ceremony (Acts viii. 17). In the early church the right of imposition of hands was employed in the receiving of catechumens and the reconciliation of penitents;

it existed in two forms, the actual laying on of hands, which was called [illegible], and the extending of the hand over or towards the person, which was styled [illegible]. In the Roman Catholic church the former is retained as an essential part of the sacraments of confirmation and holy orders; the latter is employed in the administration of the priestly absolution. The rite of imposition of hands is used in the Episcopalian and Presbyterian churches in the ordination of ministers.

HANDSBORO, a small village and summer resort of Harrison county, Miss., one mile north of the Gulf of Mexico, on Bayou Bernard. It has saw mills, machine shop, carriage shop, and a shipyard.

HANDSELL, sometimes used to denote earnest money, or part payment, by way of binding a bargain. In Scotland it popularly signifies a first transaction in trade, as the first sale effected in the day or week.

HAND-TREE (*Cheirostemon plantanoides*), a large tree of the natural order *Sterculiaceæ*. The flowers have no corolla, but a large five-lobed, angular, colored calyx—bright red within—from which project the five stamens, united by their filaments into a column, and separating and curving at the summit, where they bear the anthers, so as to have some resemblance to a hand or claw. It is related to the famous baobab, or monkey-bread tree (*Adansonia digitata*) of Senegal, Guiana, and other countries of the west coast of Africa.

HANGED, DRAWN AND QUARTERED, the capital sentence executed in the Middle Ages on a traitor. The executioner sometimes mercifully delayed the cutting down and mangling of the body till the sufferer was dead.

HANNIBAL, a city of Marion county, Mo., on the west bank of the Mississippi River. The population and business have had a steady and healthy growth during the last decade. It has 8 railroads, being the terminus of 6 trunk lines, which, with competitive river steamers, afford excellent facilities for shipping. The city has broad and handsome streets, well paved, and lighted by electricity. Gas is used chiefly for private lighting. A new electric motor line of street railway recently completed gives rapid transit to residence portions of the city. The water supply is taken from the river two miles above the city, is passed by gravity through a system of filters, and then pumped into reservoirs. In 1890 the public sewer was completed, extending to all parts of the city. At that date there were seventeen churches, 5 excellent modern school buildings, and a free public library, with 10,000 volumes. There are also several good private schools. The banks are in good condition. Hannibal has a number of factories, such as foundries, machine shops, lumber mills, flour mills, lime kilns and brick yards. Population in 1890, 12,816. See Britannica, Vol. XI, p. 445.

HANOVER, a post-village of Jefferson county, Ind. It contains Hanover College, which is under Presbyterian control.

HANOVER, a post-village of Grafton county, N. H., on the Connecticut River. It is the seat of Dartmouth College, and has considerable lumber trade.

HANOVER, a post-hamlet of York county, Pa., situated in a country abounding in iron ore. The articles manufactured are carriages, cigars, flavin and leather.

HANSBROUGH, HENRY C., a United States Senator from North Dakota; an editor, born in Prairie du Rocher, Ill., Jan. 30, 1848, received a common-school education, removed to California and in 1866 became a printer, was connected with newspapers in San Jose and San Francisco, Cal., Chicago, Ill., and Barbaroo, Wis. Removed to Dakota in 1882, and in 1883 established a newspaper in Devil's Lake. In politics he is a Republican. Served two terms as mayor of Devil's Lake; was a delegate to the National Republican convention of 1888, was elected to the 51st Congress as the first Representative at large from the State of North Dakota. In 1891 he was elected by the North Dakota legislature to the United States Senate to succeed Gilbert A. Pierce.

HANSI, a town of the district of Hissar, in the province of Punjab, India, about 80 miles northwest of Delhi. It was a British cantonment from 1802 down to the mutiny of 1857. Population, 12,656.

HARA-KIRI ("belly-cut"), a system of official suicide formerly practiced in Japan, obsolete since 1868. Military men, and persons holding civil offices under the government, were bound, when they had committed an offense, to disembowel themselves. This was performed, with elaborate formalities, in the presence of officials and other witnesses. Personal honor having been satisfied by the suicide's self-inflicted wound, his head was struck off by his second, often a kinsman or friend of gentleman's rank. This mode of suicide was also resorted to by persons who had suffered unendurable affront which could not otherwise be satisfied, the hara-kiri being regarded not only as an honorable expatiation of crime, but as a blotting out of disgrace.

HARBAUGH, HENRY (1817–67), an American clergyman of the German Reformed church. He was ordained in 1843, and sent to Lewisburg, Pa. From 1850 to 1860 he was pastor in Lancaster, Pa., and then went to Lebanon. In 1863 he became professor of theology at the Mercersburg Seminary, and occupied this chair until his death. He published *Heaven, or the Sainted Dead* (1848); *Heavenly Recognition* (1851); *The Heavenly Home* (1853); *Union with the Church* (1853); *Birds of the Bible* (1854); *Life of Rev. Richard Schlatter* (1857); *The Fathers of the German Reformed Church* (1858); *The True Glory of Woman, and a Plea for the Lord's Portion of a Christian's Wealth* (1860); *The Golden Censer* (1860); *Hymns and Chants* (1861); and *Christological Theology* (1864).

HARBOR GRACE, a port of entry and the second town of Newfoundland, situated on the west side of Conception Bay, 84 miles by rail from St. John's. It has a large but somewhat exposed harbor with a revolving light, carries on a considerable trade, and contains a Roman Catholic cathedral and convent. Population 7,054.

HARBORS AND DOCKS. We confine ourselves in this article to the harbors of the United States, and divide them under the following heads: (1) The Atlantic Seaboard; (2) the Gulf Coast; (3) the Pacific Coast, and (4) the Lake Harbors.

(1.) THE ATLANTIC SEABOARD.—Calais, Me., is the easternmost harbor of the United States. It is the center of a considerable lumber trade. At Mark's point, five miles from the town, there is a bar or ledge only eight feet deep at low water. There is no anchorage in the harbor. Eastport, Me., has a harbor free of ice in winter. There are two entrances to it, but they are not free from danger in stormy weather. Rockland, Me., has an open harbor five fathoms deep within half a mile of the wharves, and three fathoms to the wharves. But it is often closed by ice in winter. Winter Harbor, Me., is in Frenchman's Bay, and one of the best on the east coast. Penobscot Bay can carry six to fourteen fathoms up to the town of Bucksport, where there is a good anchorage but a very strong current. Bangor, at the head of this bay, has an extensive lumber and ice trade. The bay is closed by ice during winter. Fort Knox, at the narrows of the Penobscot, defends the harbor. The harbor of Wiscasset, near Bath, Me., can hardly be surpassed by any. Its depth is nine fathoms in the channel of the river. Bath has the largest ship-building and ship-owning interest in the State of Maine. It is 12 miles up the Kennebec River, which has so strong a current that the ice can seldom close it up. The entrance of the river is defended by Fort Popham. Portland, Me., on a peninsula of the Casco Bay, has a harbor which can carry five fathoms to within half a mile of the wharves and 16 feet up to the wharves. There are four entrances to the harbor, three of them rather crooked and shallow. Only the most southern entrance can be used by large vessels. The harbor is defended by Forts Gorges, Preble, Scammel, and a battery on Portland Head. Portland has a large foreign and coasting trade, and is the principal shipping port for Canada during the winter, as the harbor is always free of ice. Richmond Island harbor, near Portland, has a good anchorage of five fathoms' depth, and can easily be entered when vessels cannot get into Portland.

Portsmouth Harbor, N. H., has a good anchorage, and six fathoms can be carried up to the city. A U. S. navy-yard is opposite Portsmouth, distant half a mile. For vessels not going up to the city or navy-yard the usual anchorage is at Pepperell's Cove in from six to 11 fathoms. Portsmouth harbor is never closed by ice. It is defended by Forts Constitution, McClary and Sullivan, all in a dilapidated condition.

Newburyport Harbor, Mass., has a bar with only six feet of water at low tide, but this obstruction is being removed. Rockport harbor, Mass., on the northern shore of Cape Ann is 8 fathoms deep to the wharf. It is the best harbor of refuge in that neighborhood. In Massachusetts Bay, between the headlands of Cape Ann and Cape Cod there are several important harbors, those of Gloucester, Salem, Boston, Plymouth and Provincetown. Gloucester harbor has a good anchorage in five fathoms within 600 yards of the shore, and in three and a half fathoms close to the shore. But it is frozen over in winter. The city of Gloucester has the largest fishing industry in the United States. Salem harbor can carry three-and-a-half fathoms within half a mile of the town of Salem. The inner harbor is often closed by ice during January and February. Forts Lee, Pickering and Sewall defend this harbor. The city of Salem has a considerable coasting and ice trade. Boston harbor can carry 23 feet at any tide through the main channel. There are two other channels. It is defended by Forts Warren and Independence. The U. S. navy-yard is situated near Charlestown, opposite the city of Boston. A very extensive foreign and coastwise trade is carried on here, only second to that of New York. Plymouth harbor is often frozen over, especially the inner harbor. Only 21 feet can be carried into the outer harbor. Provincetown has one of the finest harbors on the Atlantic coast. It has plenty of water, good anchoring ground, and is easy of access. Except during severe winters this harbor is clear of ice. Sandwich harbor, in the southwestern part of Cape Cod Bay is the proposed terminus of the ship-canal from Cape Cod Bay, to the head of Buzzard's Bay, but it has a narrow and difficult entrance. New Bedford harbor can carry 16 feet into the inner harbor through a narrow, crooked channel. The outer harbor is an open roadstead with 1½ fathoms of water. There are forts at Clark's Point and Fort Point.

Newport, R. I., has a fine harbor with water enough for the largest ships; 16 feet can be carried into the inner harbor; Block Island Basin is an artificial harbor made by the United States Government for the shelter of small vessels. It is 7 feet deep and protected by a solid stone breakwater. The United States Torpedo Station is located at Newport harbor. Fort Adams and some earthworks on Dutch Island defend it. The town of Bristol, R. I., north of Newport, has a good anchorage in 5 fathoms of water, and off the lower end of the town the anchorage is 21 feet. Twenty-one feet can be carried through a dredged channel up to Providence. The nearest anchorage, in 5 fathoms, is four and a half miles distant from the city.

New London Harbor, Conn., is on Long Island Sound. It is formed by the lower portion of the Thames River and has a depth of 30 feet. Being three miles in length, it is one of the finest harbors in the United States. The entrance is defended by Forts Trumbull and Griswold. New Haven Harbor is only 12 feet deep near the city, and even this depth is only found in a narrow channel. But four miles south of New Haven the water becomes 5 fathoms deep. The harbor is defended by Fort Hale. Long Island Sound is very free from dangers throughout its length, and affords many anchoring places for light-draught coasters.

New York Harbor is one of the finest and most capacious harbors of the world. It is entered from Long Island Sound through the East River; the Upper New York Bay is entered from the ocean through the Narrows, between Staten Island and Long Island. The East River forms a large part of the water front of New York and Brooklyn, and for miles there are wharves and docks along its shores. The East River channel was formerly obstructed by dangerous rocks and reefs at Hell Gate, [illegible] but these obstructions have been removed. [illegible] New York Bay. It is [illegible] to accommodate all the shipping of the world. The Hudson or North River forms [illegible] part of New York's water-front. The defenses of New York harbor are Fort Schuyler on Throgg's Neck, at the western entrance of Long Island Sound, and a fort on Willets Point on the opposite shore; Fort Wadsworth and Tompkins [illegible] and several detached batteries on the Staten Island shore, and Fort Hamilton and several batteries on the opposite Long Island shore. The forts in the bay are Fort Columbus, Castle William and some batteries, all on Governor's Island, and Fort Gibson on Ellis Island.

Perth Amboy, N. J., has a harbor with 11 feet of water up to the town; mean rise and fall of tide, 5½ feet. It seldom freezes over. Steamers can generally force their way through the ice when any is formed.

The harbor of Wilmington, Del., has only 12 feet of water, while the Delaware River has 20 feet up to near the city of Wilmington.

Hampton Roads, Va., is a channel between Chesapeake Bay and the estuary of the James River, where the naval action between the *Monitor* and the Confederate iron-clad *Merrimac* took place in 1862. It is defended by Fortress Monroe. This channel affords an excellent rendezvous for a fleet. There is plenty of water for vessels of any draught from the entrance of Chesapeake Bay very near the fortress. Newport News is on the north, and Norfolk and Portsmouth are on the south side of this channel. The United States navy-yard is situated at Gosport, adjoining Portsmouth, and nearly opposite to Norfolk. Vessels drawing 21 feet of water can be carried to any of these cities. At Annapolis harbor, Va., vessels drawing 19½ feet of water can be carried over the bar. The United States Naval Academy is situated at Annapolis. To the city of Baltimore, Md., 24 feet can be carried through a dredged channel, and 19 feet can be carried to the city of Washington, which is 200 miles from the ocean.

Newberne, N. C., is at the head of Pamlico Sound. Ten feet can be carried to the town, but only 8 feet over the bar from the sea into the Sound. The same can be said about Plymouth, N. C., which is at the head of Albemarle Sound. These places ship lumber, tar, and turpentine. Wilmington, N. C., is 27 miles above the mouth of the Cape Fear River. Eight feet can be carried over the outer bar at the mouth of the river, and 7 feet in the river channel to the city. The town of Wilmington has a considerable trade in lumber, cotton, and turpentine.

Georgetown, S. C., is 14 miles from the bar at the entrance on Winyaw Bay. Seven and one-half feet can be carried to the town. Georgetown ships some lumber and turpentine. To Charleston harbor, S. C., 21 feet can be carried up the South Channel; but over the bar to the channel only 14 feet can be carried. Charleston has a large foreign trade, shipping quantities of cotton, phosphate, and Southern products. Port Royal, S. C., at the head of Port Royal Sound, has a fine harbor with 21 feet of water over the bar. Brunswick, S. C., has one of the best harbors on the coast. A deep arm of the sea, twenty miles long, leads to the town and approaches it by a channel 17 feet deep.

To Savannah, Ga., 9 feet can be carried, while 17 feet can be carried over the bar at the mouth of the river. The town ships large quantities of cotton, rice, lumber, and naval stores. St. Mary's, Ga., on St. Mary's River, has a good harbor. There are several anchorages inside the bar in from 4 to 7 fathoms of water. Seventeen feet can be carried to the town, 10 miles from the ocean.

To Jacksonville, Fla., on the St. John's River, nine feet of water can be carried over the bar through a narrow crooked channel. It is 20 miles from the mouth of the river. The Florida harbors ship mostly lumber. St. Augustine has a shifting bar with 10 feet of water, inside of which there is a good harbor north of the town 18 to 20 feet deep.

(2.) THE GULF COAST.—Key West, southwest of the southern end of Florida, has a good anchorage for the largest vessels within a mile of the town. Three channels, the main ship channel, the southwest and the northwest channels, having from 12 to 30 feet of water, lead to this harbor. It is defended by Fort Taylor, some batteries, and two Martello towers. Key West ships mostly cigars and sponges. The Dry Tortugas, a group of ten low islets, west of Key West, form a large, deep and commodious harbor. It is of great strategic importance in the case of war with a foreign naval power, because it will afford its possessor an excellent base for naval operations. This splendid harbor is defended by Fort Jefferson on Garden Key. Tampa Bay, Fla., is an estuary from six to ten miles wide and extending northeast for 20 miles, where it forms two arms. It affords anchorage in five fathoms of water. Cedar Keys, Fla., has three channels leading to the town. Sea Horse Key is the deepest of these channels, with nine feet of water on its bar. Cedar Key is the terminus of the Florida Railroad. Appalachee Bay is the seaport of Tallahassee. It is very shallow, and therefore seldom visited. To Appalachicola, at the mouth of the river of the same name, 15 feet can be carried over the bar at the entrance of the bay, but only four feet can be carried to the town. It is a shipping port for lumber. St. Joseph's Bay is a large, deep and commodious harbor just north of Cape San Blas. It can be entered in a gale or hurricane, and affords excellent anchorage. Pensacola Bay, Fla., is protected by Santa Rosa Island, and has an entrance 20 feet deep. It is defended by Forts Pickens, McRee, and Barrancas, besides a [illegible] on the north side. The city of Pensacola is 10 miles from the entrance, and ships large quantities of lumber. The United States navy-yard is within five miles of the city.

Mobile Bay, Ala., is an estuary 30 miles long. The Mobile River, a large navigable stream, flows into this bay. It has an entrance between Fort Morgan and Dauphin Island [illegible] navigable. Eighteen feet can be carried through a dredged channel 21 miles long to the city of Mobile. This harbor is the natural outlet of the greatest cotton region of the United States.

New Orleans, La., is 120 miles from the sea. The Mississippi River [illegible]. Where the river [illegible] the Gulf of Mexico it separates into four prongs, called the Southwest, Southeast, Northeast, and South Passes. The famous jetties of Captain James B. Eads are at the entrance of the South Pass. It is [illegible] feet deep and [illegible] feet wide. The other passes are only from [illegible] to [illegible] feet deep. The Mississippi [illegible] and the neighboring waters are defended by the [illegible] Forts Pike, Macomb, Livingston, Jackson and [illegible], Lower Dupré, Battery Bienvenue, and the Tower of [illegible]. New Orleans ships large quantities of [illegible].

[illegible], Texas: [illegible] feet can be carried over the [illegible] to the city wharfs. Appropriations have been made for [illegible]. It is defended at Fort [illegible] Point. [illegible] trade is similar to that of New Orleans.

ON THE PACIFIC COAST.—Port Townsend, Washington, on the Strait of Juan de Fuca, [illegible], and five to [illegible] within [illegible] of the town. Up to the [illegible] of Seattle and Puget Sound five fathoms can be carried, and [illegible] of water at the anchorage off the town. Seattle has [illegible].

Astoria, Oregon, at the mouth of the Columbia River, has usually [illegible] feet of water from the bar to the town. The [illegible].

Crescent City, Cal., has a very dangerous harbor with many shoals and rocks. San Francisco has one of the finest harbors in the world. [illegible] feet can be carried over the bar to the city and [illegible] part of the bay. It is connected with the ocean by a strait called the Golden Gate. The entrance of the harbor is defended by Fort Point, on the south shore of the Golden Gate, and another fort has been constructed on Alcatraz Island, two miles north of the city. Vallejo is situated [illegible] miles north of San Francisco Bay, on the opposite side of Mare Creek from the United States navy-yard. To the [illegible] between the town and the navy yard 21 feet of water can be carried at low tide. Santa Cruz, Cal., has a well-protected harbor with good anchorage in water from [illegible] to 10 fathoms deep. Santa Barbara, Cal., has a harbor open on the south side, but partially protected by an island. It is [illegible] feet deep at the wharfs. It exports much fruit and some wool. The harbor of San Diego is formed by a projecting point of land on the west side, which terminates at the south end in Point Loma, and on the east side by a flat peninsula. The entrance to this fine harbor is over a bar with [illegible] feet of water.

(c) For LAKE HARBORS, see NAVIGATION, INLAND, in these Revisions and Additions.

Docks are divided into wet docks, dry docks, and floating docks. For the description of the wet and dry docks, see Britannica, Vol. VI, p. [illegible].

"Floating sectional dry docks" consist of several sections joined together by sliding beams. Each section consists of a large rectangular tank, at the sides of which are frames formed of four uprights. In each of these frames a float moves up and down in suitable guides. It rises when a section is being lowered, and goes down when a tank is being raised.

In the "tubular floating-docks," both the bottom and vertical sides consist of large wrought-iron tubes. The bottom consists of [illegible] such tubes floating longitudinally, and the sides consist of [illegible] smaller tubes fixed vertically inside of the two outer longitudinal tubes. The tubes are divided into many water-tight compartments, and have water valves at the bottom. When the dock is to be sunk these valves are opened. When it is to be raised, compressed air is forced into the tubes and the water is thus expelled through the valves. As soon as the dock and its vessel are fully raised the bottom valves are closed again.

By the "hydraulic lift dock" the vessel is lifted bodily out of the water upon a raft-like pontoon, which has sufficient buoyancy to sustain the weight of the vessel. For this purpose the pontoon is brought up between two rows of columns extending down to the dock below. These columns carry hydraulic lifts. From the heads of these lifts some rods extend and are made fast to lattice girders reaching across to the opposite column. Upon these girders the pontoon rests. When the pontoon is raised the water is let out by valves in the bottoms of its tubes. As soon as the ship is lifted it may be floated away on its own pontoon, and the dock is left free to be used on another pontoon to raise a second ship.

A "balance floating dock" consists of a large rectangular tank having hollow walls along its two long sides, but no walls at the ends. It is divided into a number of compartments. By pumping water into these side chambers any part of the dock may be lowered; and by forcing compressed air into them and the water out of them, they may be raised. Thus the dock can be balanced at any desired level.

DRY DOCKS IN THE UNITED STATES OF MORE THAN 58 FEET BREADTH:

Ports.	Length over all.	Width of entrance at the top.	Depth over sill at high-water spring-tides.	Kind of dock.	Material.	Location.
Buffalo	350	60	10	Basin		
Detroit	308	65	15	"		Foot Orleans St.
"	330	75	11.5	"		
Albina, Oregon	400	72	28	"		
San Francisco	210	60	20	Floating	Wood	
"	[illegible]	90	24	Basin	Stone	Hunter's Point.
"	529	78	26.5	"	"	Navy Yard.
Portland, Me	[illegible]	80	24	"	Wood	
Portsmouth, N H	[illegible]	90	23	Floating	"	Navy Yard.
Boston	[illegible]	60	25	Basin	Stone	
"	[illegible]	64	17.5	"	Wood	East Boston.
New York	[illegible]	90	18.5	Balance	"	Foot Rutgers St.
"	[illegible]	100	20	Section'l	"	
"	250	75	16	"	"	Between Pike and Clinton St.
"	170	65	16	"	"	
Brooklyn	[illegible]	66	25	Basin	Stone	Navy Yard.
"	540	100	22	"	Wood	Erie Basin.
"	630	85	25	"	"	
Jersey City	185	62	14	Balance	"	Foot Essex St.
Philadelphia	[illegible]	70	21.5	Basin	"	Cramp's Ship yard.
"	200	62	14	Section'l	"	
Baltimore	504	80	23	Basin	"	Locust Point.
"	220	67	14	Floating	"	
Norfolk	320	60		Basin	Stone	Gosport.
New Orleans	315	90	16	Floating	Wood	
"	220	75	14	"	"	
"	225	75	16	"	"	

HARCOURT, Sir William Vernon, son of the late Rev. W. V. Harcourt, of Nuneham Park, Oxford, and grandson of a former archbishop of York, was born Oct. 14, 1827, and educated at Trinity College, Cambridge, where he graduated with high honors in 1851. Called to the bar in 1854, he was made queen's counsel in 1866, and in 1868 was returned to parliament for the city of Oxford as a Liberal. In 1873 he was appointed solicitor-general, and received the honor of knighthood. He held office until Mr. Gladstone's retirement in February, 1874, and when that statesman returned to power in 1880 he was appointed home secretary. Failing to secure reëlection at Oxford, he was soon afterward returned from Derby, for which constituency he has continued to sit up to the present time. In 1886 he was appointed chancellor of the exchequer. He is an able speaker and a vigorous debater, and has been conspicuous for his defense of Mr. Gladstone's Irish Home-rule scheme.

HARDÉE, William Joseph (1818–73), an American soldier. He served in Florida for a time as first-lieutenant of 2d dragoons, and in 1844 was made captain. In 1847 he was promoted major for gallantry at the siege of Monterey, and at the close of the war was brevetted lieutenant-colonel. From 1856 to 1861 he was at West Point as commandant of cadets, and then joined the Confederate army with the rank of colonel. He served with distinction during the war, and attained the rank of lieutenant-general. At the close of the war he retired to his plantation in Alabama.

HARDIE, James Allen (1823–76), an American soldier. He entered the artillery service in 1843; was an assistant professor in West Point in 1844, and served in garrison, frontier and Indian service till 1861. At the beginning of the civil war he was made lieutenant-colonel of the 5th artillery, and served through the war with distinction, attaining the brevet rank of major-general, United States Army. In 1866 he was senior member of a commission to inspect ordnance and ordnance stores in forts and arsenals.

HARDING, Chester (1792–1866), an American artist. He became a house-painter, and later devoted himself to portrait painting. He established himself in St. Louis, and in 1826 settled in Boston, where he became very popular. Among the distinguished persons who sat before him were James Monroe, James Madison, John Quincy Adams, Chas. Carroll, John Marshall, Wm. Wirt, Henry Clay, John C. Calhoun, Washington Allston, the dukes of Norfolk, Hamilton, and Sussex, Samuel Rogers, Sir Archibald Alison, Daniel Webster, and W. T. Sherman. He wrote *My Egotistography*.

HARDING, Sir Robert Palmer, an English lawyer, born in 1821. He commenced his law practice in 1847, and has since taken part in many important liquidation cases, including the celebrated case of Overend, Gurney & Co., in which the liabilities amounted to nearly 20 million pounds sterling. In 1864 he was appointed a commissioner to inquire into the working of the Bankruptcy act, and in 1883 he reorganized this department on the basis of the Bankruptcy act of 1883. In January, 1890, he was knighted. At present he is a director in the Imperial British East Africa Co.

HARDWOOD TREES, forest trees of comparatively slow growth, producing compact, hard timber, as oak, ash, elm, chestnut, walnut, beech, birch, etc. From these willows, alders, poplars, etc., are distinguished as *soft-wooded trees*. Neither term is of ordinary use extended to firs, pines, cedars or other coniferous trees.

HARDY, Arthur Sherburne, an American author, born in 1847. In 1869 he entered the United States Army as second-lieutenant, but resigned the following year and became professor of civil engineering and applied mathematics in Iowa College, Grinnell. He then became professor in Chandler Scientific School of Dartmouth, and held this position until 1878, when he became professor of mathematics in the college proper. Prof. Hardy is the author of *Elements of Quaternions* (1881); *Imaginary Quantities* (1881); *New Methods in Topographical Surveying* (1884); a poem entitled *Francesca of Rimini*, and two novels, *But Yet a Woman* (1883); and *The Wind of Destiny* (1886).

HARDY, Thomas, an English novelist, born in Dorsetshire June 2, 1840, commenced his career as an architect and prosecuted his studies in design at London, gaining such professional distinctions as the prize and medal of the Institute of British Architects, and Sir W. Tite's prize for architectural design, both in 1863. His first literary effort was a novel published in 1871, entitled *Desperate Remedies*. His next novels, *Under the Greenwood Tree* (1872), and a *Pair of Blue Eyes* (1873), prepared the way for his best work, *Far from the Madding Crowd*, which was published in the "Cornhill Magazine," in 1874. Other novels from his pen are: *The Return of the Native* (1878); *The Trumpet-Major* (1880); *A Laodicean* (1881); *Two on a Tower* (1886); *The Mayor of Casterbridge* (1886); and *The Woodlanders* (1887).

HARDY, Sir Thomas Duffus, born in 1804 at Port Royal, Jamaica, died in London, June 15, 1878. At the age of fifteen he became a junior clerk in the Tower of London, was made deputy-keeper of the public records in 1861, and knighted in 1870. He won great distinction by his editions of ancient manuscripts. Among his important works were two folio volumes of the early *Close Rolls* (1833–44); one of the *Patent Rolls* (1835), and others of the *Norman Rolls* and *Charter Rolls*; *William of Malmesbury* (1840); a *Descriptive Catalogue of MSS.* relating to the history of Great Britain and Ireland (1862–71); and other works of much historical value.

HARE, a rodent mammal of the family *Leporidæ*. See Britannica, Vol. XI, p. 476.

HARE, Augustus John Cuthbert, an English writer, born at Rome, Italy, in 1834. He received his education at Harrow and at the University College, Oxford. Afterwards he edited Murray's Hand-books for some English counties. His most interesting books are: *Walks in Rome*; *Days Near Rome*; *Wanderings in Spain*; and *Walks in London*. His *Memorials of a Quiet Life* contains charming biographies of various members of the Hare family. He wrote all the books here mentioned from 1870 to 1877.

HARE, Robert (1781–1858), an American scientist. He early showed an interest in chemistry and physics, and before he was twenty was a member of the chemical society of Philadelphia. In 1801 he invented the oxyhydrogen blowpipe, and later made many valuable contributions to science. In 1818 he became professor of chemistry in William and Mary College, and also accepted a similar position in the medical department of the University of Pennsylvania. He resigned his position in 1847. Later he became a believer in spiritualism, and lectured in its advocacy. He made numerous contributions to scientific literature, and published *Brief View of the Policy and Resources of the United States* (1810); *Chemical Apparatus and Manipulations* (1836); *Compendium of the Course of Chemical Instruction in the Medical Department of the University of Pennsylvania* (1840); *Memoir on the Explosiveness of Nitre* (1850), and *Spiritualism Scientifically Demonstrated* (1855).

HARE, SILAS, a United States Congressman, born in 1827. He served one year in the war with Mexico, was admitted to the Indiana bar in 1850, but shortly afterwards removed to Texas. In 1862 he was chief justice of New Mexico under the Confederate government, and then served till the close of the war as a captain. In 1866 he settled in Sherman, Texas, and was criminal district judge from 1873 to 1876. He was elected to the 50th Congress as a Democrat, and re-elected to the 51st.

HARE, WILLIAM HOBART, an American P. E. bishop, born in 1838. He was ordained deacon in 1859, and priest in 1862. In 1864 he was elected rector of the church of the Ascension in Philadelphia, next became general agent of the foreign committe of the board of missions, and in 1872 was elected missionary bishop of Niobrara. His jurisdiction in 1883 was extended over the southern part of Dakota.

HARELD (*Harelda*), a genus of the duck family having a short thick bill, and two feathers of the middle of the tail, in the male, greatly elongated. Two species are known; the best known, the long-tailed duck, or hareld (*H. glacialis*), inhabits the arctic regions of the Old and New Worlds, its winter migrations in America extending to the Carolinas.

HARGRAVES, EDMUND HAMMOND, the discoverer of the gold-fields of Australia, born at Gosport, England, in 1815. At the age of eighteen he settled in Australia, and in 1849 was attracted to California, where he tried his luck as a gold-digger. While thus engaged he was greatly struck by the similarity in the geological formation of California and Australia, and on his return home he entered upon explorations which resulted in the discovery of the valuable gold-fields of Australia in 1851. He was appointed commissioner of crown-lands, and received from the government of New South Wales a reward of £10,000. In 1855, one year after his return to England, he published *Australia and Its Gold-fields*.

HARISOHANDRA, one of the more prominent personages in the legendary history of ancient India. According to one poem he was the type of munificence and piety, and after death became elevated to the court of Indra.

HARIVANSA, a Sanskrit epos, which professes to be part of the Mahabharata, but may be more properly classified with the Puranus.

HARLAN, JAMES, an American statesman, born in 1820. In 1853 he was president of Iowa Wesleyan University, and from 1855 to 1865 and again from 1866 to 1873 was United States Senator, In 1865–66 he was Secretary of the Interior under Lincoln's administration. In 1873 he became editor of the "Washington Chronicle," and from 1882 to 1885 was presiding judge of the court of commissioners of Alabama claims.

HARLEQUIN DUCK, a sea-duck, *Histrionicus torquatus*, which receives its name from its variegated markings, white, gray, black and brown. It inhabits the arctic regions of both hemispheres, migrating southward in winter.

HARLESS, GOTTLOB CHRISTOPH ADOLPH VON, German Lutheran theologian, born in Nuremberg in 1806, died Sept. 5, 1879. He studied at Erlangen and Halle; was professor of theology at Erlangen in 1836–45, and at Leipzig from 1845. In 1850 he became chief court preacher at Dresden, and exercised much influence on ecclesiastical affairs in Saxony. In 1852 he was appointed president of the Protestant consistory at Munich. His most important works were his *Theologische Encyklopädie und Methodologie* (1837); and *Christliche Ethic* (1842).

HARMALIN, a vegetable base, and *Harmin* another, both of which occur in the husks of the seeds of *Peganum harmala*, or Syrian rue, a zygophyllaceous, shrubby plant that grows abundantly in the steppes of Southern Russia. The seeds have been used in dyeing silk, to which they impart various shades of red.

HARMAN, FRANÇOIS JULES, a French explorer, born at Saumar in 1845, died at Florence, April 14, 1883. As a member of the surgical staff in the French navy he took part in various expeditions. He went to Algeria in the campaign against the Kabyles in 1871, then with Garnier to Tonquin. For some time he was governor of Tonquin. In 1874 he returned to France, but set out for Cambodia the next year, and pushed his explorations far to the north of that country. In 1881 he returned to France seriously ill with consumption, and was made keeper of the colonial museum.

HARMER, ALFRED C., a United States Congressman. In 1856 he was elected a member of the city council of Philadelphia, Pa., and served four years. In 1860 he was chosen recorder of deeds for that city, and held the office three years. He was elected to the 42d, 43d, 45th, 46th, 47th, 48th, 49th, 50th and 51st Congresses.

HARMONIC PROPORTION. Three numbers are said to be in harmonic proportion when the first is to the third as the difference between the first and second is to the difference between the second and third. See Britannica, Vol. II, pp. 535–36; Vol. X, pp. 382–83.

HARMONISTS, members of a religious community organized by George Rapp (1770–1847), a German of Würtemberg. Disturbed by the authorities, they removed in 1803 to Pennsylvania and formed a settlement which they called Harmony. In 1815 they removed to New Harmony, Ind., but returned to Pennsylvania ten years later, and formed the township of Economy, a few miles from Pittsburgh, where they own a large tract of land and carry on important manufactures. They hold all property in common, and strongly discourage marriage and sexual intercourse.

HARMONY OF THE SPHERES, a music, imperceptible to human ears, which the ancients imagined was produced by the motions of the heavenly bodies. These motions were supposed to be governed by fixed laws, the seven planets producing severally the seven notes of the gamut. By some the sound was thought to be imperceptible because always heard; others thought it too powerful for our hearing.

HARMS, KLAUS, a German divine, born at Fahrstedt, Holstein, May 25, 1778, died at Kiel, Feb. 1, 1855. He studied theology at the University of Kiel, was appointed assistant pastor at Lunden in 1806, and pastor at Kiel in 1817. He exercised a powerful influence on the religious life of Germany and the Scandinavian countries. His memorial work, *Das sind die 95 Thesen oder Streitsätze Luther's* 1817, published in celebration of the ter-centenary of the Reformation, produced a sensation in Germany.

HARMS, GEORG LUDWIG DETLEF THEODOR, a German clergyman, born at Walsrode in Lüneburg in 1808. After studying theology at Göttingen he taught a private school till 1844, when he became the assistant of his father, the pastor of Hermannsburg. In 1849, after he had succeeded his father, Harms founded an institute for training young men as missionaries for Africa. He died in 1865

HARNACK, ADOLF, born in 1851 at Dorpat, Russia, where he studied in 1869–72. In 1874 he was appointed privatdocent for church history at Leipzig, extraordinary professor there in 1876, and ordinary professor successively at Giessen (1879), Marburg (1886), and Berlin (1888). In critical knowledge of the sources of church history he is thought to have no superior. His chief writings are: *Zur Quellenkritik der Geschichte des Gnostizismus* (1873); *Die Zeit des Ignatius und die Chronologie der antiochenischen Bischöfe* (1878); *Das Monchtum, seine Ideale und Geschichte* (1882); and *Lehrbuch der Dogmengeschichte* (1886).

HARNACK, Theodosius, a German Lutheran theologian, born at St. Petersburg in 1817, died in 1889. After studying theology at Dorpat, Bonn, and Berlin, he became in 1843 privatdocent of theology at Dorpat. In 1848 he was made professor in the same place. From 1853 to 1866 he was professor at Erlangen, but in the latter year he returned to Dorpat, and in 1873 he retired from the professorship. He published *Die Idee der Predigt; Die Theologia practica; Der Christliche Gemeindegottesdienst; Luther's Theologie; Die Kirche, ihr Amt, ihr Regiment*, etc.

HARNETT, Cornelius (1723–81), an American statesman. He was a promoter of the Revolutionary cause, and in 1773 was placed on the committee of continental correspondence for the Wilmington, N. C., district. He was president of the Provincial Congress, and a signer of the "articles of confederation and perpetual union."

HARNEY, William Selby, an American soldier, born in 1800. He entered the army in 1818 as second-lieutenant of the 19th infantry, and remained in continuous service until 1863, when he was placed on the retired list, having attained the brevet rank of major-general "for long and faithful service." After his retirement he lived in St. Louis. He died in 1889.

HAROERIS, the elder Horus, son of *Seb*, the Egyptian Saturn, and *Nu*, or Rhea; the brother of Osiris. He was ruler over heaven, illuminating the world with the brightness of his eyes. See Britannica, Vol. VII, p. 717.

HARPER, a city of Harper county, Kan., situated about 60 miles southwest of Wichita.

HARPER, James (1795–1869), the founder of the publishing firm of Harper & Bros., originally consisting of James, John (1797–1875), Joseph Wesley (1801–70), and Fletcher (1806–77). In 1844 James was elected mayor of New York City. The firm publishes four illustrated periodicals: "Harper's Magazine," established 1850; "Harper's Weekly," established 1857; "Harper's Bazar" established 1867; and "Harper's Young People," established 1881. The members of the firm now are: Philip J. A. Harper, born 1824; Fletcher, Jr., 1828; Joseph Wesley, Jr., 1830; John Wesley, 1831; Joseph Abner, 1833, and Joseph Henry.

HARPER, Robert Goodloe (1765–1825), a United States Senator. At the age of fifteen he served in the army, and in 1786 became a member of the North Carolina bar. He was elected to the legislature, and from 1795 to 1801 served in Congress. He served in the war of 1812, and became a major-general. From 1816 to 1821 he was a United States Senator from Maryland. He published *Observations on the Dispute between the United States and France* (1797); *An Address on the British Treaty* (1796); *Letters on the Proceedings of Congress;* and *Letters to His Constituents* (1801).

HARP-SHELL (*Harpa*), a genus of gasteropodous mollusks of the whelk family (*Buccinidæ*), having the last whorl of the shell large, and covered with numerous sharp, smooth ribs, resembling the strings of a harp. The foot is large, and there is no operculum. These shells are much prized for their beauty. Nine species are known, all of them tropical, and living in deep water, on sandy or muddy bottoms.

HARRIS, Howell, one of the fathers and founders of Welsh Calvinistic Methodism, born in 1713 at Trevecca, Wales, in the county of Brecon. His mind was first seriously awakened to religious questions in 1735, and for seventeen years from that date he spent his time as a lay itinerant preacher, confining his ministrations for the most part to Wales. After his retirement to Trevecca in 1752, he still continued to preach daily at his own home; and in order to accommodate those who came to hear him he built a large house, the inmates of which led a kind of monastic life.

HARRIS, Isham Green, a United States Senator, born in 1818. He was admitted to the bar in 1841, and commenced practice at Paris, Tenn.; was elected to the State legislature as a Democrat in 1847; was chosen to Congress in 1849, and was reelected in 1851. In 1853 he moved to Memphis, and from 1857 to 1863 was governor of the State. During the last three years of the war he was a volunteer aid on the staff of the commanding general of the Confederate army of Tennessee. In 1877 he was elected to the United States Senate, and reelected in 1883 and in 1889. His term of service expires March 3, 1895.

HARRIS, William Torrey, an American educator, born in 1835. In 1867 he founded the St. Louis "Journal of Speculative Philosophy," and in 1868–80 was superintendent of public schools in St. Louis. In 1884 he became president of the Boston Schoolmasters' Club. Besides numerous contributions to periodical literature, he has published twelve *Annual Reports* on the St. Louis schools (1869–81), and *Statement of American Education*, used at the World's Expositions at Vienna and Paris.

HARRIS, Samuel, an American clergyman and educator, born in 1814. He taught from 1838 to 1841, and then held pastorates at Conway and Pittsfield, Mass., until 1855. He then became professor of systematic theology in Bangor Seminary, and held the position till 1867, when he was chosen president of Bowdoin College. In 1871 he was made professor of systematic theology at Yale. Among his published works are *Zaccheus; the Scriptural Plan of Beneficence* (1844); *Christ's Prayer for the Death of His Redeemed* (1863); *Kingdom of Christ on Earth* (1874); and *Philosophical Basis of Theism* (1883).

HARRIS, Samuel Smith, an American P. E. bishop, born in 1841. He was admitted to the bar in 1860, and engaged in the practice of his profession in Autauga county, Ala., until 1865, when he removed to New York. In 1869 he was ordained priest, and held pastorates at Montgomery, Ala., Columbus, Ga., New Orleans, La., and Chicago, Ill. In 1879 he was consecrated bishop of Michigan. He published *Bohlen Lectures* (1882).

HARRIS, Thaddeus William (1795–1856), an American entomologist. He practiced medicine at Milton Hill, Mass., from 1818 to 1831, and then became librarian of Harvard. In 1837 he was appointed a commissioner for a zoölogical and botanical survey of Massachusetts. Besides many papers on antiquarian research he published *Insects Injurious to Vegetation* (1841).

HARRIS, Thomas Lake, an American spiritualist, born in 1823. He entered the ministry of the Universalist church at an early age, and later organized an "Independent Christian Society." In 1850 he became a convert to the spiritualistic faith, and has since lectured throughout the United States and England. He has published *The Epic of the Starry Heaven* (1854); *Modern Spiritualism* (1856); *A Lyric of the Morning Land* (1854); *A Lyric of the Golden Age* (1856); *Truth and Life in Jesus* (1860); and *The Millennium Age* (1861).

HARRISBURG, the county-seat of Saline county, Ill., situated in a county abounding in salt, iron, coal and lead. Agricultural implements are manufactured here.

HARRISBURG, the county-seat of Dauphin county, Pa., and capital of the State, pleasantly situated on the left bank of the Susquehanna River, which is here crossed by four bridges, each over a mile in length. Besides the State Capitol building, the city contains a court-house, the State arsenal, the State insane asylum, a Roman Catholic cathedral, and some forty other churches. The State library contains about 60,000 volumes. The city is well provided with schools and academies, having, besides Harrisburg Academy and Miss Woodward's Seminary, about 20 large and a number of small public school buildings. The new water-works are extensive; the streets are macadamized and well lighted. The prosperity of Harrisburg is due chiefly to its facilities for communication with the coal and iron districts of the State; the Cumberland Valley, Northern Central Pennsylvania, Philadelphia and Reading, and the Vanderbilt or Southern Pennsylvania railroads, all centering here, to which the facilities afforded by the Pennsylvania canal with its outlets may be added. As a result of the resources it has large and important manufacturing establishments of iron, steel, boilers, galvanized iron cornices, brick, and tile. Harrisburg is also an important depot for lumber via the Susquehanna River, and has extensive saw and planing establishments. For history, description of capitol building, etc., see Britannica, Vol. XI, p. 494. Population in 1880, 30,762; in 1890, 40,164.

HARRISON, a post-village of Hamilton county, Ohio, 25 miles northwest of Cincinnati. It contains tanneries, flour-mills, brush factories, corn-drill factory, railroad shops, woolen and furniture factories.

HARRISON, Benjamin (1740–1791), a signer of the Declaration of Independence. In 1773 he was a member of the committee of correspondence which united the colonies against Great Britain, and was five times elected to a seat in Congress. He was governor of Virginia in 1782–85, and at the time of his death was a member of the legislature.

HARRISON, Benjamin, the twenty-third President of the United States, great-grandson of the preceding, born in North Bend, Ohio, Aug. 20, 1833. He graduated in 1852 from Miami University, and studied law in Cincinnati. In 1854 he removed to Indianapolis, Ind., and gained a large legal practice. In 1862 he entered the United States army, and served with conspicuous gallantry in the Atlanta campaign, returning to civil life at the close of the war with the rank of brevet brigadier-general. In 1876 he was the Republican candidate for governor of Indiana, and in 1881 was chosen to the United States Senate for six years. In 1888 he was nominated on the Republican ticket for President of the United States, with Levi P. Morton for Vice-President. The election resulted in favor of Mr. Harrison, who received 233 electoral votes to 168 for Grover Cleveland, the Democratic nominee.

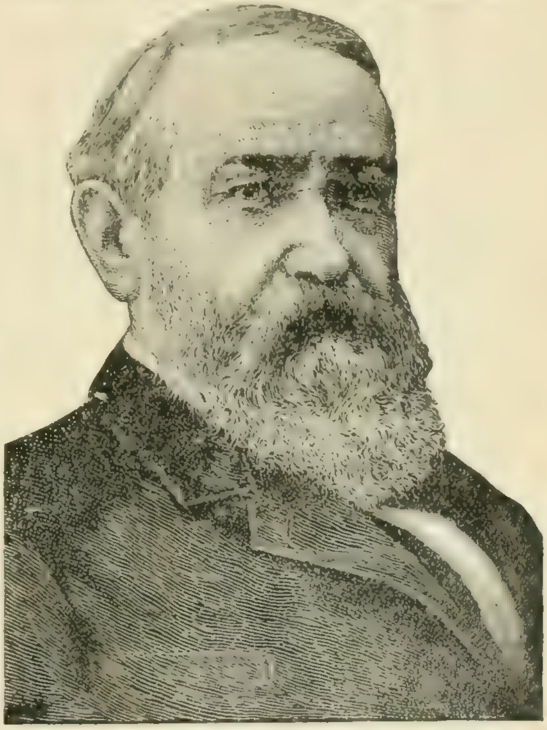
HARRISONBURG, a village, capital of Rockingham county, Va., situated in the Shenandoah Valley, 25 miles from Staunton. It is a railroad junction, and has various manufactories. Rawley Springs are 12 miles east of Harrisonburg.

HARRODSBURG, a town and the county-seat of Mercer county, Ky., said to be the oldest town in the State. It enjoys a reputation for its mineral waters; is the seat of Daughters' College; has a variety of manufacturing establishments, and carries on an important trade in horses, cattle, and other live stock.

HART, the name given to the stag or male deer from the age of six years, when the crown or surroyal antler begins to appear.

HART, Joel T. (1810–1877), an American sculptor. For a time he was a stone-cutter, and then modeled busts in clay. In 1849 he went to Italy, where he remained until his death. He subsequently modeled the statue of Henry Clay, now in Richmond, Va., the bronze statue of that statesman in New Orleans, and the marble statue in Louisville court-house, besides numerous other busts and statues of many distinguished men. Among his best works are *Charity*, *Woman Triumphant*, and *Penserosa*.

HART, John (1708–80), a signer of the Declaration of Independence. He served in the provincial legislature for several years, and was a member of the Congresses of 1774, '75, and '76. In 1777–78 he was chairman of the New Jersey council of safety, and when the State was invaded by the British his farm and stock were destroyed and he had to fly with his family to the forest. After peace was restored he returned to his farm and passed the remainder of his days in agricultural pursuits.



BENJAMIN HARRISON.

HART, John Seely (1810–77), an American author. In 1832 he became tutor in Princeton College, and in 1834 adjunct professor of ancient languages. From 1836 to 1841 he had charge of the Edgehill School; from 1842 to 1859 he was principal of the Philadelphia high-school; from 1863 to 1871 of the State Normal School of New Jersey, and in 1872 became professor of rhetoric and the English languages at Princeton. He has edited the *Pennsylvania Common School Journal*, *Sartain's Magazine*, and the *Sunday School Times*, and published *Reports of The Philadelphia High-School;* (1842–59); *Class-book of Poetry* and *Class-book of Prose* (1844); *In the School Room* (1868); *Essay on the Life and Writings of Edmund Spencer* (1847); *Manual of Com-*

position and Rhetoric (1870); *Manual of English Literature* (1872); *Manual of American Literature* (1873); and *Short Course in English and American Literature* (1874).

HARTE, Francis Bret, an American author, born in 1839. After a connection as editor with various California newspapers, he was appointed, in 1864, secretary of the United States branch mint, holding the position for six years. In 1868 he began the publication of *The Overland Monthly*, and about this time became widely known as an author. In 1871 he settled in New York City; from 1878 to 1880 he was United States consul at Crefeld, Germany, and from 1880 to 1885 consul at Glasgow, Scotland. Among his publications are: *Condensed Novels* (1867); *Poems* (1871); *Luck of Roaring Camp and Other Sketches* (1871); *East and West Poems* (1871); *Poetical Works* (1871); *Mrs. Skaggs's Husbands* (1872); *Tales of the Argonauts and Other Stories* (1875); *Thankful Blossom* (1876); *Two Men of Sandy Bar* (1876); *Gabriel Conroy* (1876); *The Story of a Mine* (1877); *Echoes of the Foot Hills* (1879); *Drift from Two Shores* (1878); *The Twins of Table Mountain* (1879); *Flip and Found at Blazing Star* (1882); *In the Carquinez Woods* (1883); *On the Frontier* (1884); *By Shore and Sedge* (1885); *Maruja, a Novel* (1885); *Snow-Bound at Eagle's* (1886); *A Millionaire of Rough and Ready* (1887), and *The Crusade of the Excelsior* (1881); also his collected *Works* (1882).

HARTE, Solomon Alexander, an English painter of Jewish descent, born at Plymouth in 1806, died in 1881. After studying at the Royal Academy in London, he exhibited a miniature of his father, Samuel Hart, in 1826; but his first oil painting, *Instructions*, was exhibited in 1828. He devoted himself mostly to historical painting. In 1841 he made drawings of many historical places in Italy. In 1857 he was made professor of painting in the Royal Academy, and in 1865 he became its librarian. Among his works we mention *Wolsey* and *Buckingham* (1834); *Cœur de Lion* and *Saladin*; *Milton Visiting Galileo in Prison*; *Raphael* and *Pope Julius II*.

HARTFORD, a city of Connecticut, sole capital of the State since 1873, and county-seat of Hartford county. For an account of the site, history, and government of Hartford, see Britannica, Vol. XI, pp. 496, 497. The population in 1890 was 53,182, being an increase of 11,167 during the decade, and there had been a corresponding increase in the business and wealth of the city, resulting in the erection of new buildings and the improvement of old ones, and the display of business enterprise. A board of trade has been organized. It held its third annual meeting on Jan. 1, 1891, and has a fine building in process of erection. Hartford Theological Seminary has laid the foundation of the Case Memorial Library. The new buildings of Trinity College are, to some extent, a reproduction of those of Trinity College in Glenalmond, Perthshire, Scotland; the new post-office building was completed in 1883 and the county court-house in 1884, and many of the insurance companies and banks have very fine and substantial edifices. There are fifteen miles of street railway, and seven railroads enter the city.

HARTFORD CITY, the county-seat of Blackford county, Ind., 40 miles south of Fort Wayne. It contains a hub and spoke factory, a heading-factory, flour-mill, and a stave factory.

HARTINGTON, Spencer Compton Cavendish, Marquis of, born July 23, 1833, and graduated at Trinity College, Cambridge, in 1854. He entered Parliament in 1857, being first returned for North Lancashire, in 1869, for the Radnor boroughs, in 1880 for Northeast Lancashire, and in 1885 for the Rossendale division of that county. Between 1863 and 1874 he held office as a Lord of the Admiralty, under-secretary for war, war secretary, postmaster-general, and, from 1871, chief secretary for Ireland. On Mr. Gladstone's temporary abdication, in February, 1875, he was chosen leader of the Liberal opposition, and in the spring of 1880, on the downfall of the Beaconsfield administration, was invited by the Queen to form a ministry. He rejected the offer, and served under Mr. Gladstone, first as Secretary of State for India, and then as War Secretary from 1883 to 1885. But he wholly dissented from Mr. Gladstone's scheme of Irish Home Rule, and since 1886, as head of the Liberal Unionists, has firmly supported Lord Salisbury's Conservative government.

HARTMANN, Karl Robert Eduard von, a German philosopher, born at Berlin Feb. 23, 1842. He was trained at the School of Artillery, and from 1858 to 1865 served as an artillery officer in the Prussian Guards. Compelled by an affection of the knee to abandon his calling, he has since 1867 resided in Berlin, occupied with literary and philosophical studies. From 1868 to 1877 he was chiefly working out his ideas on methodology, the philosophy of the natural sciences, psychology, metaphysics, and the theory of knowledge; since 1878 he has been chiefly concerned with ethics, the philosophy of religion, and æsthetics. His great aim is the harmonizing and reconciling philosophy with science, by gathering up the varied results of modern scientific investigation into an all-comprehensive philosophic conception of the world. Among the books in which his philosophical creed is laid down are: *Philosophie des Unbewussten* (1869); *Phänomenologie des sittlichen Bewusstseins* (1878); *Das religiöse Bewusstsein der Menschheit im Stufengang seiner Entwickelung* (1882); *Die Religion des Geistes* (1882); *Die Deutsche Aesthetik seit Kant* (1886); and *Die Philosophie des Schönen* (1887). He also gives close attention to the public questions of the day in Germany, and writes ably and clearly on such matters as education, politics, etc.

HARTOGIA, a genus of trees or shrubs, of the natural order *Celastraceæ*. *H. capensis*, a native of the Cape of Good Hope, is only 10 or 15 feet high, but the trunk is about a foot and a half in diameter. The wood is valued, and when polished is superior to mahogany. It is often used for veneering.

HARTRANFT, John Frederick (1830–89), an American soldier. In 1859 he was admitted to the bar, and at the beginning of the civil war organized the 4th Pennsylvania regiment. He commanded it during the three months of its enlistment, and then organized the 51st Pennsylvania regiment, becoming its colonel. He was present at the battles of Fredericksburg, Campbell's Station, Knoxville, Vicksburg, the Wilderness, and Spottsylvania, and in 1864 was made brigadier-general of volunteers. The following year he was brevetted major-general. In 1865 he was made auditor-general of Pennsylvania, and re-elected in 1868. From 1872 to 1878 he was governor of the State. He became postmaster of Philadelphia in 1879, and in 1880 collector of the port of that city.

HART'S FALLS, a village of Rensselaer county, N. Y., situated on the Hoosac River, near its mouth, and on the Boston, Hoosac Tunnel and Western and the Troy and Boston railroads. It contains paper and woolen mills, and has manufactories of cassimeres, gunny-cloth, and twine. It was formerly called Schaghticoke Point.

HARTSHORNE, Edward (1818–85), an American physician, son of Dr. Joseph Hartshorne. He graduated in medicine at the University of Pennsylvania in 1840, and eight years later began practice in Philadelphia. For a time he was a surgeon in Wills Eye Hospital and afterwards in the Pennsylvania hospital. During the war he served as consulting surgeon in the United States Army hospitals and in connection with the United States sanitary commission. He is the author of *Military Surgery*, notes to Taylor's *Medical Jurisprudence* (1861), and *Ophthalmic Medicine and Surgery* ([illegible]).

HARTSHORNE, Henry, an American physician, born in 1823. He graduated in the medical department of the University of Pennsylvania in 1845. In 1859 he became professor of the practice of medicine, and in 1865 of hygiene, in the University of Pennsylvania. In 1867 he was given the chair of organic science and philosophy in Haverford College. He has also been a professor in the Pennsylvania College of dental surgery, in Girard College, and in the Woman's Medical College of Pennsylvania. He is the author of *Water vs. Hydropathy* (1846); *Essentials of Practical Medicine* (1867); *Woman's Witchcraft, or the Curse of Coquetry* (1854); and *Summer Songs* (1865).

HARTSHORNE, Joseph (1779–1850), an American physician. He graduated in medicine at the University of Pennsylvania in 1805, and after two years of travel settled in Philadelphia. From 1815 to 1821 he was surgeon of the Pennsylvania hospital.

HARTS-TONGUE (*Scolopendrium*), a genus of widely distributed ferns, of which one species, *S. vulgare*, is a native of Britain, and is common in moist woods, on shady banks, in caves on the seashore, and other cold and damp situations. Its fronds are in general undivided, although sometimes forked, and from a few inches to 2 feet in length and from 1 to 3 inches in breadth. The sori are in transverse lines on the lateral veins. Fine plants of this fern are ornamental, and are most luxuriant in winter.

HARTZENBUSCH, Juan Eugenio, a Spanish dramatic poet, born of German parentage, in Madrid, Sept. 6, 1806, died there August 3, 1880. He was intended for the church, and was educated by the Jesuits, but his liking for the drama led him to devote himself to literature. During the greater part of his life he was employed in the national library at Madrid, of which he became director in 1862. His principal works, all published at Madrid, are the drama *Doña Mencia* (1838); the comedies *La Redoma Encantada* (1839); and *La Visionaria* (1840); and the dramatic poems *Alfonso el Casto* (1841); *La Coja y el Encogido* (1843); and others. He also published several works in prose, and issued good critical editions of the plays of Tirso de Molina, Calderon, and Lope de Vega.

HARUGARI, a German order established in the United States in 1847. This organization comprises several hundred subordinate lodges, combined into State lodges, and these again into one national lodge. The aims of the order are principally benevolent and social.

HARVARD, a thriving village of McHenry county, Ill., 63 miles northwest of Chicago. It is a railroad junction, has several elevators, railroad repair shops, and manufactories of farm machinery and carriages.

HARVARD COLLEGE. See Colleges, in these Revisions and Additions.

HARVARD, John (1607–38), an American philanthropist, born in England. He sailed for America in 1637, and the same year was made a freeman of Massachusetts. In 1638 a tract of land in Charleston was deeded to him, where he exercised his ministerial functions. At the time of his death his property was worth £1,500, one half of which he left for the erection of the College which bears his name. He also gave a library of 320 volumes. See Britannica, Vol. XI. p. 500.

HARWICH, a village of Barnstable county, Mass., on the south side of Cape Cod. It carries on a good fishing and coasting trade.

HASE, Karl August, a German theologian, born at Steinbach, in Saxony, Aug. 25, 1800, died Jan. 3, 1890. Expelled from Erlangen University for his connection with the political students' unions, he became in 1823 a University tutor at Tübingen, but, as the result of another investigation was afterwards imprisoned for ten months. In 1829 he settled at Leipzig, and in the following year was called to Jena as professor of theology. Here he remained till his retirement in 1883, when he was ennobled and appointed a privy councilor. He did great service in the reconciliation of the church's faith to modern thought, and was an equally resolute and effective opponent of orthodoxy on the one hand and rationalism on the other. His chief writings are: *Des alten Pfarrers Testament* (1824); *Lehrbuch der Evangelischen Dogmatik* (1826); *Gnosis* (1826–28); *Hutterus Redivivus* (1828); *Das Leben Jesu* (1829); *Kirchengeschichte* (1834); *Die beiden Erzbischöfe* (1839); *Neue Propheten* (1851); *Geschichte Jesu* (1876); and *Des Kulturkampfes Ende* (1879).

HASE, Karl Benedict, a German philologist, born near Weimar in 1780, died at Paris, March 21, 1864. After studying philosophy and theology at Jena, he went to Paris, and obtained a position in the Imperial library in 1805. In 1816 he became professor of Greek palæography and of modern Greek at the *Ecole des Langues Orientales*; in 1830 professor of the German language and literature at the Polytechnic School; in 1832 keeper of manuscripts in the Imperial library; and in 1852 professor of comparative grammar in the University of Paris. Hase edited *Leo Diaconus* (1819), and was the chief editor of a new edition of the Greek Lexicon of Stephanus. He was noted for his knowledge of the Byzantine historians.

HASSLER, Ferdinand Rudolph (1770–1843), an American surveyor. In 1807–10 he was professor of mathematics in the United States Military Academy, and in 1810–11 occupied a similar position in Union College. He then became first superintendent of the United States coast survey, and was sent to Europe to procure instruments, but was detained in England till 1815 as an alien enemy. In 1818 the work was discontinued and not resumed until 1832. From this time until his death he was at the head of the survey. He published *Analytical Trigonometry* (1826); *Elements of Geometry* (1828); *System of the Universe* (1828); *Logarithmic and Trigonometric Tables* (1838); and *Elements of Arithmetic* (1843); besides his annual reports of the coast survey.

HASTINGS, according to the French chroniclers, the name of a viking or sea-rover of the 9th century. The shores and cities of France, Spain, Portugal and Italy are said to have been repeatedly wasted and burned by him and his savage comrades.

HASTINGS, a city and county-seat of Barry county, Mich., on Thornapple River, 32 miles southeast of Grand Rapids. It has a foundry and flouring-mills.

HASTINGS, a city and county-seat of Dakota county, Minn., on the west bank of the Mississippi River. Carriages furniture and flour are manufactured, and the city contains grain elevators, saw mills, and is a wheat and lumber market.

HASTINGS, a city and county-seat of Adams county, Neb. With the recent rapid growth in population there has been a corresponding growth in all the important institutions of the city. A land company has been organized. Since 1886 railroad facilities have increased; five roads, with eleven outlets, connecting the city with all parts of the country. Street railway lines have increased to 18 miles. The streets are well paved and lighted. The public buildings are the court house, city hall. opera house, Masonic temple, State asylum for the insane, city hospital, Hastings College (Presbyterian) and Academy (Roman Catholic) and Young Men's Christian association. There are six fine public school buildings, public library, three daily and four weekly papers, four national banks, one private bank and a loaning company. The water plant is owned by the city. There is a good police force and fire department, also free mail delivery. There are five extensive brick-yards, two flour mills, six lumber yards, two foundries, three sash and door factories, a cold storage plant and a packing-house. There are thirty-one jobbing houses, and the wholesale trade in 1890 amounted to $1,250,000. Population in 1880, 4,500; 1890, 13,793.

HASWELL, Charles Haynes, an American civil engineer, born in 1809. In 1836 he was appointed chief engineer of the United States Navy, and was a member of the board that designed the steam frigates *Missouri* and *Mississippi*. In 1844 he was appointed engineer-in-chief of the engineer corps, and held the position till 1850, when he left the service. In 1877–78 he was a trustee of the New York and Brooklyn bridge. Mr. Haswell is the author of *Mechanics' and Engineers' Pocket Book* (1844), *Mechanics' Tables* (1856); *Mensuration and Practical Geometry* (1858); *Book-keeping* (1871); *History of the Steam Boiler and its Appendages;* and *Reminiscences of New York from 1816 to 1860.*

HATCH, William Henry, a United States Congressman, born in 1833. He was admitted to the Kentucky bar in 1854, and was chosen circuit attorney of the sixteenth judicial circuit of Missouri in 1858, and reelected in 1860. He served in the Confederate army; was commissioned captain and assistant adjutant-general in 1862; in 1863 was assigned to duty as assistant commissioner of exchange under the cartel, and continued in this position until the close of the war. He was elected to the successive Congresses from the 46th to the 51st as a Democrat.

HAT MONEY, a small duty formerly paid to the master of a ship for his care and trouble over and above the freight. The right to it was regulated by custom of particular ports.

HATTEMISTS, a sect founded in the Netherlands about 1683 by one Pontiaan van Hattem, a pupil of Spinoza. They were fatalists, and denied the existence of moral evil, teaching that the whole duty of the elect was to be patient. The sect disappeared in a few years.

HAUGIANS. See Hauge, Britannica, Vol. XI, p. 522.

HAUPT, Herman, an American engineer, born in 1817. From 1835 to 1839 he was assistant engineer on the public works of Pennsylvania, and from 1844 to 1847 was professor of civil engineering and mathematics in Pennsylvania College. In the latter year he became principal engineer of the Philadelphia and Columbia railroad, was made superintendent in 1849, and from 1856 to 1861 was chief engineer of the Hoosac Tunnel in Massachusetts. He served in the civil war as aid to Gen. Irwin McDowell and chief of the bureau of United States military railways. Since 1878 he has been chief engineer of the Tide-water pipe line company. Col. Haupt is the author of *Hints on Bridge-building* (1840); *General Theory of Bridge Construction* (1852); *Plan for Improvement of the Ohio River* (1855); and *Military Bridges* (1864).

HAUPUR, Hapoor, or Hapur, a town of India, in the North-west Provinces, eighteen miles south of Meerut. The western portion is substantially built, and the streets metaled and drained; the eastern half resembles a large agricultural village, full of cattle. A famous government stud was formerly maintained here. Population, 14,294.

HAUSSMANN, George Eugene, Baron, a French administrator, born in Paris, March 27, 1809, died there Jan. 12, 1891. Entering the public service under Louis Philippe he distinguished himself in various parts of France, and under Napoleon III, in 1853, rose to be prefect of the Seine. He then commenced his great work of improving and embellishing Paris, which continued until 1870 and imposed a financial burden of $175,000,000. He was made baron and Senator in recognition of his services. There was, however, much dissatisfaction with his enormous expenditures, and charges of mismanagement being freely made he was dismissed from office in 1870. The following year he was appointed director of the *Crédit Mobilier*, and in 1881 was elected a member of the chamber of deputies. "Haussmannizing" has become a popular term for the destruction of ancient landmarks to make way for improvements.

HAVANA, a post-village and county-seat of Mason county, Ill., situated on the east bank of the Illinois River, opposite the mouth of the Spoon River. It is a railroad junction, and has various public buildings and factories.

HAVANA, a village of Schuyler county, N. Y., at the head of Seneca Lake, eighteen miles from Elmira. It contains machine shops. potteries, and mills, where flour, plaster, and woolen goods are made.

HAVELOCK, Sir Arthur Elibank, K. C. M. G., the present governor of Ceylon, born in 1844. In 1877 he was appointed president of Nevis, a beautiful island of the Antilles, with Charlestown as capital, and two years later he became the chief civil commissioner of the Seychelles. His next promotion was in 1881 to the governorship of the West African settlements. In 1885 he became governor of Natal; after he had been created K. C. M. G., he was appointed to the governorship of Ceylon, in March, 1890.

HAVEN, Alice Bradley, an American authoress, born in Hudson, N. Y., in 1828, died at Mamaroneck, N. Y., in 1863. She wrote sketches for various papers until 1847, when she took editorial charge of the Philadelphia "Saturday Gazette," on the death of her husband, Joseph C. Neal, its editor, her pen-name being "Cousin Alice." She conducted this journal for several years, contributing at the same time to other periodicals. In 1853 she married Samuel L. Haven. Among her books are: *The Gossips of Rivertown, with Sketches in Prose and Verse* (1850); *Helen Morton; Pictures from the Bible; No Such Word as Fail; Patient Waiting No Loss; Contentment Better than Wealth; All's Not Gold that Glitters; Out of Debt, Out of Danger; The Coopers;* and *The Good Report—Lessons for Lent* (1867).

HAVEN, Erastus Otis, an American M. E. bishop, born in Boston, Mass., in 1820, died in Salem, Oregon, in 1881. In 1848 he entered the Methodist ministry in the New York conference, and in 1853 became professor of Latin in Michigan University. From 1856 to 1863 he was editor of the Boston "Zion's Herald," during which time he served two terms in the Massachusetts Senate. In 1863 he became president of Michigan University; in 1869 of Northwestern University, Evanston, Ill.; in 1872 was made secretary of the M. E. board of education; and from 1874 to 1880 he was chancellor of Syracuse University, N. Y. In the latter year he was ordained a bishop. He published *American Progress; The Young Man Advised* (1855); and *Pillars of Truth* (1866).

HAVEN, Gilbert (1821–80), an American M. E. bishop. In 1846 he became a teacher in Amenia Seminary, N. Y., and in 1851 a member of the New England conference. For the next nine years he preached in churches in Massachusetts, and then traveled in Europe, Palestine, Egypt and Greece. In 1867 he became editor of the Boston "Zion's Herald," and in 1872 was ordained bishop. He is the author of *The Pilgrim's Wallet, or Sketches of Travel in England, France and Germany; National Sermons; Life of Father Taylor, the Sailor Preacher* (1871); and *Our Next Door Neighbor, or a Winter in Mexico* (1875).

HAVEN, Joseph (1816–74), an American Congregational clergyman. In 1839 he was ordained pastor of the Congregational church at Ashland, Mass., and from 1846 to 1850 had charge of the Harvard church, Brookline. In 1850 he was made professor of mental and moral philosophy in Amherst College, and in 1858 of systematic theology in the Chicago Theological Seminary. He then traveled in Germany, Palestine and Egypt, and from 1873 until his death was professor of mental and moral philosophy in Chicago University. He published *Mental Philosophy* (1857); *Moral Philosophy* (1859); *Studies in Philosophy and Theology* (1869); and *Systematic Divinity* (published posthumously, 1875).

HAVER, a term used in Scotch law to denote the person in whose custody a document is.

HAVERFORD COLLEGE. See Colleges, in these Revisions and Additions.

HAVERGAL, Frances Ridley, an English writer, born at Astley, Worcestershire, in 1836, died at Caswell Bay, near Swansea, Wales, June 3, 1879. She displayed great talents as a singer, pianist and organist while a child. When grown up she wrote to give expression to her strong religious feelings. Among her many published books, which are all of a devotional character, we mention: *Little Pillows; The Ministry of Song; Morning Bells; Our Work and Our Blessings; Under His Shadow; My King; Kept for the Master's Use;* and *Swiss Letters* (1882). They are partly in prose and partly in verse.

HAVERHILL, a city of Essex county, Mass., pleasantly situated on the Merrimac River, 18 miles from its mouth, and connected with Boston by the Boston and Maine railroad. The principal industry is the manufacture of fine boots and shoes, in the production of which the city ranks third in the country. In February, 1882, a large part of the business portion of the city was destroyed by fire, involving a loss of nearly $2,000,000. Rebuilding was promptly begun. See Britannica, Vol. XI, pp. 526–27. Population in 1880, 18,472; in 1890, 27,322.

HAVERHILL, a village and one of the county-seats of Grafton county, N. H., located on the east bank of the Connecticut River. In the township leather, lumber, whetstones, paper, starch and boxes are made.

HAVERSTRAW, a post-village and railroad junction of Rockland county, N. Y., situated on the Hudson River, 38 miles from New York city. It has a paper mill, large print works, a rolling mill for copper, and engages extensively in the manufacture of brick.

HAVILDAR, the highest rank of non-commissioned officer among native troops in India and Ceylon.

HAVRE DE GRACE, a village of Harford county, Md., on the south bank of the Susquehanna River. It has a fine harbor, shipyards, a trade in lumber and coal, flour mills, fruit-canning factories, and extensive fisheries. The famous canvas-back ducks are obtained in the vicinity.

HAWAIIAN ISLANDS, a group of 12 islands (8 inhabited and 4 uninhabited), in the North Pacific Ocean. Area, as officially stated in 1891, 6,640 square miles. Population, 80,578. Capital, Honolulu (on the southwest coast of Oahu), with a population of 20,487. For the history, government, productions and early statistics, see Britannica, Vol. XI, pp. 528–32.

Reigning Monarch and Family.—Queen Liliuokalani, eldest sister of the late King Kalakaua I, born Sept. 2, 1838; married to His Excellency John O. Dominis, Governor of Oahu; succeeded to the throne Jan. 20, 1891, on the death of King Kalakaua.

Under Kaméhaméha I the Hawaiian or Sandwich Islands were united into one kingdom. The second king of the name and his queen died in England in 1823. Under Kaméhaméha III, the integrity of the kingdom was recognized by England, France and the United States, and subsequently by other governments. This king gave his subjects a constitution in 1840, which was revised and extended in 1852, and on his death in 1854 was succeeded by his nephew, Kaméhaméha IV, the husband of Queen Emma, who died in 1863. His brother, Kaméhaméha V, succeeded, and proclaimed a revised constitution, Aug. 20, 1864. On his death in 1872, without issue, Prince Lunalilo was chosen, on whose death in 1874 the late king Kalakaua was elected, and he was succeeded in 1891 by the present queen.

The late king, Kalakaua I, was born Nov. 16, 1836. He was the son of Chiefess Keohokalole and Kapaakea; was of pure Hawaiian blood, and akin to the ancient royal family. He was elected king by the Parliament on Feb. 12, 1874, on the death of Lunalilo I; was crowned February, 1883; was married to Queen Kapiolani (born Dec. 31, 1834, and died in 1888), and died in San Francisco, while on a visit to the United States, Jan. 20, 1891.

A new constitution was granted in 1887. The effect of the constitutional changes introduced was to curtail the power of the crown and to extend the popular basis of the government. Under the new constitution, as under the old, there are two houses—a house of nobles and a house of representatives—both consisting of 24 members. Under the former constitution the nobles were nominated by the king. Now both houses are elected by all adult males, subject to the possession of educational qualifications, and, in case of the house of nobles, of a property qualification as well. Representatives (who receive $250 for the term of service) are elected for two years, nobles for six. The two houses sit together, and form the legislature, in which the king's ministers hold seats *ex officio*, with the right to vote, except on questions of want of confidence in them. There is a privy council, the members of which are appointed by the king; and a cabinet, consisting of a minister of foreign affairs, of the interior, and of finance, and an attorney-general.

By an arrangement made in 1889, the Government of the United States controls the foreign relations of Hawaii.

The naval and military forces consist of 250 men, authorized by law, and a volunteer force—the Honolulu Rifles—of 250 men. All natives are liable to serve if called on.

AREA OF THE ISLANDS AND MOVEMENT OF POPULATION.—The areas of the island groups are as follows: Hawaii, 4,210 square miles; Maui, 760; Oahu, 600; Kauai, 590; Molokai, 270; Lauai, 150, Niihau, 97; Kahoowe, 63.

According to the census of 1884 there were 51,539 males, 29,039 females. Of the population in 1884, 40,014 were natives, 4,218 half-castes, 2,170 born in Hawaii of foreign parents, 17,939 Chinese, 12,237 foreigners (2,066 Americans, 1,282 English, 9,377 Portuguese, 1,600 Germans, 192 French, 116 Japanese, 767 Polynesians). The native population is closely allied to the Maories of New Zealand. At the time of Captain Cook's discovery of the islands the population numbered probably 200,000. Since then the natives have rapidly decreased, and since the census of 1878 there has been a decrease in the native population of 4,084. The foreign element is, however, rapidly increasing. The total arrivals in 1883 were 11,194; departures, 3,535; the immigration in 1884 was 7,654 and emigration 4,941, being an excess of 2,713 arrivals; in 1885 the former 5,410, the latter 1,805, being an excess of arrivals of 3,605; in 1886 there were 3,725 arrivals and 2,189 departures, showing an excess of 1,536 arrivals; in 1887, arrivals 3,250, departures 2,220; in 1888, 5,532 arrivals, 2,890 departures; excess of arrivals, 2,642. Most of the immigrants are Chinese and Japanese.

RELIGION, INSTRUCTION, AND FINANCE.—All forms of religion are permitted and protected. Nearly all the natives are Christians. The king belongs to the Church of England, of which there is a bishop at Honolulu; there is also a Roman Catholic bishop, and ministers of various denominations. Schools are established all over the islands, the sum allotted for public instruction in 1886–88 being $203,020 yearly. In 1888 there were 189 schools, with 8,770 pupils; of the pupils 5,320 were Hawaiians and 1,227 half-castes.

The budget is voted for a biennial period. The following shows the revenue and expenditures in dollars for the last three financial periods:

Finances.	1882–84	1884–86	1886–88
Revenue	3,092,085	3,010,655	4,812,576
Expenditures	2,216,406	2,988,722	4,712,285

Estimated revenue, 1888–90, $2,618,913; expenditure, $3,102,418. The revenue is largely derived from customs ($1,024,365 in 1886–88) and internal taxes ($786,422 in 1886–88), while the largest items of expenditure are for the interior ($1,528,260 in 1886–88), and finances ($727,264 in 1886–88). The debt on June 30, 1888, was $1,936,500. The interest varies from 6 to 12 per cent.

COMMERCE, IMPORTS AND EXPORTS.—The islands are very productive. Sugar and rice are the staples, while coffee, hides, wool, whale-oil, and bone are also exported. The following figures show the commerce and shipping for 1889: Imports, $5,438,000; native exports, $14,030,000; customs receipts, $[illegible]; ships entered, [illegible]; tonnage, [illegible].

Of the exports in 1889 sugar was valued at $13,-[illegible]; rice, $[illegible]. The imports are mainly groceries and provisions, clothing, grain, timber, machinery, hardware, cotton goods. Ninety per cent of the trade is with the United States.

Steamers connect the islands with the American continent, Australasia, and China. In the interisland traffic 20 steamers and a large number of schooners are constantly engaged. In 1889 there were 57 vessels belonging to the islands, of 15,403 tons. There are about 56 miles of railway in the islands of Hawaii, Maui, and Oahu. There are telegraphs in the islands of Maui, Hawaii, between Hawaii and Oahu, and round the latter island; total length, 250 miles; nearly every family in Honolulu has its telephone. In 1887 the total number of letters, etc., transmitted and received by the post-office was 1,574,442; there were 54 post-offices. Postal savings banks—depositors, 819; amount, $214,185. Honolulu is lighted by electricity and has lines of tramways. The various islands will shortly be connected by telegraphic cable.

HAWEIS, HUGH REGINALD, an English clergyman and author, born at Egham, Surrey, in 1838. He received his education at Trinity College, Cambridge, and graduated in 1859. After being curate of some London churches for six years he was appointed incumbent of St. James church, Marylebone, in 1866. He took a great interest in the welfare of the lower classes, diffused knowledge among them by his *Penny Readings*, and advocated the opening of the museums on Sundays. In 1868 Haweis was made editor of "Cassell's Family Magazine," and in 1885 he visited the United States, where he lectured in the larger cities. He has published *Music and Morals*; *Speech in Season*; *Arrows in the Air*; and has contributed articles to several magazines.

HAWES, JOEL (1789–1867), an American Congregational clergyman. In 1818 he was ordained pastor of the first Congregational church in Hartford, Conn., and was sole pastor until 1860, senior pastor until 1864, and pastor *emeritus* until his death. He published *Lectures to Young Men* (1828); *Tribute to the Memory of the Pilgrims* (1830); *Memoir of Normand Smith* (1839); *Character Everything to the Young* (1843); *The Religion of the East* (1845); *Washington and Jay* (1850), and *An Offering to Home Missionaries* (1865).

HAWESVILLE, the county-seat of Hancock county, Ky., on the Ohio River. Tobacco-raising and coal-mining are the chief occupations. This village is in the center of the Kentucky coal-beds, and eight mines are in operation in the vicinity.

HAWKBIT, the *Leontodon autumnale*, or fall dandelion, a plant of weedy aspect, belonging to the natural order *Compositæ*, closely related to and formerly included with the dandelion, from which it has been separated on account of its feathery pappus. The name is due to the deep tooth-like lacerations of the leaves. The species are natives of Europe, but are naturalized in parts of the United States.

HAWKERS, also called PEDDLERS, or, in England, petty chapman, persons who go from town to town, or door to door, selling goods or merchandise, or exercising their skill in handicraft. In the United States hawkers are generally required to take out licenses under the local laws of the several States. In some States and Territories, as Florida and Arizona, and in the District of Columbia, commercial travelers must pay a license-fee of from twenty-five to two hundred dollars; while in Pennsylvania it is a great misdemeanor to sell goods unless the agent or his principal be a tax-payer of the State. But in many States no such law has ever been enacted; and in others, as in Montana and Nevada, similar acts, although on the statute-book, are held to be unconstitutional, and are not enforced. In England hawkers who use beasts of burden, and hawkers who go from place to place, hiring rooms or booths for the exhibition of their wares, are by the Hawkers' act, 1888, required to take out an annual or half-yearly license from the excise, which is valid all over the kingdom. These licenses are at the rate of $10 per annum. A hawker is not entitled to sell spirits, but he may sell tea and coffee. He must not sell plated goods without taking out a plate license, nor must he sell by auction without an auctioneer's license. Any person hawking unprovided with a license, or who refuses to produce the license to any person who calls for it, is liable to penalties. Commercial travelers, book-agents, sellers of fruit, fish, victuals, or coal, also sellers in fairs or markets legally established, do not require either licenses or certificates.

HAWKESBURY, a river of New South Wales, which rises in the Cullarin range, and under the names of Wollondilly and Nepean flows northeast; then turns as the Hawkesbury southeast, and enters the Pacific at Broken bay, about twenty miles northeast of Sydney. Its length is 330 miles, and it is navigable for vessels of one hundred tons as high as Windsor. The Hawkesbury is crossed by a steel girder bridge (1886–89) on the railway between Sydney and Newcastle. This bridge is one of the largest structures of its kind in the world, and completes the system of railway communication between Brisbane and Adelaide.

HAWKESBURY, a Canadian lumbering village of Prescott county, Ont., situated on the Ottawa River, across from Grenville.

HAWKINSVILLE, a city and county-seat of Pulaski county, Ga., 40 miles south of Macon. It has cotton ware houses, grist mill, and manufactures carriages, wagons and cotton goods.

HAWKES, Francis Lister (1798–1866), an American Episcopal clergyman. In 1819 he was admitted to the North Carolina bar, but after a few years of marked success in the practice of law took up the study of theology, and was ordained deacon in 1827, and priest shortly afterward. In 1829 he became assistant rector of Trinity church, New Haven, Conn., and the same year at St. James's, Philadelphia. In 1830 he was made professor of divinity in Trinity College, and in 1831 became rector of St. Stephen's church, New York. From December of 1831 to 1843 he was rector of St. Thomas's, New York, and from 1845 to 1849 of Christ church, New Orleans. In the latter year he returned to New York, and became rector of Calvary church. In 1862 he resigned and went to Baltimore, where he became rector of Christ church, but in 1865 returned to New York. He was the author of many important works on legal, ecclesiastical, and other subjects.

HAWKSBEE, or Hauksbee, Francis, English natural philosopher, born in the latter half of the 17th century, and died about 1730. He was admitted a fellow of the Royal Society in 1705, and appointed curator of experiments to the society, and in 1723 was elected assistant secretary. He carried further the tentative observations by Dr. Gilbert and Boyle (see Britannica, Vol. VIII, pp. 3–4) on the subject of electricity, and by his experiments laid the scientific foundations of that branch of knowledge. He contributed forty-three memoirs to the "Philosophical Transactions," chiefly on chemistry and electricity, between 1704 and 1713. His chief independent work, published in 1709, was entitled *Physico-Mechanical Experiments on Various Subjects*. He is also well known as the improver of the earlier air-pumps of Boyle, Papin and Hooke, and as the first who used glass in the electrical machine.

HAWLEY, a village of Wayne county, Pa., situated on the Lackawaxen River, eight miles southeast of Honesdale. It is a railroad junction, and has a large business in the transfer and forwarding of coal.

HAWLEY, Joseph Roswell, a United States Senator, born in 1826. He was admitted to the Connecticut bar in 1850, and in 1857 became editor of the Hartford "Evening Press," which was consolidated with the "Courant," of which he is editor, in 1867. He enlisted in the Union army as a lieutenant in 1861; became brigadier and brevet major-general, and in 1866 was mustered out. In April of the same year he was chosen governor of Connecticut, and in 1872 was made a member of Congress. In 1881 he took his seat as a United States Senator, and was reelected in 1887. His term of service expires March 3, 1893.

HAWSE (akin to Icel. *hals*, "the neck"), part of a vessel's bow, in which the hawse-holes are cut. Through the hawse-holes the cables pass which hold the vessel when she is moored with two anchors out forward—one on the starboard, the other on the port bow. *Hauser* is a small cable or a large rope.

HAWTHORNE, Julian, an American author, son of Nathaniel Hawthorne, born in 1846. He was engaged in various occupations until 1871, when he decided to devote himself entirely to literature. He has published: *Bressant* (1873); *Idolatry* (1874); *Garth* (1875); *Sebastian Strome* (1880); *Fortune's Fool* (1883); *Dust*, and *Noble Blood* (1884); besides numerous novelettes and short stories. He edited his father's posthumous romance, *Dr. Grimshaw's Secret*.

HAY. See Agriculture and Grasses, in these Revisions and Additions.

HAY, John, an American author, born in 1838. In 1861 he was admitted to the bar of the Supreme court of Illinois, but immediately afterward became assistant secretary to President Lincoln. He acted also as his adjutant and aid-de-camp, and served for some time under Gen. Hunter and Gen. Gillmore. He was first secretary of legation at Paris, *chargé de affaires* at Vienna in 1867–68, and then secretary of legation at Madrid. From 1870 to 1875 he was on the editorial staff of the New York "Tribune," and from 1879 to 1881 was first assistant Secretary of State. He published *Pike County Ballads* (1871); *Castilian Days* (1871); and, with John G. Nicolay, *History of the Administration of Abraham Lincoln*.

HAYBOTE, an implied right of a tenant to take wood off the land he occupies to repair the hedges, gates and fences thereof.

HAYDEN, Ferdinand Vandeveer (1829–87), an American geologist. In 1853 he explored the "Bad Lands" of Dakota, and in 1854–55–56 was in the basin of the upper Missouri. From 1859 to 1862 he was naturalist and surgeon to the expedition sent out to explore the Yellowstone and Missouri Rivers under Capt. W. F. Raynolds, and in the latter year became assistant surgeon of volunteers in the United States Army. In 1863 he was promoted full surgeon, and in 1865 resigned with the brevet of lieutenant-colonel. From 1865 to 1872 he was professor of mineralogy and geology in the University of Pennsylvania. He then became connected again with the government geological surveys, and remained in charge of the Montana division until 1886, when failing health compelled him to resign. He was the author of numerous scientific papers and government reports.

HAYES, Isaac Israel (1832–81), an American explorer of the Arctic regions. In 1853 he sailed as surgeon of the second Grinnell expedition in search of Sir John Franklin, and was the first civilized man to place foot on Grinnell Land. In 1860 Dr. Hayes sailed in command of the *United States*, and claimed to have reached a point which he called Cape Lieber, in lat 81° 35′ N., long. 70° 30′ W. Some explorers, however, surmise that his calculations were incorrect, and that he reached Cape

Joseph Good, about lat. 80° 15' N., long. 70° W. In 1869 Hayes again entered the Arctic Circle in the *Panther*. During the civil war he was surgeon of volunteers, and attained the brevet rank of lieutenant-colonel. He published *An Arctic Boat Journey* (1860); *The Open Polar Sea* (1867); *Cast Away in the Cold, a Story of Adventure for Boys* (1868); and *The Land of Desolation* (1871).

HAYES, RUTHERFORD BIRCHARD, the nineteenth President of the United States, born in Delaware, Ohio, Oct. 4, 1822. He began the practice of law at Lower Sandusky in 1845, and in 1850 removed to Cincinnati, where he was city solicitor in 1859–60–61. At the outbreak of the civil war he was appointed lieutenant-major of the 23d Ohio infantry, and shortly afterward lieutenant-colonel. He distinguished himself in the campaigns of West Virginia, and in the battles around Winchester. At South Mountain he was severely wounded. In 1864 he was promoted brigadier-general, and the following year was brevetted major-general. From 1864 to 1866 he was a member of Congress from Ohio, and from 1867 to 1875 was governor of the State. In 1876 he was the Republican candidate for President of the United States. At the following election he was chosen over Mr Samuel J. Tilden, by a majority of one vote in the Electoral College, and Mr. Hayes was inaugurated March 5, 1877. As President his career was marked with moderation, wisdom, and a sympathy with all true reforms. His independence of character was shown by his vetoes, his steady adherence to principle, and his refusal to pander to mere party politics. His term expired March 3, 1881, and Mr. Hayes retired to his home in Fremont, Ohio, to lead a private life.

R. B. HAYES.

HAYES, WALTER I., a United States Congressman, born in 1841. He was admitted to the Michigan bar in 1863, was city attorney for Marshall; was United States Commissioner for the eastern district of Michigan, and also for Iowa; was city solicitor of Clinton, Iowa, and was district judge of the seventh judicial district of Iowa from 1875 to 1887. He was elected as a Democrat to the 50th Congress, and reëlected to the 51st.

HAYNAU, JULIUS JAKOB, BARON VON, Austrian general, born at Cassel, Germany, Oct. 14, 1786, died at Vienna, March 14, 1853. Entering the Austrian service in 1801, he became noted during the Italian campaigns of 1848–49 for military skill and ruthless severity. He was engaged in the siege of Venice, when he was summoned by the emperor to Hungary, in May, 1849, to take the supreme command of the forces in that country. The storming of Raab, his victory at Komorn, his occupation of Szegedin, and his victories on the Theiss contributed materially to the final success of the imperialists; but his atrocious severity towards the defeated Hungarians excited the detestation of Europe. Appointed governor of Hungary after its pacification, he was dismissed in 1850 for insubordination.

HAYNE, ISAAC, a patriot, born in South Carolina in 1745; was a wealthy planter and iron founder at the beginning of the Revolution, and at the same time was State Senator of South Carolina. He took the field as a captain of artillery. In 1780, when the British invaded his State, Hayne served in a cavalry regiment. At the capitulation of Charleston he was paroled. In 1781 he, with others, was required to join the royal army, and, being assured that he would not be made to bear arms against his country he took the oath of allegiance. Afterwards he was summoned to join the army immediately, and as this was in violation of the promises made to him he went to the American camp and was commissioned colonel of a militia company. In July, 1781, he captured Gen. Andrew Williamson, a former patriot, who had gone over to the British. But the British captured Hayne in return, threw him into the provost's prison, and after a brief examination hanged him at Charleston.

HAYNE, PAUL HAMILTON, an American poet, was born at Charleston, S. C., in 1831, and died July 6, 1886, and received his education at the Charleston schools. He published a volume of poems in 1855, a second in 1857, and a third in 1859. During the civil war Hayne wrote some fiery poems which were reprinted in Simms's *War Poetry of the South*. In 1872 he published *Legends and Lyrics*, and in 1873 he edited the *Poems of Henry Timrod*.

HAYNES, WILLIAM E., a United States Congressman, born in 1829. In 1856 he was elected auditor of Sandusky county, Ohio, and served two terms. In 1861 he enlisted in the Union army, and served till 1864. In 1866 he was appointed collector of internal revenue for the ninth district of Ohio, and held the position one year. Mr. Haynes was a member of the 51st Congress as a Democrat.

HAYS, EDWARD R., a United States Congressman, born in 1847. He was admitted to the Ohio bar in 1869, and in 1871 removed to Knoxville, Iowa. He was a member of the 51st Congress.

HAYS, ISAAC, an American physician, born at Philadelphia in 1796, died there April 12, 1879. He graduated at the University of Pennsylvania and practiced in Philadelphia, especially as an oculist. In 1820 he became editor of the "American Journal of Medical Science," and had sole charge of it till 1869. In the latter year was associated with him his son, Dr. I. Minis Hays, who still edits the periodical. In 1843 Dr. Hays also established a monthly, called "Medical News," and in 1874 the "Monthly Abstract of Medical Science." He also edited *Wilson's [illegible] Ophthalmology*, and a number of medical works. The code of ethics of the American Medical Association was framed by Dr. Hays. It has been adopted by every medical society in the United

States. He was president of the Philadelphia Academy of Natural Sciences from 1865 till 1869.

HAY, SPONTANEOUS COMBUSTION OF. After a series of very careful experiments, Prof. Cohn, of Breslau, has found that the heating of damp hay to a temperature sufficient to cause spontaneous combustion of it is due to a fungus. He first studied the heat generating action of *Aspergillus fumigatus*, which has the bad reputation of heating barley in the course of germination, and of rendering it sterile. Through the effect of the respiration of the little germ, that is to say, through the combustion of the starch and other hydrocarburets which the diastasic ferment converts into maltrose and dextrine, the temperature is raised by about 40 deg. The heating of the germs to more than 60 deg. occurs only through the intervention of the *Aspergillus*, which acts as a ferment. Under these conditions, it reaches its greatest development and produces its maximum action. In this state it rapidly burns the hydrocarburets.

HAYTI, a Republic, formerly a French colony, now governed by a constitution adopted June 14, 1867. Area embracing the western portion of the island of Hayti, 10,204 square miles. Population (there is no official census) estimated in 1891, by best authorities, at 572,000, about nine-tenths of whom are colored persons. Capital, Port-au-Prince, with a population, in 1891, of about 40,000. For early history, productions, government, and statistics, see Britannica, Vol. XI, pp. 543–46.

The religion of the Republic is chiefly Roman Catholic. Public elementary education is free. There were in 1891 about 400 national schools, besides several private schools, and five public lycées. As a result largely of long-continued civil war, there has been much disorder in financial affairs, and in 1890 there was an external government debt of $4,[illegible], and an internal debt of $9,180,000; total, $13,[illegible].

The army, under a "law of reorganization" passed in 1878, consists nominally of 6,828 men, chiefly infantry. There is a special "guard of the government," numbering 650 men with 10 generals, who act as aids to the president. In 1890 Hayti had one gun-vessel of 900 tons, a corvette, and two sloops.

In 1888 the total imports were valued at 7,543,294 piastres, exports valued at 13,250,307 piastres. The chief articles exported were: Coffee, 84,028,588 pounds; cacao, 3,927,089 pounds; mahogany, 30,262 ft.; logwood and cotton, 242,219,476 pounds—the latter chiefly to France.

The following is a list of the presidents of Hayti, from the date of the Republic:

Presidents.	Assumed Office.
Gen. Fabre Geffrard	Jan. 23, 1859
Sylvain Salnave	March 27, 1867
Gen. Nissage Saget	Mar. 19, 1870
Michel Domingue	May 15, 1874
Boisrond Canal	July 1876
Gen. Salomon	Oct. 22, 1879
Gen. Légitime	Oct. 22, 1888
Gen. L. M. F. Hyppolite	Oct. 17, 1889

The present constitutional term is for 7 years; salary of the president, £4,800—($24,000)

The historic outline for the last decade has been largely interwoven with that of San Domingo, which embraces the eastern portion of the island of Hayti. On Jan. 1, 1880, the Republic of Hayti was reported as "tranquil;" and this state of things continued notwithstanding serious government trouble in San Domingo until 1883, when a negro insurrection broke out in Port-au-Prince; but this was suppressed September 22d, of the same year. In 1888 great troubles arose because of large thefts of funds from the national bank of Hayti, resulting in convictions of doubtful desert, and imprisonments against which the English and American governments protested. The prisoners were soon after released. In 1888 a revolution took place in Hayti, and Salomon was deposed. He fled to Cuba August, 1878, and died in Paris, Oct. 19, 1888. A little later an insurrection took place under Gen. Télémaque, and during the month of October, while engaged in an attack on the Palais National at Port-au-Prince he was killed with about 300 of his followers. Gen. Légitime was elected president Oct. 22, 1888, and Gen. Hippolyte was installed as president at Haytien, Jan. 1, 1889. A conflict of authority and immediate war followed. Légitime was defeated Jan. 29, 1889, and Gen. Hippolyte was defeated Feb. 20, 1889; subsequently the latter advanced on Port-au-Prince, and soon became reestablished in office. At this writing (June, 1891), another rebellion is reported in progress in Port-au-Prince, and the president is said to have caused many of the leaders to be shot.

HAYWARD, the name given in England to one who keeps the common herd of cattle of a town, or of a manor, when the copyhold or other tenants have the right of sending cattle to graze.

HAZARD, ROWLAND GIBSON, an American manufacturer and philosopher, born at South Kingston, R. I., in 1801, died in 1888. Being engaged from his youth in manufacturing pursuits he accumulated a large fortune. In 1841, while in New Orleans, he secured the release from the chain gang of many free negroes who belonged to vessels from the North. He was twice elected to the State legislature of Rhode Island, and in 1866 also to the State Senate. Hazard published a number of philosophical treatises. We mention his *Essay on Language; Adaptation of the Universe to the Cultivation of the Mind; Decline of Political and National Morality; Railroad Corporations and the Public; Resources of the United States; Freedom of the Mind in Willing;* and *Causation and Freedom.* They were written between 1834 and 1869.

HAZARD, SAMUEL, an American antiquarian, born at Philadelphia in 1784, died there May 22, 1870. Ebenezer Hazard, the first postmaster-general of the United States was his father. S. Hazard was first engaged in mercantile pursuits, and made several voyages to the East Indies. Inclining toward historical research, he devoted himself to studying and editing documents relating to the early history of Pennsylvania. Among his compilations are: *Pennsylvania Register*, 16 volumes, finished in 1836; *Annals of Pennsylvania*, embracing the years from 1609 to 1682, published in 1850; and the *Pennsylvania Archives*, covering the years from 1682 to 1790 (1853).

HAZEN, WILLIAM BABCOCK, an American general, born at West Hartford, Vt., in 1830, died in 1887. He graduated at West Point in 1855, and served in the eighth infantry against the Indians in California, Oregon and Texas. In 1861 he became assistant professor of infantry tactics at West Point, and was made a captain in the same year. Soon after this he took command of the forty-first Ohio regiment, and joined Gen. Buell's army. In 1862 he was appointed to command a brigade. Hazen was with Buell in Alabama, fought bravely at Shiloh, and afterwards drove the Confederates from Danville, Ky. At the battle of Stone River he saved the left wing from being vanquished. After the battle of Chickamauga he deprived the Confederates of the advantages they had gained, and relieved the army at Chattanooga. At Missionary Ridge he captured 18 cannons. During Sherman's famous march to the sea Hazen commanded a division.

With this he captured Fort McAllister, Dec. 13, 1864, and was promoted major-general of volunteers. Afterwards he took part in forcing Johnston to surrender, and was made commander of the fifteenth corps, May 19, 1865. After the war Hazen was made colonel of the sixth infantry of the Regular Army. In December, 1880, he was appointed chief signal officer, with the rank of brigadier-general. While in this office he sent Lieut. Greely to Lady Franklin Bay to make meteorological observations, introduced the "cold-wave signals," promoted the use of local and railway weather signals, organized special observations for the cotton-producing States, established frost warnings, and initiated forecasts for vessels coming to this country from Europe. He published: *The School of the Army in Germany and France, with a Diary of Siege-Life at Versailles*, in 1872; *Barren Lands in the Interior of the United States*, in 1874; and *Narrative of Military Service*, in 1885.

HAZLETON, a city of Luzerne county, Pa. Its location, in the midst of a great coal region, and on two great railroads, the Lehigh Valley and the Pennsylvania roads, has been favorable to its leading industries. Among its manufactures are undertakers' supplies, pianos and organs, spring guns, iron and flour, and a beef company, established in 1884, does an extensive business. The public schools are excellent. The miners' new hospital is an extensive and commodious building. There are public halls and numerous churches. There are two daily, one semi-weekly, and two weekly papers, and three banks in the city. Population in 1880, 7,161; 1890, 11,818. See Britannica, Vol. XI, p. 549.

HEAD BOROUGH, an old Scottish term for the head of a borough, or high constable.

HEADLEY, Joel Tyler, an American author, born at Walton, Delaware county, N. Y., in 1814. After graduating at Union College in 1839 he studied theology at Auburn Theological Seminary, and became pastor of a church at Stockbridge, Mass. Ill health soon obliged him to give up pastoral work. In 1842 he went to Europe, and on his return published *Letters from Italy, and the Alps and the Rhine*. After this he devoted himself entirely to authorship, and wrote the following biographies: *Napoleon and His Marshals; Washington and His Generals; Grant and Sherman* (1866); *Sacred Heroes and Martyrs*; and also the following historical books: *History of the War of 1812*; *The Great Rebellion* (1866); and *The Great Riots of New York* (1873). His *Sacred Scenes and Characters* and *Sacred Heroes* are of great Biblical interest. In 1854 Headley was elected to the state legislature of New York, and in 1855 he was Secretary of State.

HEADLEY, Phineas Camp, an American author, born at Walton, N. Y., in 1819. He studied law and was admitted to the bar in 1847. Afterwards he studied theology in the Seminary at Auburn, N. Y., and held pastorates in the Presbyterian and Congregational churches. He published *Historical and Descriptive Sketches of the Women of the Bible* (1850; *Life of the Empress Josephine* (1851); popular biographies of *Kossuth*, *Lafayette*, *Mary Queen of Scots*, also *Hero Boy, or Life of Gen. Grant*, *Patriot Boy, or Life of Gen. O. M. Mitchell*, *Life of Ericsson*; also the *Life and Military Career of Major-General W. T. Sherman* (1865). Among his later works are: *Massachusetts in the Rebellion* (1866); *Half-Hours in Bible Lands* (1867); *Court and Camp of David* (1868); *Island of Fire* (1874); *Evangelists in the Church* (1875); and *Public Men of To-day* (1882).

HEALDSBURG, a city of Sonoma county, Cal., situated on the San Francisco and North Pacific railroad, 65 miles north of San Francisco, and 20 miles from the ocean. It has an academy, a graded school, and manufactories of chairs, baskets and wine. It was incorporated as a city in 1874.

HEALY, George Peter Alexander, an American portrait painter, born at Boston, Mass., in 1813. He studied for several years in Paris, and painted afterwards the portraits of Louis Philippe, Marshal Soult, Lewis Cass, Clay, Calhoun, Daniel Webster, Seward, Pierce, Gen. Sherman, William H. Prescott, H. W. Longfellow, Cardinal McCloskey and Stephen A. Douglas. In 20 years he executed nearly 600 portraits. In 1851 he completed his large historical picture of *Webster's Reply to Hayne*, which contains 130 portraits and hangs now in Faneuil Hall, Boston. In 1855 he exhibited at Paris a large picture representing Franklin urging the claims of the American colonies before Louis XVI, besides a series of 13 portraits. To the Philadelphia centennial exhibition he sent portraits of Thiers, the princess of Roumania, Elihu B. Washburn, and Lord Lyons.

HEALY, Timothy M., a member of Parliament, born at Bantry, Ireland, in 1855. He took an active part in the Land League agitation in 1880, and was arrested on a charge of intimidation, but was acquitted at the trial. Elected to parliament without opposition, he took a lively interest in the discussions of the Land bill of 1881, and obtained the insertion of the clause which excluded the improvements made by tenants from rent. This clause was since known as the *Healy clause*. In 1882 he was sentenced to imprisonment for six months for intimidation; but he was released after four months' service. In 1884 Healy was called to the Irish bar, and was afterwards one of the counsel for the scheduled members before the Parnell commission. In the parliamentary session of 1890 Healy delivered many speeches in Ireland's cause, and appeared on behalf of the Irish members at Tipperary.

HEARD, John T., a United States Congressman, born in 1840. He was admitted to the Missouri bar in 1862, and in 1872 was chosen to the State legislature. In 1881 he was elected to the State senate, serving four years, and then to the 49th, 50th and 51st Congresses.

HEARD'S ISLAND, an island in the South Indian Ocean, extending between 53° 2′ and 53° 14′ S. lat., and between 73° 30′ and 72° 30′ E. lon. It is 30 miles long and 10 miles wide, and its highest point, Kaiser Wilhelm Peak, is about 6,000 feet high. The island was discovered by Captain Heard in 1853.

HEARING IN PRESENCE, in the law of Scotland, a hearing of a difficult or important case before the whole of the thirteen judges of the court of session. In England it is not in general competent for any court, when equally divided, to order a case to be argued before all the other courts sitting together.

HEARING OF A CAUSE, the phrase used in the court of chancery, when the merits of the case and the arguments on both sides are entered upon.

HEARNE, a post-village of Robertson county, Texas, about 3 miles east of the Brazos River at the junction of the Houston and Texas Central Railroad and the International and Great Northern Railroad. The car shops of the latter railroad are located here.

HEARSE, the carriage in which the dead are conveyed to the grave, but originally the term applied to a triangular bar or framework with upright spikes for holding candles at a church service, and especially at funeral services. It was originally very simple in form, but in the 15th and 16th centuries hearses or "herses" of great splendor came into use, and were erected in the churches over the graves of distinguished personages. From this the transition to the modern funeral hearse can be easily traced.

HEARST, GEORGE, a United States Senator, born in 1820, died Feb. 28, 1891. In 1865 he was elected to the California State legislature, and in 1886 he became United States Senator to fill the vacancy caused by the death of John F. Miller. In 1887 he was again sent as a Democrat to the United States Senate to succeed A. P. Williams, Republican.

HEART'S CONTENT, a port of Newfoundland, beautifully situated on the S. E. side of Trinity Bay, in lat. 47° 50′ N., lon. 53° 20′ W. It is the landing-place of the Atlantic telegraph cables extending to Valentia, Ireland, and there are overland wires connecting with St. John's and Cape Ray. It has a fine telegraph building. Most of the inhabitants are engaged in fishing. Population, [illegible]

HEATH, WILLIAM, an American Revolutionary general, born at Roxbury, Mass., in 1737, died there June 24, 1814. He was active in organizing the militia before the Revolution; was a captain in the Suffolk regiment, of which he afterward became the colonel, joined the artillery company of Boston, and was chosen its commander in 1770. In 1774–75 he was a member of the Provincial Congress, and as provincial brigadier general he performed valuable services in the pursuit of the British troops from Concord on April 19, 1775. He organized and trained the undisciplined forces at Cambridge before the battle of Bunker Hill. Upon the organization of the Continental Army he was commissioned a brigadier-general, and stationed at Roxbury with his command; and on Aug. 9, 1776, he was made a major-general in the Continental Army. In March, 1776, he opposed the evacuation of the city of New York. After the battle of White Plains he took command of the posts in the Highlands. In 1777 he had charge of the prisoners of Burgoyne's army at Cambridge. In June, 1779, he took charge of the posts on the Hudson with 4 regiments, and remained in that vicinity till the close of the war. After the war he returned to his farm, was a member of the convention that ratified the Federal Constitution, was a State Senator in 1791–92 and probate judge of Norfolk county in 1793. In 1798 he published *Memoirs of Major-General William Heath, containing Anecdotes, and Details of Skirmishes, Battles, etc., during the American War.*

HEAVYSEGE, CHARLES, a Canadian poet, born at Yorkshire, England, in 1816. After receiving a limited education he became a wood carver, and emigrated to Montreal, Canada, in 1853. There he worked at his trade, but in his leisure hours he studied the Bible and Shakespeare. Frequently he contributed to the daily press, and acquired after a while a reputation as a poet. After his first juvenile effort at poetry, *The Revolt of Tartarus*, and some 50 sonnets, he published *Saul*, a drama, in three parts, in 1857; *Count Filippo, or the Unequal Marriage*, a drama in 5 acts; *Ode on Shakespeare*, and *Jephthah's Daughter* (1865). He died in 1876.

HEBREWS, EPISTLE TO THE. See Britannica, Vol. X, pp. 602–07.

HECATOMB: in the worship of the Greeks and in other ancient religions, a sacrifice of a large number of victims; properly, although by no means necessarily, one hundred. As early as the time of Homer it was usual only to burn the legs wrapped up in the fat and certain parts of the intestines the rest of the victim being eaten at the festive meal after the sacrifice. In Athens the hecatomb was a most popular form of sacrifice, while the Spartans limited the number of victims and sacrifices. In the hecatomb, strictly so called, the sacrifice was supposed to consist of one hundred bulls, but other animals were frequently substituted.

HECKER, ISAAC THOMAS, an American clergyman the founder of the Paulists, born at New York in 1819, died in 1889. In 1843 he joined the Brook Farm community, near Boston, where for 9 months he baked the bread eaten by the members. After this he worked with his two brothers in the flour business, and gave the workmen frequent lectures. In 1845 he became a Roman Catholic; went to Germany to study for the priesthood; joined the Redemptorist fathers in Belgium in 1847, and was ordained priest in London in 1849 by Cardinal Wiseman. After being released from connection with the Redemptorists, he founded in 1858 the new congregation of the missionary priests of St. Paul (the Paulist fathers), having their principal house in New York city. The members take no vows, and any priest can leave the order when he chooses. They are nearly all Americans converted from Protestantism. Hecker established "The Catholic World," a monthly periodical, in 1855; wrote the *Questions of the Soul; Aspirations of Nature*, and a pamphlet on *Martin Luther* (1883); and many other papers.

HECKER, FRIEDRICH KARL FRANZ, a German revolutionist, born at Eichtersheim, Baden, in 1811, died at St. Louis, Mo., March 24, 1881. He studied law at Heidelberg, and had afterwards a good law practice at Mannheim, but he entered politics. In 1842 he was elected to the chamber of deputies of Baden, and soon became a prominent member of the opposition. While visiting Berlin he was arrested and ordered out of the Prussian domains. This made him popular with the revolutionary class. In 1846–47 he was the leader of the extreme left in the Baden Diet. At Heidelberg he appeared in 1848 as a red-hot republican and socialist-democrat, and with the aid of Struve tried to unite the South-Germans in a revolutionary movement. Soon he placed himself at the head of columns of armed workingmen, unfolded the banner of the social republic, and advanced into the southern (Black Forest) part of Baden. Gen. Siegel was the military leader. They were beaten by the Baden soldiery at Kandern, May 20, 1848, and had to retreat into Switzerland. In September of the same year Hecker emigrated to America, but was recalled by the provisional government erected in Baden in 1849. Before his arrival in Baden the new government had, however, collapsed, and Hecker returned at once to America, settling as a farmer near Belleville, Ill., and became a citizen of the United States.

In 1856 he was a prominent speaker in behalf of the Republican party. The first German Illinois regiment was raised by him in 1860. He served in Gen. Fremont's division as colonel of this regiment, and afterwards as brigadier-general under Gen. Howard. At the battle of Chancellorsville he was wounded. In March, 1864, he resigned, and retired to his farm. In the winters he often delivered popular lectures to German-Americans. During the Franco-German war he hoped that Germany would soon be ripe for a republic, but after visiting Germany in 1873 he felt disappointed by the actual political condition in Germany.

HECKEWELDER, JOHN GOTTLIEB ERNST, an American Moravian missionary to the Indians, born at Bedford, England, in 1743, died at Bethlehem, Pa., Jan. 21, 1823. His father brought him to Pennsylvania in 1754, where he was afterwards apprenticed to a cooper. In 1762 he visited the Indian tribes on the Ohio with Christian F. Post, a colonial Indian agent, and in 1771 he became a missionary to the Delaware Indians. In 1792 and 1793 he accompanied the United States commissioners sent to make treaties with several Indian tribes near the Great Lakes. After staying in Ohio for some years as postmaster, justice of the peace, and also of the court of common pleas, he retired to Bethlehem, Pa., where he studied the languages and customs of the Indians, especially the Delawares, and wrote a *History of the Indians of Pennsylvania* (1819); *Narrative of the Mission of the United Brethren Among the Delaware and Mohegan Indians* (1820); and a collection of *Names Which the Delaware Indians Gave to Rivers, Streams and Localities Within the States of Pennsylvania, New Jersey, Maryland and Virginia, With Their Significations* (1822).

HECKLES (Mid. Eng., *hekele*, from the Dutch *hekel*, *haak*, "a hook"), very important parts of various machines employed in the preparation of animal and vegetable fibers for spinning. They consist of a series of long metallic teeth, through which the material is drawn so that the fibers may be combed out straight and so fitted for the subsequent operations. Gills are heckles with finer teeth. *Heckling* is also now the received term for the rough and trying process of catechization to which Parliamentary candidates and members are subjected by their British constituencies.

HECTIC FEVER (Gr., *hektikos*, "habitual"), the name given to the fever which occurs in connection with certain wasting diseases of long duration. It is one of the most serious and constant symptoms of consumption, and seems to be directly related to the progressive emaciation which marks the course of that malady. In the morning the patient's temperature may be normal, but towards evening or after eating he grows hot and flushed, and there is a preternatural vividness of expression, which, with the heightened color, sometimes gives a very fallacious impression of health. The patient retires to bed, has uneasy sleep, and wakens in the middle of the night or towards early morning, bathed in cold perspiration, and in a state of extreme languor. The same exhausting cycle repeats itself day after day. The only radical way of treating the fever is to cure the disease on which it depends. When the symptom itself must be combated, a pill containing a grain of sulphate of quinine, with half a grain of digitalis and as much of Dover's powder, taken three times a day, is often serviceable.

HEDDING, ELIJAH, bishop in the Methodist Episcopal church, born at Pine Plains, N. Y., in 1780, died at Poughkeepsie, April 9, 1852. He became a Methodist in 1798, and was licensed to preach in 1800. He preached in Northern New York, Vermont and New Hampshire, enduring sometimes great hardships. In 1807 he was appointed presiding elder of New Hampshire district, and in 1808 was a delegate to the general conference at Baltimore. After 24 years of itinerant labors he was elected and ordained bishop, and for nearly 28 years longer served the church with great zeal. During his episcopate he lived mostly at Lynn, Mass., but in 1837 he removed to Poughkeepsie, N. Y. Hedding assisted in founding "Zion's Herald," the first Methodist Episcopal journal in the United States, subsequently merged in the "Christian Advocate." He was an eloquent preacher, forcible and convincing, yet pleasant and cheerful in private life.

HEDGE, FREDERIC HENRY, an American clergyman and author, was born at Cambridge, Mass., in 1805, died in 1890. In charge of George Bancroft he was educated in Germany. On his return to America he studied theology at the Cambridge Divinity School, and in 1829 became pastor of the Unitarian church at West Cambridge. In 1835 he took charge of a church at Bangor, Me., and in 1850, after spending a year in Europe, he became pastor of the Westminster church at Providence, R. I., from which he removed to Brookline, Mass., in 1856. In 1858 Hedge became professor of ecclesiastical history in the theological department of Harvard College, and edited at the same time the "Christian Examiner." In 1872 he assumed the professorship of the German language in the same college. Besides many poems and frequent contributions to the "North American Review" and other periodicals, Dr. Hedge published *The Prose Writers of Germany* (1848); *Reason in Religion* (1865); *The Primeval World of Hebrew Tradition* (1870); *A Christian Liturgy for the Use of the Church*, etc. He also wrote hymns for the Unitarian church and published translations from the German poets.

HEDGE-MUSTARD (*Sisymbrium*), a genus of plants of the natural order *Cruciferæ*, annual or rarely perennial herbs, with various foliage, small yellow or white flowers, and a long roundish or six-angled pod (*silique*). Several species are natives of Britain, of which one, the common hedge-mustard (*S. officinale*), was once employed in medicine. It is said to be diaphoretic and expectorant, and has a mild pungency. It is an annual plant, sometimes two feet high, branched, with renunciate or deeply-lobed leaves, stem and leaves hairy, flowers very small and yellow, and it is sometimes cultivated as a pot herb. The pods are erect and closely pressed to the stalk.

HEEN, CHOW, TING AND FOO, Chinese geographical terms used to designate the relative rank of cities and districts. Generally speaking, however, the terms designate the rank of cities, from *foo*, the chief, to *heen*, the least in size.

HEFELE, KARL JOSEPH, VON, German theologian, born at Unterkochen, in Wurtemburg, March 15, 1809. He studied at Tübingen, and in 1836 became privatdocent, and in 1840 professor of church history and Christian archæology, in the Catholic theological faculty of that University. In 1869 he was made bishop. As a member of the Vatican council, he voted against Papal infallibility, but afterwards submitted. He became widely known as an eminent church historian through his *Apostolic Fathers* (1839); [illegible] (1841); *History of the Christian Councils* (1855-74); *Pope Honorius*, *Cardinal Ximenes* (1851); *Contributions to Church History*, and other works.

HEGESIPPUS, the earliest of the Christian church historians. Of his life we know nothing, save that he was almost certainly a Jewish convert, and that he flourished about the middle of the 2d century. He must have written most of his history previous to A. D. 167, and probably published it early in the episcopate of Eleutherus. His work was entitled *Five Memoirs of Ecclesiastical Affairs*, and appears not to have been a complete and continuous history, although extending from the death of Christ to the writer's own age. Unhappily it survives only in a few fragments which Eusebius had embodied in his own history, the most important of which are his account of the martyrdom of St. James and also of St. Simeon of Jerusalem.

HEIGHTS may be determined by four methods: by trigonometry, by levelling, by ascertaining and comparing the atmospheric pressure at top and bottom of the height by the barometer, or by ascertaining and comparing the boiling point of water at the top and bottom by the thermometer.

HEINSIUS, Anthony, a Dutch statesman, born at Delft, Dec. 22, 1641, died Aug. 13, 1720. He studied law at Leyden; in 1688 became grand pensionary of Holland, and as the close friend of William III of England guided Dutch politics till his death.

HEINTZELMAN, Samuel Peter, an American soldier, born at Manheim, Lancaster county, Pa., in 1805, died in 1880. He graduated at West Point in 1826, spent several years in border service as lieutenant, served during the Mexican war as captain, and was on the 9th of October, 1847, brevetted major for bravery. He then organized a battalion of recruits and convalescent soldiers at Vera Cruz, and marched them to the City of Mexico. After serving in California against the Indians and on the Rio Grande against Mexican marauders, he was brevetted lieutenant-colonel in May, 1861, for meritorious services, and was made inspector-general of the United States forces with headquarters at Washington. Afterwards he commanded a division of McDowell's army at the battle of Bull Run, and was wounded. In March, 1862, Heintzelman was in command of the third army corps; took an active part in the battles of Williamsburg and Fair Oaks; in the seven days' fighting around Richmond; in the second battle of Bull Run, and commanded the defenses of Washington. He was now major-general. After the war he served in New York harbor and Texas as colonel of the 17th infantry. In April, 1869, he was placed on the retired list with the rank of major-general.

HEIR and EXECUTOR, a short phrase to denote that branch of the law in which a leading distinction is made between the two kinds of property left by a deceased person, real and personal. If real, it goes to the heir-at-law; if personal, it goes to the executors or administrators. In Scotland the same leading distinction exists under the head of heritable and movable, but in Scotland some things are classed among heritable which in England would not be classed among real property.

HEIR-APPARENT, in English law, means the person who is certain to succeed if he outlive his ancestor; thus the eldest son is so, because no other person can ever come between and obtain precedence.

HEIR-FEMALE, the female heir connected through a female.

HEIRESS, a female heir when there are no male heirs to succeed. When there are several females, all sisters, who are in that case equally entitled, they are sometimes called co-heiresses.

HEIRESS, in heraldry, a lady is accounted an heiress if she has no brothers who leave issue.

HELICIDÆ (Gr. *helix*, "a spiral"), a large family of terrestrial air-breathing (pulmonate) gasteropods, of which snails are familiar examples.

HELIACAL RISING (from Gr. *helios*, "the sun"). A star is said to rise heliacally when it rises just before the sun. When the sun approaches a star which is near the ecliptic, the star becomes for a time invisible; the heavens being too bright in the quarters of sunrise and sunset, at the times of its rising and setting to allow it be seen. But when the sun, progressing in its orbit, separates from the star, and the latter begins to rise first, it in time rises so much earlier then the sun as just to be visible before daylight. It is then said to rise heliacally.

HEL: in Norse mythology, the goddess of the dead, and daughter of the evil-hearted Loki. The All-father hurled her down into Niflheim, and gave her authority over the lower world. She was of fierce aspect, and to her were assigned the characteristics of insatiable greed and pitilessness. After the diffusion of Christianity the ideas personified in Hel gradually merged, among the races of Scandinavian and German descent, in the local conception of a hell, or dark abode of the dead.

HELENA, a city and county-seat of Phillips county, Ark., situated on the Mississippi River and containing Southland College.

HELENA, the capital of Montana and county-seat of Lewis and Clarke county, situated among foot-hills in the Prickly Pear valley, about fourteen miles from the Missouri River, and with the Rocky Mountains rising behind the city to the south. The Northern Pacific Railroad passes through Helena, and the city is connected with the Canada Pacific and the Union Pacific roads, and by branch lines with several mining camps. Many of the streets are wide and straight, shaded with rows of cottonwood trees, and faced with handsome residences and business premises, and well lighted with gas and electricity. There are six street railways. A board of trade was organized in 1887. There are thirty-four graded schools, a high school and a number of private and parochial schools. Montana University, opened in 1890, is located outside the city. Charitable institutions are numerous, industries of nearly every type are pursued, and nearly all religious denominations are represented by the churches of the city. Gold was found here in 1864, and the camp was known as Last Chance Gulch until December of that year, when it received its present name. Population in 1890, 13,834. See Britannica, Vol. XVI, p. 774.

HELIGOLAND ("Holy Land"), an island thirty-six miles north of the Elbe mouth (see Britannica, Vol. XI, p. 630). It consists of a rock 200 feet high, on which are a village and a light-house. It is the resort of bathers from Hamburg. During 1890 the announcement of its proposed transference, under the terms of the Anglo-German agreement respecting Africa, from British to German rule came as a complete surprise upon the public of both countries, and various opinions were speedily elicited as to the propriety of the step contemplated. In England the value of the island as a naval station was strongly insisted upon; it was declared that the Heligolanders themselves were bitterly averse to the change, and Lord Salisbury was loudly reproached in some quarters for not having ascertained more carefully their views upon the subject. The protests, however proved unavailing, and on August 9 the island was formally handed over to Germany; the ceremony being followed by the visit of the German emperor on the next day, when a proclamation was read in which his Majesty promised the utmost care for the rights and wishes of the islanders, and announced that all living males would be exempt from compulsory military and naval service, to which they have a remarkable abhorrence. The revenue of the island in 1888 was slightly over $40,000, and the expenditure over $35,000.

HELLER, Stephen, German pianist and musical composer, born at Pesth, May 15, 1814, died at Paris Jan. 14, 1888. He made his début as a pianist when only nine years of age, and before he was sixteen had played in many of the principal cities of Europe. In 1830 he settled in Augsburg, and began the study of composition. In 1838 he removed to Paris, where he occupied himself with composing and teaching until his death. His works are distinguished by originality and refinement.

HELIOCENTRIC: in astronomy, having the sun (Gr. *helios*) as centre of reference; the heliocentric place of a planet being opposed to its geocentric (Gr. *gē* "earth"), its place as seen from the earth.

HELL GATE, named by the Dutch settlers of New York *Hellc Gat*, is a pass in the East River, between New York City and Long Island, formerly very dangerous to vessels from its numerous rocks and its rapid currents. These rocks and reefs were in mid-channel, and projected also from several small rocky islands. The largest were known as the Gridiron, Flood Rock, Hen and Chickens, Negro Head, Bread and Cheese, Hallett's Point, Way's Reef, Pot Rock, Frying Pan, Middle Reef, etc. In 1851 attempts were made to blast away the obstructions, and in these operations Maillefert's process of surface-blasting was employed. This consisted in placing charges of gunpowder, usually 125 pounds, on the surface of a rock and exploding the powder by means of an electric current. The rocks thus operated upon were Pot Rock, Frying Pan, Way's Reef, Baldheaded Billy, Sheldrake Rock, and Diamond Reef. On all of them the depth of the water was increased, in some cases only 2 feet, and in others as much as 10 feet. These improvements consumed over 74,000 pounds of gunpowder, and cost about $14,000. The money was furnished by New York City. In these operations the broken material was not dredged or otherwise cleared away.

The depths obtained were not sufficient for first-class vessels. Besides, a number of other obstructions remained in the channel. The U. S. Government, therefore, appropriated $20,000 in 1852; and Major Frazer, U. S. E., continued the surface-blasting on Pot Rock in the same year, thereby increasing the depth of the water over this rock from 18 to 20 feet. By this time it was deemed necessary to adopt other methods of working. Drilling under water through diving-bells was impossible, because the current runs too fast and the space was too small. The question arose, How can this work be done successfully? No satisfactory plan was devised until 1866, when Gen. John Newton, U. S. E., proposed drilling from a fixed platform through tubes reaching to the surface of the rocks. Congress made now sufficient appropriations for the work.

In 1869 Newton used a floating scow having a central opening of 32 feet diameter, through which a large hemispherical iron bell, open both at top and bottom, was lowered to the rock below. This dome-like caisson, made of boiler iron, afforded a frame-work for supporting 21 drill tubes. Drills weighing from 600 to 900 pounds worked through these tubes. The bell had legs which could be let out or drawn in to fit the rock. Cams were used to hold the legs in place. After the drilling was completed the drill-holes were filled by a diver, who inserted charges of nitro-glycerine and made the electrical connections with the fuses. After this the scow was floated away and the blasts fired. The broken rock was removed by means of a steam grapple.

In 1871 Newton used a steam-drilling scow on the Diamond Reef. He now drilled holes from 7 to 13 feet deep and 4 inches in diameter. He fired them with charges of from 30 to 35 pounds of nitro-glycerine. In 1871 he operated in like manner on Coenties Reef, in 1872 on the Frying Pan and Pot Rock. In that year the scow was struck 16 times by colliding vessels, and four of the latter were sunk by it. One vessel was drawn under the scow and carried off its dome; but the dome was afterwards recovered in a damaged condition. In 1874 Newton reduced Way's Reef from 17 feet to a depth of 26 feet.

The most difficult problem was the removal of the reef at Hallett's Point. To accomplish this he sank a large shaft on shore in 1869. From this shaft 41 radial and 11 concentric galleries of various cross-sections were driven under the reef. The length of all these galleries together amounted to nearly $1\frac{1}{2}$ miles. Diamond drills, Ingersoll drills, Burleigh drills and hammer drills were all used in this work. The excavations were completed in June, 1876. Then holes were drilled in piers and roofs for the charges. From Sept. 11, 1876, till the 20th of the same month was occupied by charging the holes. Twenty-three distinct galvanic batteries, aggregating 960 cells of zinc and carbon, were arranged to fire 160 fuses each; 3,680 mines were connected in continuous series with a lead and return wire, so that the circuits of all could be closed with one circuit-closer—*i. e.*, by pressing down a button. After everything was ready the mines were tamped by water run in through a syphon; and on Sunday, Sept. 24, 1876, they were fired at 2.50 P. M. without any hurtful shocks to surrounding objects. The water was thrown up to a height of 123 feet. The total expense of this blast was $81,092.

Flood Rock, situated in mid-channel, was still projecting above water, and constituted a dangerous reef. Work tending to its removal began June, 1875, by sinking a shaft 10 feet by 20 feet down through the rock. During the following year the mine was filled with water. Want of appropriations caused several suspensions, which added considerably to the cost of the work, in consequence of the pumping required to free the mine from the water flowing into it by some large seams. In 1874 the undermined area covered 9 acres. The total length of the galleries, 10 feet square, was 21,670 feet. The drill-holes for breaking up the roof and columns amounted to a total length of 113,000 feet, or over 20 miles. For charging the drill-holes cartridges 2 feet long were inserted and held in place by 4 small wire legs. These cartridges were filled with "rackarock," a mixture of 79 per cent. of finely ground chlorate of potash with 21 per cent. of dinitro-benzole. After filling the drill-holes with several rackarock cartridges, a dynamite cartridge, 15 inches long, with a fulminate of mercury exploder, was inserted. The mine was fired by primary charges of dynamite placed at intervals of 25 feet along the galleries, lashed to some timbers. Their explosion produced a concussion strong enough to ignite the fulminate primers in the charges of rackarock. By this "sympathetic" method the entire mine, containing over 120 tons of rackarock and 42,000 pounds of dynamite, was simultaneously exploded, on Oct. 10, 1884. The battery contained 60 bichromate cells connected together in series. When the electric contact was made a dull thud was heard, the earth shook for a considerable distance, and an immense mass of water was thrown some 200 feet up into the air. But no damage was done except the breaking of a few dozen panes of glass and shaking down some loose brick and plaster in Astoria. No severe shock was felt anywhere. Yet the entire roof of the mine was shattered, and about 500,000 tons of rock were loosened. The total expense of this blast was $106,509.

Immediately after this explosion dredging was commenced with the Government scow, but in October, 1885, a contract was let for the removal of 50,000 tons of loosened rock, and afterwards other similar contracts were let. About 120 tons were removed daily for a considerable time. But there are some of the rocky obstructions yet to be removed, inasmuch as the mean low-water depth is not quite 26 feet over the Diamond Reef, Coenties Reef, located near the North Brother's Island, and the Pilgrim Reef, which have been included in the projected improvements. Both the main and Eastern channels, however, now afford passages wide and deep enough for the largest vessels

HELMET-SHELL, the shell of a mollusk belonging to the genus *Cassis*, a thick heavy shell, with bold ridges, a short spire, and a long aperture, the outer lip toothed, the canal recurved. There are numerous species, most of them found in tropical seas, some in the Mediterranean. The shells are made up of differently colored layers, and are much used for the manufacture of cameos.

HELMHOLTZ, Hermann von, German scientist, born at Potsdam, Aug. 31, 1821; studied medicine at Berlin, was at first a surgeon in the army, then assistant in the Berlin anatomical museum. He was professor of physiology at Königsberg, 1849–55, from 1855 at Bonn, and from 1858 at Heidelberg. In 1871 he became professor of physics at Berlin. Helmholtz is equally distinguished in physiology, in mathematics, and in experimental and mathematical physics. His physiological works are principally connected with the eye, the ear, and the nervous system. He is the inventor of the ophthalmoscope, and has made discoveries of the first importance in acoustics. He was elected to the French Academy of Sciences in 1870, and was ennobled by the Emperor of Germany in 1883. His principal works are his paper on *Conservation of Energy* (*Ueber d. Erhaltung d. Kraft*, 1847); *Popular Scientific Lectures* (*Populäre wissenschaftliche Vorträge*, 1865–76); his great work on the *Sensations of Tone* (*Die Lehre der Tonempfindungen*, 1862); and his *Scientific Treatises* (*Wissenschaftliche Abhandlungen*, 1881–83).

HELOSTOMIDÆ, a peculiar family of acanthopterygian fishes. The mouth is small, having movable teeth on the lips. In most other respects they agree with the *Anabantidæ*, and are frequently classed with them in the same family. They are represented by the genus *Helostoma*, peculiar to the fresh waters of Java, Sumatra and Borneo.

HEMATOCELE, a tumor containing blood; opposed to hydrocele, a dropsical swelling.

HEMIBRANCHII, an order of teleocephalous fishes, having the palatine bone directly articulated with the quadrate, imperfect branchial arches, and a peculiar structure of the shoulder-girdle. Six families are referred to this order: the *Gasterosteidæ* or sticklebacks, *Fistulariidæ* or pipefishes, *Aulorhynchidæ*, *Aulostomidæ*, *Centriscidæ* and *Amphisilidæ*.

HEMITRIPTERIDÆ, a family of acanthopterygian fishes, represented by the genus *Hemitripterus*. It includes *Cottoidea* having numerous vertebræ (16 abdominal plus 23 caudal), an elongated spinous dorsal fin, imperfect ventrals enveloped in a thick skin, and inflated head with prominent orbits. The family is represented on the coasts of the United States by a species known as the deep-water sculpin, *Hemitripterus Acadianus*.

HEMLOCK, or Hemlock Spruce. See Fir, Vol. IX, pp. 222–25.

HEMP. See Brittanica, Vol. XI, pp. 647–49.

HEMPHILL, John J., a United States Congressman, born in 1849. He was admitted to the South Carolina bar in 1870. In 1876 he was elected as a Democrat to the legislature, and reelected in 1878 and 1880. He was a member of the 48th, 49th, 50th, and 51st Congresses.

HEMPSTEAD, a village of Queens county, N. Y., in Hempstead township, situated on the Long Island Railroad, 21 miles east of New York city. It has Hempstead Institute, public halls, a seminary, and many fine residences. The township of Hempstead is bounded on the south by the Atlantic Ocean, and includes Rockaway, a fashionable bathing-place. Population in 1890, 23,517.

HEMPSTEAD, a railroad junction and county-seat of Waller county, Texas. It has a cotton factory, and manufactures cotton-seed oil.

HENDECAGON, or Endecagon: in geometry, a plain figure of eleven sides and as many angles. The area of a regular or equilateral endecagon is very nearly equal to 9.36564 times that of the square of one of its sides.

HENDERSON, a railroad junction and county-seat of Vance county, N. C. Its principal industry is connected with tobacco.

HENDERSON, the county-seat of Henderson county, Ky., on the Ohio River, 212 miles southwest of Louisville. It has car works, wagon and carriage factories.

HENDERSON, the county-seat of Rush county, Texas. It is the seat of Henderson College.

HENDERSON, David Bremner, a United States Congressman, born in 1840. He was admitted to the Iowa bar in 1865. In 1861 he enlisted in the Union army, and served until discharged in 1863, owing to the loss of his leg. He reëntered the army the following year as colonel, and served until 1865, when he became collector of internal revenue for the third district of Iowa. He resigned in 1869, and became assistant United States district attorney for the northern division of the district of Iowa, and served two years. He was chosen as a Republican to the 48th, 49th, 50th and 51st Congresses.

HENDERSON, James Pinckney, an American soldier and statesman, born in Lincoln county, N. C., in 1808, died in Washington, D. C., June 4, 1858. After studying law he moved to Mississippi in 1835, and practiced law there until the Texas troubles began. He volunteered in the Texas army, and was appointed brigadier general in 1836. When the army was disbanded, President Houston appointed Henderson attorney-general of Texas. Subsequently he was Secretary of State. In 1839 he was sent to England and France in order to procure the recognition of Texan independence. In 1844 he was special minister to the United States to negotiate the annexation of Texas. In 1846 Henderson was a member of the State constitutional convention, and when the constitution was ratified he was elected governor of Texas. In the Mexican war he took command of the Texas corps of volunteers, distinguished himself at Monterey, and received afterwards the thanks of Congress and a sword for bravery in action. In 1857 he was chosen a United States Senator, and took his seat in March, 1858.

HENDERSON, John Steele, a U. S. Congressman, born in 1846. He entered the Confederate army in 1864, and served through the war. In 1876 he was a member of the North Carolina legislature, and of the State Senate in 1878. In 1881 he was elected one of three commissioners to codify the statute laws of the State, and in 1884 became presiding justice of the inferior court of Rowan county. He was elected as a Democrat to the 49th, 50th and 51st Congresses.

HENDERSON, Thomas J., a United States Congressman, born in 1824. In 1852 he was admitted to the Illinois bar, and was a member of the legislature in 1855 and 1856, and of the State Senate in 1857, 1858, 1859 and 1860. In 1862 he entered the Union army, and served till the close of the war, receiving the brevet of brigadier-general. He was a Republican member of consecutive Congresses from the 44th to the 51st, both inclusive.

HENDRICKS, Thomas Andrews, an American statesman, born near Zanesville, Ohio, in 1819, died suddenly at Indianapolis, Nov. 25, 1885. He graduated at South Hanover College, Ind., in 1841, studied law at Chambersburg, Pa., and was admitted to the bar there in 1843. He afterwards practiced law at Shelbyville, Ind., very successfully. In 1850 he was elected to the State convention to revise the constitution of Indiana. From 1851 to 1855 he was a member of Congress, after which President Pierce appointed him commissioner of the U. S. general land office. In 1863 Mr. Hendricks was elected to the U. S. Senate from Indiana, and was one of the leaders on the Democratic side. In 1872 he became governor of Indiana. After the expiration of his term, Mr. Hendricks continued to practice law at Indianapolis until 1884, when, after the nomination of Grover Cleveland for President at the Chicago convention, he was unanimously nominated for Vice-President, and in November was elected. He was an effective public speaker and an earnest Democrat.

HENLE, Friderich Gustav Jakob, born at Fürth, Bavaria, July 9, 1809, died May 18, 1885. He graduated M. D. at Bonn in 1832; was for a time assistant in the anatomical museum at Berlin, became professor of anatomy at Zürich 1840–44, at Heidelberg 1844–52, and in the latter year accepted a similar professorship at Göttingen. Among his works are: *Ueber Schleim und Eiterbildung* (1838); *Vergleichende Anatomie des Kehlkopfes* (1839); *Pathologische Untersuchungen* (1840); *Handbuch der allgemeinen Anatomie* (1841); *Handbuch der rationellen Pathologie*, and *Handbuch der Systematischen Anatomie*.

HENNEPIN, the county-seat of Putnam county, Ill. It is connected with Chicago by the Illinois River and the Michigan and Illinois canal, and is 114 miles southwest of that city. It contains a flour mill and a planing-mill.

HENNEPIN, Louis, a French explorer of America, born at Ath, Belgium, in 1640, died in Holland in 1702. He entered the order of Recollets of St. Francis, and was employed by his brethren to solicit alms at different places—among others at Dunkirk and Calais, where the stories related by the sailors stimulated his desire to visit foreign countries. Afterwards he traveled in Germany and Italy, and was regimental chaplain at the battle of Seneffe, between the Prince of Condé and William of Orange. In 1675 he was ordered to Canada, where he preached for some time at Quebec, and founded a convent at Fort Frontenac. Father Hennepin went first to Niagara with La Salle's expedition (see Britannica, Vol. XIV, pp. 318, 319), and took part in navigating Lakes Erie, Huron, and Michigan as far as Mackinaw. Then they sailed down to the Illinois River as far as Peoria, where La Salle built Fort Crèvecœur. Thence Hennepin set out with two men in a canoe, [illegible] descended the Illinois to its mouth, and, after going up the Mississippi River for some weeks, fell into the hands of a large party of Sioux Indians, who carried him and his men to their country. Here he discovered and named the Falls of St. Anthony. He spent eight months among the savages. Then Daniel Greysolon de Luht, who had come by way of Lake Superior, rescued him, and returned with him to Green Bay by way of the Wisconsin River. Hennepin returned to Quebec in April, 1682, and soon afterwards returned to France, where he published his *Description de la Louisiane, nouvellement découverte au Sud-ouest de la Nouvelle France* (1683). He was appointed guardian of the convent of Renty, in Artois, but he soon left it to go to Holland. After having asked his religious friends [illegible] he fled to England, where he published his *New Discovery of a Vast Country in America* (1698). His last work is *Nouveau Voyage dans un Pays plus Grand que l'Europe entre la Mer Glaciale et le Nouveau Mexique* (1698).

HENNINGSEN, Charles Frederick, an English soldier and author, born in England of Swedish parents in 1815. He joined the Carlist army in Spain in 1834, and became colonel of cavalry after the battle of Vielas de los Nevarros. He was afterwards taken prisoner and released on parole. Then he served in the Russian army in Circassia, and afterward joined Kossuth in the Hungarian revolution, becoming commander of the fortress of Comorn. Coming to America in Kossuth's interest, he joined in 1856 William Walker in Nicaragua, where he was given command of the artillery. He distinguished himself by his defense of Granada and in the victory of Queresma. After Walker's surrender to Com. Davis, U. S. N., in 1857, Henningsen returned to the United States. At the outbreak of the civil war he entered the Confederate army as colonel, but was soon afterwards made brigadier-general. He was an able artillerist. Henningsen published: *Revelations of Russia* (1845); *The White Slave*, a novel; *Eastern Europe; Sixty Hours Hence*, a novel of Russian life; *Past and Future of Hungary; Personal Recollections of Nicaragua;* and various other works, mostly issued in London.

HENRY, a village of Marshall county, Ill., situated on the Illinois River and on a railroad, 120 miles south of Chicago. A combined wood and iron bridge spans the river at this point, and here is a lock and dam of the Illinois River Improvement. The village contains a paper mill, a wagon factory, and Marshall College, founded in 1855.

HENRY, Caleb Sprague, an American clergyman and author, born at Rutland, Mass., in 1804. He studied theology at Andover and New Haven, and was ordained as a Congregational minister in January, 1829. He first became pastor at Greenfield, Mass., and then in West Hartford, Conn. In 1835 he took deacon's orders in the Protestant Episcopal church, and was ordained priest in 1836. From 1835-38 he was professor of intellectual and moral philosophy in British College, Pa., and from 1839 to 1852 professor of philosophy and history in the New York University. For some time he also performed the duty of chancellor. He was also rector of St. Clement's church, New York, from 1847 to 1850. During that period he edited the "Churchman," and was also for a year the political editor of the New York "Times." Before this he had founded the "American Advocate of Peace," which soon became the organ of the American Peace Society; also the New York "Review," which he conducted till 1840. Among his many published works we mention: *Cousin's Psychology* (1834), translated from the French; *Compendium of Christian Antiquities; Moral and Philosophical Essays; Guizot's History of Civilization*, with notes; *Ancient and Modern History*, revised; *Epitome of the History of Philosophy; Dr. Oldham at Greystones and His Talk There; Social Welfare and Human Progress;* and *Satan as a Moral Philosopher*.

HENSON, Josiah, an American clergyman, born at Port Tobacco, Charles county, Md., in 1789, died at Dresden, Ontario, in 1883. He was a negro, and was born and bred as a slave. Mrs. Harriet Beecher Stowe took him as the foundation of her novel entitled *Uncle Tom's Cabin*. His arms were crippled as the result of blows from a Maryland overseer. Although he paid [illegible] toward purchasing his freedom, yet his master took him to New Orleans to be sold. The latter was attacked with yellow fever and the slave accompanied him back to Kentucky and nursed him through his sickness. He finally escaped with his wife to Canada, carrying his two children through swamps and thick forests. "Uncle Si," as he was called, settled on Sydenham River near the present town of Dresden and prospered as a farmer. He was also the pastor of a church. When 42 years old he began to read and write. In 1858 he wrote and published an Autobiography. He went three times to England, lecturing and preaching in various cities, and was in 1876 entertained by Queen Victoria at Windsor Castle.

HEPATITIS (Gr. *hepar*, "the liver"), inflammation of the liver.

HEPPENHEIM, an old walled town of Hesse, situated on the Main-Neckar Railway, 16 miles from Darmstadt. It is noted for the excellent wine produced in the vicinity, and for the ruins of the castle of Starkenburg. Population, 5,000.

HEPTAGON, a plane figure of seven sides and seven angles; when the sides and angles are equal the figure is a *regular heptagon*. Geometers have hitherto failed to discover a method of inscribing the heptagon in or of circumscribing it about a circle and the problem is believed by many to be impossible of solution by the ancient geometry.

HERBARIUM. See Britannica, Vol. XI, pp. 715–718.

HERBERT, HILARY A., a United States Congressman, born in 1834. He was admitted to the Alabama bar, and then served in the Confederate army until 1864. He was elected as a Democrat to consecutive Congresses from the 45th to the 51st, both inclusive.

HERBERT, SYDNEY, Lord HERBERT, of Lea, English statesman, born at Richmond, Sept. 16, 1810, died Aug. 2, 1861. Educated at Harrow and at Oriel College, Oxford, he entered the House of Commons as member for South Wilts, which he represented until his elevation to the peerage in 1861. He was secretary to the admiralty 1841–45, secretary for war 1845–46, 1852–55, and in 1859. He was an able and popular Conservative leader, his army administration being signalized by great improvement in the sanitary condition and education of the army, the amalgamation of the Indian with the royal army, and the organization of the volunteer force. In 1861 he was called to the Upper House, under the title of Baron Herbert of Lea. He was heir-presumptive to the 12th earl of Pembroke, and his son became 13th earl in 1862.

HERCULES BEETLE (*Dynastes hercules*), a gigantic lamellicorn beetle from tropical America. The male bears on the thorax an enormous horn, which is met by a shorter upturned horn from the head. The female is without horns, and decidedly smaller. Another species, *D. tityus*, about two inches in length, occurs in the United States. The genus *Megasoma* is nearly allied to *Dynastes*.

HERCULES, PILLARS OF, the name given by the ancients to Calpe (now Gibraltar), and Abyla (now Ceuta), two rocky promontories forming the entrance to the Mediterranean Sea. According to the fable, they were originally one rock, but were torn asunder by Hercules.

HERD BOOK, a book of record containing the list of pedigrees of cattle of choice breeds.

HEREDITAMENTS, any species of property that may be inherited. See COPYRIGHT, Britannica, Vol. VI, pp. 356–68; PERSONAL ESTATE, Vol. XVIII, pp. [illegible]; REAL ESTATE, Vol. XX, pp. 304–08; TITHES, Vol. XXIII, pp. 310–13.

HEREDITARY RIGHT: strictly speaking, the right of succession as an heir-at-law. The foundation of this right is nothing but convenience, the principle being that if a man does not by will appoint his own heir, the law will do it for him, proceeding according to certain degrees of relationship.

HEREDITY, the general resemblance of children or young animals to one or both of their parents. In some cases this likeness is very close, so that, but for the difference in age, the offspring could scarcely be distinguished from the parent it resembles most. With children this likeness is, however, much less close than with animals. The most generally observed heredity in man is the resemblance in the external structure, comprising the size and shape of the body, the features, complexion, obesity or leanness, and other minor peculiarities. Among the latter may be mentioned the anomaly of six fingers and six toes, which has often been transmitted through several generations; of unusually long canine teeth, etc.

As to the internal structure, we find that the proportions of the bones and the organs of the body are transmissible characteristics. In some families the heart and the main blood-vessels are very large, while they are small in others. Some families are more full-blooded than others. In some the nervous and muscular systems are more developed than in others, and this greater or smaller development runs through many generations. In consequence of this we find certain diseases hereditary in some families, while others are free from them; many families are constitutionally weak in certain organs or tissues, while others are strong. Greater or less fecundity, longevity, immunity from infectious diseases, keenness of sight, hearing, or smell, personal idiosyncracies powers of voice, etc., are all transmissible characteristics. There are also on record many cases of the inheritance of special habits, graceful movements, bodily activity, and great muscular strength.

In regard to the intellectual and moral qualities the instances of heredity are too evident and well known to be dwelt upon here. Children resemble their parents very frequently in their passions, propensities, likings or dislikings, in their pride or humility, in their capability and love for music, painting, acting, dancing, etc. The same may be said of their literary or scientific tendency; of their logical, mathematical, and poetical or practical tendencies.

There are also cases on record where lunacy was transmitted through many generations; the tendency to commit suicide has been traced through four generations; and the alcohol habit has been transmitted through entire communities for centuries. Distinctive characteristics—mental as well as bodily ones—of isolated peoples, as the Gypsies, Jews, Chinese, are transmitted through entire nations for thousands of years.

This persistent inheritance of peculiarities cannot be the result of chance. It is altogether too general for that. We find it most strikingly exhibited in the instincts of the lower animals. Ants, bees, beavers, birds, etc., will now build their habitations exactly the same as ants, bees, beavers, birds, etc., built theirs thousands of years ago. The habits, modes of living and the methods of attacking their enemies, or of self-defense, etc., remain forever the same in the same genus of animals. We must, therefore, conclude that heredity is a law of nature.

As to particular phases of heredity, it is impossible that a child should resemble both parents if they are unlike. It will resemble one or the other, or else be intermediate between them in form and character. In most cases it strongly deviates towards one of the parents, and shows a less marked influence of the other. We find that the characteristics of the father sometimes descend to the son, at other times to the daughter. So the characteristics of the mother reappear as often in her sons as in her daughters. In other, but rarer cases, children resemble one of their grandparents, or even some remoter ancestor. This indirect heredity is called "atavism." There are cases on record where characters have appeared that are traceable to some very remote ancestor. Resemblance to an uncle or aunt occurs once in a long while also. We call this collateral atavism.

When a child is intermediate between its two unlike parents, yet shows the influence of both, this is no exception to the law of heredity, but a proof of it. Sometimes it is very difficult to trace this or that particular characteristic of the child to either of the parents, and then we speak of exceptions to heredity with more justification. These exceptions are apparently as numerous as the accordances. They are partly due to the combined influence of both parents upon the child, since a compound of two unlike elements must necessarily differ from either of the elements. The offspring of two markedly different parents, if it is strongly individualized, cannot resemble either. If the two parents are too greatly unlike in organization, descent, or color, the offspring will very likely be an infertile hybrid. And if they are too much alike in organization and descent, as branches of the same family sometimes are, then the offspring will be defective in some of the mental faculties or in some bodily development. Too much similarity of the parents causes partial arrest of development.

The other general cause of heterogeneity is the acquirement of new habits and mental tendencies during the life of the individual parent. Such new-gained characteristics are often transmissible, and may produce in the children marked deviations from the general family characteristics. The future parent, even while an embryo in its mother's womb, may be subject to disturbing influences which produce changes even in its structural organization. Many instances are on record where the uterine development of an embryo has been warped so as to produce permanent changes from the family type. Later on we observe individual variations produced by physical and mental influences acting upon the body or mind of a person during his adolescence. These variations are quite marked—much more so than those produced during the maturity of the person.

There are other causes of individual variations and deviations from the family resemblance—causes which act upon the germinal cells of both parents even before the procreation of the offspring. These warping causes are and will remain a mystery. We know only their effects. Thus we find good-sized parents begetting dwarfs, and medium-sized parents begetting children who grow to be giants, parents of very ordinary intellects begetting children who develop great genius; but in no instance can abnormally great mental powers be traced for more than two or three generations. The descendants of great thinkers and great actors in the world's theater generally return easily to the common level. The all-powerful influence of heredity makes itself felt in this return to the average condition of mankind. Individuals are incessantly diverging from the normal condition of body or mind, and they often make a lasting mark in history, yet the force of heredity acts in such a way as to straighten out such divergences. Divergent individuals are ever isolated and ephemeral. But family characteristics may be established by close breeding, as it is practiced with domesticated animals, as horses, cattle, dogs, pigeons, etc. The same thing takes place where peoples are strictly separated into castes or classes; where the members of the nobility, for instance, are not allowed to intermarry with those of the bourgeois or peasant class, the former become gradually thinned out, and physically and mentally degenerated.

National differences in physical and mental characters do not oppose the law of heredity. They are mostly due to the influence of circumstances on individual persons, families and communities, such as climate, food, education, occupation, etc. These influences produce transmissible characteristics, which, by their accumulation through centuries, constitute a new national character or type.

The physical and mental characters of nations are therefore very different. In ancient times a Greek was mentally as different from a Roman as a modern Yankee is now different from a Briton. The physical characteristics of races are very persistent, because heredity acts more vigorously upon the body than upon the mind. A child receives his body complete from his parents, but with respect to his mind he receives only a germ; an undeveloped faculty of thinking and willing. This faculty is very plastic. He must mold it himself and gather his mental stores himself. Yet the germinal mental tendencies are very tenacious, and yield but slowly to transforming influences. The child of a savage can, therefore, not attain the intellectual superiority of a Shakespeare or a Goethe; neither can the average child of a Mongolian, Papuan or Negro attain the intellectual development of an average Caucasian. Heredity is, therefore, an all-pervading agency or force in organic nature, that has produced the racial, national, and family characteristics, but it is counteracted by several opposing agencies which produce divergences from the general types, varieties, species, genera, and individual changes and modifications. While heredity instills an inherent tendency to repeat the characteristics of the parent, these opposing agencies tend to produce characteristics in the offspring not existent in either parent. Heredity alone would produce homogeneity, a tiresome sameness; while the opposing agencies differentiate the general types, and thus produce heterogeneity.

HERING, CONSTANTINE, a German physician, born at Oschatz, Saxony, in 1800, died at Philadelphia, July 23, 1880. Having studied medicine and graduated as M.D., he was engaged in writing a book confuting homœopathy. He read Hahnemann's works, became a convert and, after personal acquaintance with Hahnemann, his admiring friend. The king of Saxony sent him to Surinam to study the flora and fauna of that country. In 1833 he arrived at Philadelphia, where he founded the first homœopathic school in this country. From 1845 to 1869 he filled the chairs of homœopathic materia medica and medicine in this school. He edited several homœopathic papers, as the "Homœopathic Quarterly," the "Homœopathic News," and the "American Journal of Homœopathic Materia Medica." He published many books in both English and German on his favorite doctrine, as the *Rise and Progress of Homœopathy*, *Effects of Snake Poison*, *Condensed Materia Medica*, *Hering's Domestic Physician*, and *American Drug Provings*.

HERITABLE AND MOVABLE, a Scotch law-phrase denoting the distinction of things which go to the heirs and to the executors respectively. Movables include such property as passes to the executor in succession, or is movable by the tenant on leaving his farm, or as comes under the operance of the law of the owner's domicile in bankruptcy and succession. Money and household furniture may be taken as examples. Heritable subjects are such as go to the heir in succession, or go with land to a buyer, and are regulated by the territorial law. The best examples are land and houses. The gearing of engines and all machinery fixed to the floor are also heritable. Heritable bond, in Scotch law, is a personal bond for a sum of money, with a real right of annual rent payable out of land, and accompanied by a conveyance of the lands themselves in security. The usual deed is now a bond and disposition in security, corresponding to the English mortgage. Heritable securities is the name given, in the law of Scotland, to what in England are called mortgages and charges on land. By the constitution of a heritable security, the debt secured becomes a burden on the land, entitling the creditor to appropriate the rents until the debt is paid. This right of the creditor remains entire against the land, no matter into whose hands it passes. In Scotland the principal heritable security is called the bond and disposition in security, which consists of an obligation to pay the debt, and a disposition to the creditor by way of security till the debt is paid. Power is given to the creditor to sell the estate if the principal or interest is not paid, in which case the creditor must account for the surplus after paying himself the debt.

HERITOR: in the law of Scotland, the owner of land in a parish liable to public burdens. The heritors, collectively, have vested in them the fee of the church and churchyard; they repair the parish church and manse, or rebuild them where necessary.

HERKIMER, the county-seat and a railroad junction of Herkimer, N. Y. It is a thriving village, and has good schools, a flour mill, and a paper mill.

HERKIMER, NICHOLAS (c. 1725–1777), an American Revolutionary soldier. In 1758 he became lieutenant of militia, and commanded Fort Herkimer, on the Mohawk, during the attack of the French and Indians in that year. In 1775 he became colonel and chairman of the committee of safety of Tryon county, N. Y. A year later he was made brigadier-general in the New York militia. When Colonel St. Leger, sent out by General Burgoyne, besieged Fort Schuyler (now Rome, N. Y.), Herkimer marched to its relief with 800 militia. He proceeded cautiously at first, but his younger officers urged him to proceed more rapidly. As they advanced through a wooded ravine near Oriskany, the British regulars attacked him in front and the Indians on both sides, Aug. 6, 1777. He was soon wounded, but continued to direct the fight for five hours longer. A sortie from Fort Schuyler relieved his men after a loss of 200. He died from the effects of the amputation of his leg. Congress and New York united in erecting a monument to his memory in 1884.

HERKOMER, HUBERT, an English painter, born in 1849. In 1870 he exhibited two pictures in the Dudley gallery, and his success was immediate. His two most popular oil-paintings are *Chelsea Pensioners*, and the companion piece, *Eventide*, the latter showing a group of old women at the workhouse.

HERMANN, the county-seat of Gasconade county, Mo., eighty-one miles from St. Louis. It is a noted wine-producing town, and its inhabitants are mostly Germans.

HERMANN, BINGER, a United States Congressman, born in 1843. In 1866 he was admitted to the Oregon bar, the same year was elected to the legislature, and two years later to the State Senate. In 1868–71 he was deputy collector of United States internal revenue for Southern Oregon, and from 1871 to 1873 was receiver of public moneys at the United States land office at Roseburg. He was a member of the 49th, 50th and 51st Congresses.

HERMETIC BOOKS, the sacred canon of the ancient Egyptians, consisting of forty-two books, divided into six sections. They constitute what is virtually an encyclopædia of Egyptian wisdom, in that they treat of religion, the arts and science. The name "hermetic" comes from Hermes Trismegistus ("Hermes Thrice-greatest"), Greek name of the Egyptian god Thoth, regarded as the originator of Egyptian culture. These books are evidently based upon the Egyptian mythology, but at a time when it was beginning to feel the influence of Hellenistic culture. The Greek and Latin texts of the hermetic books exist only fragmentarily, in the writings of Stobaeus, Cyrillus, Suidas and Lactantius. The teachings of Thoth were at first regarded as esoteric doctrines, and as such jealously guarded by the sages, and from them transmitted to their pupils. Thoth was also the inventor of magic and alchemy, whence the latter was sometimes called the *hermetic art*, and whence are derived the terms *hermetic medicine*, *hermetic freemasonry* and *hermetically sealed*.

HERMODACTYL ("Hermes's finger"), a bulbous root, formerly brought from Turkey, and much esteemed as a cathartic, but entirely discarded in modern times. It is probably obtained from *Colchicum variegatum*.

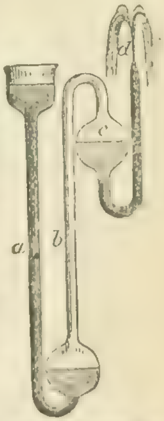
HERNANDEZ-VELASCO, GREGORIO, a Spanish priest and poet, born at Toledo about 1550; translated the *Æneid* of Virgil into Spanish verse (1585). Though the style is rather inflated, the version is correct and presents some elegant passages.

HERNDON, WILLIAM LEWIS (1813–57) an American naval officer, born at Fredericksburg, Va. He served in the American navy and in the Mexican war. In 1851 he was sent to explore the Amazon River. He crossed the Andes from Lima to the headwaters of the Amazon, and then sailed down the river in a canoe. The United States Government published two volumes of Herndon's *Exploration of the Valley of the Amazon*. In 1857 he was captain of the steamer *Central America*, which with 580 persons on board, sailing from Havana for New York, sank in the Gulf-stream. The women and children were saved, but Herndon with 426 men sank with the vessel.

HEROIC AGE: in Greek history or mythology, the age preceding the true historic period. The heroes of that time were regarded by the ancients as intermediate between gods and men, and were venerated much as the saints of Christianity are now. The heroic age furnished abundant material for dramatic and epic poetry of later times, and afforded noble examples of courage, purity and justice.

HEROIC VERSE, the form of verse adapted to heroic or epic poetry. In classic poetry it is the common hexameter verse; in English, German and Italian the iambic of ten syllables; and in French the iambic of twelve syllables.

HERON. See Britannica, Vol. XI, pp. 760-62.



HERO'S FOUNTAIN.

HERO'S FOUNTAIN, a pneumatic apparatus named from its inventor, Hero of Alexandria.

This instrument, through the elastic force of a confined body of air, increased by hydraulic pressure and reacting upon the surface of water in a closed reservoir, produces a jet which may rise above that surface to a height equal to the effective height of the pressing column. An open basin connected with two closed reservoirs on different levels below constitutes the instrument, a simple mode of constructing which is shown in the annexed figure. The column of water in the tube *a* compresses the air in *b;* this presses on the surface of the water in *c*, and causes it to gush out at *d*

HERRERA, y Cabrera, Desidero (1792–1856), a Cuban writer and educator, born in Havana, Cuba. After studying in his native city he devoted himself to teaching and journalism. He published *Agrimensura Cubana*, *Observaciones Científicas*, which Arago translated into French; *Huricanes de la Isla de Cuba*, *Topografia Medica de Cuba*, *Lecciones de Agrimensura*, a treatise on meteorology, and a number of scientific pamphlets.

HERRING. See Britannica, Vol. XI, 764–65.

HERRING SILVER, money paid in lieu of supplying a religious house with a certain number of herrings. See Tithes, in Britannica, Vol. XXIII.

HERRISON: in heraldry, the hedgehog; a charge allusively borne by families of the name of Harris.

HERSCHELL, Farrer, an English statesman, born in 1837. After being educated at the Universities of London and Bonn he became a queen's counsel in 1872, and recorder of Carlisle in 1873. In 1880 he was solicitor-general in Gladstone's ministry, and in 1886 he was raised to the peerage and became lord chancellor. On the appointment of a royal commission to inquire into the working of the metropolitan board of works, Lord Herschell was elected president of this commission. In 1888 he visited India.

HERWARTH VON BITTENFELD, Karl Eberhard, Prussian general, born at Grosswerther, Sept. 4, 1796, died at Bonn, Sept. 2, 1884. He entered the military service in 1811, and gained his first laurels in the war of liberation, especially in the battle of Leipzig. In 1863 he was promoted to the rank of general, and in 1864 commanded the Prussian troops against Denmark, distinguishing himself by his daring capture of the isle of Alsen. In the campaign of 1866 he was intrusted with the occupation of Saxony, and then with the command of the army which advanced from Saxony into Bohemia. He gained victories at Hühnerwasser and Münchengrätz, and took a prominent part in the battle of Königgrätz. In 1870, on the outbreak of the Franco-German war, he was made governor of the Rhine provinces, and in 1871 a general field-marshal.

HERWEGH, Georg, German poet and politician, born at Stuttgart May 31, 1817, died at Baden-Baden, April 7, 1875. He studied at Tübingen, was drafted into the army, and subsequently went to Switzerland, where in 1841 he published his successful *Gedichte eines Lebendigen*, a collection of political songs. He returned to Germany in 1842, but soon after incurred the displeasure of the king of Prussia, and was obliged to retire a second time to Switzerland, whence in 18[illegible] he published [illegible] the part he [illegible] in the revolution in Baden in [illegible]. The remainder of his life was [illegible] in southern France.

HERZ, Henri, pianist and composer, born of Jewish parentage at Vienna in [illegible], and educated in Paris, where his talent was early recognized. His compositions became [illegible] throughout Europe and [illegible] with [illegible] visiting England [illegible] and America [illegible]. In 18[illegible] he received the decoration of the Legion of Honor, and from 1842 till 1874 he was professor of music at the conservatory of Paris. He was also manager of a pianoforte factory, and in 1855 his pianofortes won the first prize at the Paris exhibition. His compositions, more than 200 in number, are mostly for the piano. He died in 1888.

HERZOG, Johann Jakob, German theologian of the Reformed creed, born at Basel, Sept. 12, 1805, died Sept. 30, 1882. He studied theology in his native city and in Berlin, became professor at Lausanne in 1830, at Halle in 1847, and at Erlangen in 1854, retiring in 1877. Among his works are: *Calvin*, 1843; *Das Leben Oekolampadii* (1843); *Die Romanischen Waldenser* (1853); but his name is best known for the great theological encyclopædia edited by him, *Realencyklopädie für Protestantische Theologie und Kirche*, 22 vols., 1854–68; new ed. 18 vols., 1877–88; English abridged ed. by Schaff, 3 vols., 1882–4.

HESSE, a Grand-duchy of the German empire. Area (1885), 2,965 square miles. Population, 956,611. Capital, Darmstadt. For history, government, productions and early statistics, see Britannica, Vol. XI, p. 780.

Reigning Duke and Royal Family.—Ludwig IV, born Sept. 12, 1837; the son of Prince Karl, eldest brother of Grand-duke Ludwig III, and of Princess Elizabeth of Prussia. Succeeded to the throne at the death of his uncle, Grand-duke Ludwig III, June 13, 1877; married, July 1, 1862, to Princess Alice, second daughter of Queen Victoria, of Great Britain and Ireland; widower, Dec. 14, 1878.

Offspring.—I. Victoria, born April 5, 1863; married to Prince Ludwig, of Battenberg, April 30, 1884. II. Elizabeth, born Nov 1, 1864; married to the Grand-duke Sergius Alexandrovitch, of Russia, June 15, 1884. III. Irene, born July 11, 1866; married to Prince Heinrich, of Prussia, May 24, 1888. IV. Ernst Ludwig, born Nov. 25, 1868. V. Alice, born June 6, 1872.

Brothers of the Grand-duke.—I. Prince Heinrich, born Nov. 28, 1838; married, Feb. 28, 1878, to Caroline Willich, elevated Freifrau zu Nidda; widower, Jan. 6, 1879. II. Prince Wilhelm, born Nov. 16, 1845.

Cousins of the Grand-duke.—The children of Prince Alexander (died December, 1888), and Princess Julia von Battenberg, born Nov. 12, 1825. Offspring of the union are five children: I. Marie, born July 15, 1852; married, April 29, 1871, to Count Gustaf von Erbach-Schönberg. II. Ludwig, born May 24, 1854, commander in the British navy; married to Princess Victoria of Hesse, April 30, 1884; offspring, Alice, born Feb. 25, 1885; Louise, born July 13, 1889. III. Alexander, born April 5, 1857; elected Prince of Bulgaria, April 29, 1879; abdicated, Sept. 7, 1886. IV. Heinrich, born Oct. 5, 1858; married, July 23, 1885, to Princess Beatrice of Great Britain; offspring, Alexander Albert Victor, born Nov. 23, 1886; Victoria, born Oct. 24, 1887; Leopold Arthur Louis, born May 21, 1889. V. Franz Josef, born Sept. 24, 1861.

The former Landgraves of Hesse had the title of grand-duke given them by Napoleon I. in 1806, together with a considerable increase of territory. At the congress of Vienna this grant was confirmed, after some negotiations. The reigning family are not possessed of much private property, but dependent almost entirely upon the grant of the civil list, amounting to [illegible] marks, the sum including allowances to the princes.

The executive is vested in a ministry divided at present into three departments, viz.: of the

Grand-ducal house and Foreign Affairs, of the Interior and Justice, and of Finance.

The largest towns of the grand duchy are, Mayence with a population, in 1885, of 66,321, Darmstadt, 51,302, Offenbach, 31,731, Worms, 29,703, Geissen, 19,002.

Of the population on Dec 31, 1885, there were, of Protestants, 643,939; Roman Catholics, 278,440; other Christian sects, 7,957; Jews, 26,114; and 161 of no religion.

HESSIAN FLY. See Britannica, Vol. XI, p. 781.

HETEROCERCAL (Gr. *heteros*, "different," "unequal," and *kerkos*, "a tail," a term introduced by Agassiz, to designate the unsymmetrical tail of *Palæozoic*, and most ganoid fishes, in which the vertebral axis is bent upwards in the tail, making the upper lobe much the larger—a structure still seen in the sharks and sturgeons. In bony fishes also the axis is somewhat bent upwards in its termination; but the asymmetry is disguised, and the tail looks equal-lobed or homocercal, as in the herring.

HETEROGANGLIATA, a term introduced by Owen and adopted by many zoölogists, in accordance with a scheme of classification founded on the nervous system in animals to designate the mollusca of Cuvier, with which are ranked the "zoophytes" of the division *Polyzoa*, or *Bryozoa*. The nervous centres or ganglia are not arranged in a longitudinal series of symmetrical pairs, but are variously distributed in different parts of the body; one principal ganglionic mass, however, occupying a position above the gullet, with which all the nerves of the special senses are connected.

HETH, HENRY, an American general, born in Virginia in 1825. He was a West Point graduate. When Virginia seceded he was a captain of infantry, but resigned promptly and entered the service of his native State as brigadier-general. In 1863 he was major-general, and commanded a division in General A. P. Hill's corps in Virginia. He fought at Chancellorsville, Gettysburg, and in the campaigns of 1864–65. He surrendered with General R. E. Lee.

HETMAN, or ATAMAN, the title of the head or general of the Cossacks.

HEVES, a town of Hungary, sixty miles east-northeast of Pesth.

HEWES, JOSEPH, a signer of the Declaration of Independence, born in Kingston, N. J., in 1730, and died in Philadelphia, Pa., Oct. 29, 1779. In 1774 he was a delegate to the Continental Congress, and assisted in the preparation of the report on "the statement of the rights of the colonists, the several instances in which these rights are violated, and the most proper means for obtaining their restoration." He belonged to the Society of Friends. When this society denounced the proceedings of Congress he severed his connection with it, and became even a promoter of war. In 1776 he was one of the signers of the Declaration of Independence, and was at the head of the naval committee. Hewes declined a re-election in 1777, but resumed his seat in Congress in 1779.

HEWIT, NATHANIEL AUGUSTUS, an American clergyman, born at Fairfield, Conn., in 1820. He studied theology at East Windsor, Conn., and in 1843 was ordained deacon in the Protestant Episcopal church. While holding a charge in North Carolina he became a Roman Catholic, and was ordained in that church in 1847 by Bishop Reynolds. Hewit was thereupon appointed vice-principal of the Charleston Collegiate Institute. He joined the order of the Redemptorists in 1850; and in 1858, on the foundation of the congregation of St Paul by Father Hecker, Hewit became one of its chief members, taking the religious name of Augustine Francis. In the Paulist Seminary in New York city he was professor of philosophy, theology and Holy Scriptures since 1865. From 1869 till 1874, he edited the "Catholic World." He has been active as an author, and has published *Reasons for Submitting to the Catholic Church; Life of Princess Borghese; Problems of the Age; Light in Darkness; The King's Highway;* and many other works.

HEWITT, ABRAM STEVENS, an American statesman, born at Haverstraw, N. Y., in 1822. After graduating at Columbia College he studied law and was admitted to the bar in 1845. His impaired eye-sight made him soon give up the practice of law, and he became associated with Peter Cooper in the manufacture of iron. The firm Cooper & Hewitt now own and control the Trenton, Ringwood, Pequest and Durham iron works. He was a commissioner to the French exhibition of 1867, and made a report on "iron and steel." He married Peter Cooper's daughter, and has been secretary of the Cooper Union for the Advancement of Science and Art since its incorporation in 1859. Hewitt was elected to Congress in 1874 as a Democrat, and served continuously, with the exception of one term, until 1886. He advocated moderate tariff reform. In 1886 he was elected mayor of New York city. In this office he enforced the laws strictly, and held the heads of the departments strictly accountable. In 1887 Columbia College gave him the degree of LL.D. on account of his expert knowlege in the manufacture of iron.

HEXACHORD: in modern music, denotes the six diatonic degrees of which Guido formed his scale.

HEXAHEDRON, a solid figure bounded by six faces—the cube being one.

HEXAMETER, the name applied to the most important form of classical verse. It is the heroic or epic verse of the Greeks and Romans, the grandest examples of which are the *Iliad* and *Odyssey* in Greek and the *Æneid* in Latin. It consists of six feet, or measures, the last of which must be a spondee (a measure composed of two long syllables), and the penultimate a dactyl (one long syllable and two short). If the penultimate is also a spondee, the verse is said to be spondaic. Klopstock, Goethe and Voss have produced admirable specimens of hexameter verse in German, and it has become familiar in English through Longfellow's *Evangeline*. The following lines from the last show the only varieties of the hexameter which are endurable to the ear—that is, those in which the accent on each foot falls on its first syllable:

Felt she in | myriad | springs her | sources | far in the | mountains.
Stirring, col | lecting, | heaving up | rising | forth out | flowing.

It will be observed that on whatever syllable here the metrical accent falls, that syllable is precisely the same which the voice naturally accentuates. Whether this was the case in ancient Greek and Latin hexameters we do not know; but, if the present system of Greek accentuation represents the natural accent of Homeric words, Homer disregarded the natural accents, or did not observe our rule of always placing the metrical accent on the first syllable of each foot; and we still pronounce Latin hexameters by preserving what we take to be the natural accent of each word, whether that corresponds to the metrical accent or not. Thus, in the line—

Ital | iam fa | to profu | gus La | vinaque | venit,

we disregard the metrical accent, which should fall on the first syllable of each foot and actually does so on the fifth and sixth), and in reading the line give effect to the natural accents only, as we conceive them, to the words *Italiam, fato, profugus.*

When English hexameters were first written they were constructed in the same manner; the natural accent, except in the last two feet, overruled the metrical. In the following lines from Stanihurst's translation of the *Æneid*, it will at once be seen that the effect is absurd if we read the lines as modern English hexameters are read:

Either here | are crouch | ing some | troops of | Greekish as- | sembly,
Or to crush | our bul | warks this | work is | forgéd, all— houses
For to pry, | surmount | ing the | town; some | practice or other
Here lurks | of cun | ning; trust | not | this | treacherous ensign.

If we read by the natural accent, the effect is rough and harsh to the ear; if by the modern metrical, ridiculous and absurd. Such are the limitations of the hexameter in English.

HEYWARD, Thomas, Jr. (1746–1809), an American statesman, born in South Carolina. He studied law in the Temple in London. After returning home he was elected to the Continental Congress of 1775, and became one of the signers of the Declaration of Independence. In 1778 he was appointed judge of the criminal and circuit court of South Carolina. At the siege of Charleston, May 12, 1780, he commanded a battalion of volunteers, and on the surrender of the city was taken prisoner and sent to St. Augustine, Fla., where he was confined one year. After his release he resumed his office as State judge. In 1790 he was a member of the constitutional convention, and then retired to his plantation.

HEYSE, Paul Johann, German author, born in Berlin, March 15, 1830, educated there and at Bonn. He was one of the band of authors whom King Max of Bavaria gathered around him in Munich in 1854. He has published more than a score of collections of novelettes under various titles, good specimens of which are contained in *Das Buch der Freundschaft* (1883–84). His poetic works include narrative poems, such as *Urica*, 1852; and epics, such as *Die Braut von Cypern*, 1856; and *Thekla*, 1858. As a dramatist he has been a voluminous writer of dramas, but few if any of his dramatic pieces have been unequivocally successful. He has also written a couple of more ambitious novels, *Die Kinder der Welt* (1873), and *Im Paradiese* (1876), which have been very popular, and has translated the poetical works of Giusti, of Leopardi, and of Parini, Monti and Manzini.

HIAWATHA, a city and county-seat of Brown county, Kan., 40 miles west of St. Joseph, Mo. It has grain elevators and a steam flour mill.

HICKMAN, a city and county-seat of Fulton county, Ky., on the Mississippi River. Flour, furniture and wagons are manufactured here.

HICKOK, Laurens Perseus (1798–1888), an American clergyman and philosopher, born at Bethel, Conn. After studying theology he became successively pastor at Newtown, Kent and Litchfield, Conn., from 1822 to 1836. In the latter year he was appointed professor of theology in the Western Reserve College, and in 1844 professor of the same branch in the Auburn Theological Seminary. In 1852 he removed to Schenectady, N. Y., to become professor of mental and moral science and vice-president of Union College there. From 1860 to 1866 Dr. Hickok was president of the same college. At the age of seventy Dr. Hickok retired (1868) to Amherst, Mass., where he devoted himself to philosophical studies. He published *Rational Philosophy* (1848); *System of Moral Science; Empirical Psychology; Rational Cosmology; Creator and Creation; Humanity Immortal; Rational Logic* (1875), etc. He placed reason as far above the understanding in its comprehensiveness as the understanding is above sensual perception.

HICKORY, a tree of America, of the genus *Carya.* See Britannica, Vol. XI, pp. 790, 91; United States, Vol. XXIII, p. 808.

HICKS-BEACH, Sir Michael Edward, an English statesman, born in 1837. After being educated at Eton and Oxford, he became a justice of the peace for Gloucestershire, and sat as M. P. for the same shire and Bristol. In 1868 he was under-secretary for the home office; in 1874–78 and 1886–87 chief secretary for Ireland; and in 1878–80 secretary of state for the colonies. Under Salisbury's first administration he was chancellor of the exchequer and leader of the House of Commons. In 1886 Sir Michael resumed the chief secretaryship for Ireland, but had to resign soon afterwards owing to failing eyesight. Then he traveled on the Continent for some time, and in February, 1888, reëntered the cabinet as president of the board of trade. In 1890 he opposed the channel tunnel scheme in Parliament.

HIERA PICRA, or Holy Bitter, once a popular remedy, and still much employed in domestic medicine and in veterinary practice, is composed of four parts of powdered aloes and one part of canella. It is, however, liable to cause irritation of the lower part of the intestinal canal.

HIEROPHANT, the priest who presided over the mysteries at Eleusis.

HIGGINS, Anthony, a United States Senator, born in 1840. He was admitted to the Delaware bar in 1864, and in the same year was appointed deputy attorney-general. From 1869 to 1876 he was United States Attorney for Delaware, and in 1889 took his seat in the United States Senate as a Republican. His term of service expires March 3, 1895.

HIGGINSON, Francis, a New England clergyman, born in England in 1588, died in Salem, Mass., in 1630. He was a Puritan preacher of great influence in Leicester, England. In 1628 he was invited by the Massachusetts Bay Company to accompany its expedition to New England. He arrived at Salem on June 29, 1629, and was soon after chosen teacher of the congregation. He drew up a confession of faith which was assented to by 30 persons. During the ensuing winter he was attacked by a fever which disabled him, and finally caused his death. He wrote *New England's Plantation*, or *A Short Description of the Commodities of that Country* (1630).

HIGGINSON, Thomas Wentworth, an American author, born at Cambridge, Mass., in 1823. He studied theology at the Divinity School at Cambridge, and was ordained Congregational pastor at Newburyport, Mass., in 1847. He preached and worked against slavery. This did not suit his congregation, and he resigned his charge in 1850. In 1852 he became pastor of a free church at Worcester, Mass. In 1854 he attempted to rescue a fugitive slave from the custody of the United States Marshal in Boston, and was wounded in the face. As a man had been killed in his attack on the courthouse Higginson was indicted for murder, but escaped finally through a flaw in the indictment. In 1856 he went to Kansas, and was conspicuous in the movement to make it a free State.

On the outbreak of our civil war he was made a captain in a Massachusetts regiment. In November, 1862, he became colonel of the 1st South Carolina volunteers, the first regiment of former slaves mustered into the service of the United States. With this regiment afterward the 33d United States colored infantry he made various expeditions in South Carolina and Florida; but he was wounded in 1863, and compelled to retire in October, 1864. Living at Cambridge, Mass., he was elected to the State legislature in 1880, and has since been a member of the Massachusetts State Board of Education. Higginson has published *Out-Door Papers*, *Harvard Memorial Biographies*; *Malbone, An Oldport Romance*; *Army Life in a Black Regiment*; *History of the United States*; *Common Sense About Women*, advocating woman suffrage; and many other works on social and historical topics.

HIGH CHURCH AND LOW CHURCH, two ecclesiastical parties in the Church of England, and in the Protestant Episcopal church. The terms are used exclusively as adjectives. The high churchmen emphasize the doctrine of the Apostolic succession, and attach much importance to ceremonies and symbols in worship. Low churchmen usually reject the peculiar tenets of the high-church school, and emphasize the spiritual doctrines of the Gospel, while they make but little of ecclesiastical rules.

HIGHLAND, a city of Madison county, Ill. It has a Roman Catholic university, woolen and flour mills, and a foundry. Many Germans and Swiss reside here.

HIGHLAND REGIMENTS, regiments recruited in the Highlands of Scotland. There are nine in the British army, of whom five wear the national costume. The first Highland regiment, the "Black Watch," was organized in 1739. See ARMY, Britannica, Vol. II, p 580

HIGH-LEVEL BRIDGE, at Halifax, England, opened in 1890, was built to provide railway accommodation for the upper part of the town, which is 400 feet higher than the station of the Lancashire and Yorkshire Railway. The line ascends in a ruling gradient of one in fifty with sharp curves, and several deep cuttings; there are also a tunnel of 820 yards, a viaduct of ten spans of 50 feet each, and a number of bridges. The total length is three and one-half miles, and there are two stations. The cost was £300,000.

HIGH MISDEMEANOR, an offense closely bordering on treason. See "Cognate Offenses," under TREASON, Britannica, Vol. XXIII, pp. 528–29.

HIGH SEAS, the open sea, including the whole extent of sea, not the exclusive peoperty of any particular country. The rule of international law is that every country bordering on the sea has the exclusive sovereignty over such sea to the extent of three miles from its shores, all beyond being common to all countries. The part of the sea within three miles distance is generally called the territorial sea of the particular country, or *mare clausum*. The distinction has little effect on the right of navigation, but as regards fishing it is otherwise. See FISHERIES QUESTION, in these Revisions and Additions.

HIGHTSTOWN, a post-borough of Mercer county, N. J., fourteen miles northeast of Trenton. It contains three educational institutions, and manufactories of plows, chains and doors.

HIGHWAYMEN, robbers who attack passengers on the public road. Famous English highwaymen were Claude Duval, Swift Nick Nevison (hanged at York in 1684), Dick Turpin and his comrade Tom King, and Jerry Abershaw. The best known "romances of the road" are W. H Ainsworth's *Rookwood* and Lord Lytton's *Paul Clifford*. Biographical notices of most "knights of the road" ultimately came to appear in the pages of the *Newgate Calendar*.

HIGHWAYS. For general article on HIGHWAYS, see Britannica, Vol. XI, p. 810. In American countries, and generally on the Continent of Europe, the "rule of the road" requires that in passing, both in riding and in walking, the *turning shall be to the right*. In Great Britain and Ireland, *carriages* in passing are required to *pass to the left* and "walkers" *to the right*. The following English couplets express the rule in quaint verse.

> The Rule of the Road is a paradox quite;
>   For in driving your carriage along,
> If you bear to the left you are sure to go right,
>   If you turn to the right, you go wrong.
>
> But in walking the streets 'tis a different case:
>   To the right it is proper to steer;
> On the left there should be enough of clear space
>   For the people who wish to walk there.

Another reading:

> The rule of the *path*,
>   To get well along
> Is "keep to the right,"
>   And you cannot go wrong.
>
> The rule of the *road*
>   Is a paradox quite:
> If you keep to the left,
>   You are sure to be right.

HILARY TERM, January 11th to 31st, one of the English legal terms during which the courts of law sit at Westminster in banc. See Britannica, Vol. XI, p. 812.

HILGARD, EUGENE WOLDEMAR, an American chemist, born at Zweibrücken, Bavaria, in 1833. He studied at the Royal Mining Academy in Freiburg, Saxony, at the Universities of Zurich and Heidelberg. In 1857 he became assistant State geologist of Mississippi,and in 1857 he was appointed chemist in charge of the laboratory of the Smithsonian Institution, and filled also the chair of chemistry in the National Medical College at Washington. From 1858 to 1866 he was State geologist of Mississippi, and till 1873 also professor of agricultural chemistry in the State University there. In 1873 Hilgard was called to the chair of geology and natural history in the University of Michigan, and in 1875 he accepted the professorship of agricultural chemistry and botany in the University of California, where he since remained. During 1881–83 he had charge of the agricultural division of the northern transcontinental survey.

HILGARD, JULIUS ERASMUS, an American engineer and scientist, born at Zweibrücken, Bavaria, in 1825. From 1843 to 1845, he studied civil engineering at Philadelphia. In the latter year he became one of Alexander D. Bache's assistants on the coast survey, and soon rose to the office of assistant in charge of the bureau at Washington. This place he held until the death of the superintendent in 1881, when he was appointed to fill the vacancy. Hilgard had also charge of the United States standard weights and measures, and in 1872 he was made a delegate to the international metric commission which met at Paris. In 1885, on the advent of Cleveland's administration, he was suspended and then permitted to resign. Professor Hilgard's work in terrestrial physics, geodesy, the magnetic survey of the United States, tidal action in harbors, etc., and his papers and lectures on these topics are of considerable scientific importance. Died in 1891.

HILL, Ambrose Powell, an American soldier, born in Culpeper county, Va., in 1825, died near Petersburg, Va., in 1865. He graduated at the United States Military Academy in 1847, served as lieutenant of artillery during the Mexican war, and was engaged in Florida against the Seminoles in 1849–50. When Virginia seceded, in 1861, Hill went with it and was appointed colonel of the 13th regiment of Virginia volunteers. After the battle of Bull Run he was promoted brigadier-general, and fought as such in the battle of Williamsburg, in May 1862, with such a spirit that he was made a major-general. He took part in the seven days' battles around Richmond, and was at the second battle of Bull Run. At the battle of Fredericksburg he held the right of Jackson's force, and repulsed the attack of Meade. At Chancellorsville, in May, 1863, he participated in Jackson's daring march and unexpected assault on Howard's division. After Jackson's death he became lieutenant-general, fought at Gettysburg, and in 1865 commanded the city of Petersburg during its siege. On April 2, of the same year, while reconnoitering, Hill was killed by a rifle shot.

HILL, Benjamin Harvey, an American statesman, born in Jasper county, Ga., in 1823, died at Atlanta, Aug. 16, 1882. He practiced law successfully in La Grange, Ga., from 1845 to 1861. When his state seceded he was elected to the Confederate Senate at Richmond, where he remained till the close of the war. In 1875 he was elected to the United States Congress, but resigned on being chosen United States Senator in 1877.

HILL, David B., United States Senator from New York, a lawyer, born in Havana, Vt., Aug. 29, 1844. He received a common-school and academical education; removed to Elmira, N. Y., and entered the profession of law. In politics he is a Democrat, and in 1865 was elected city attorney of Elmira; was elected a member of the State assembly in 1871 and 1872; was afterward elected mayor of Elmira. In 1882 was elected lieutenant-governor of the State of New York on the ticket with Grover Cleveland; became governor when Mr. Cleveland resigned to become President of the United States; was elected governor in 1885, and reelected in 1887. In 1891 he was elected by the State legislature to the United States Senate, to succeed William M. Evarts.

HILL, Daniel Harvey, an American general, born in South Carolina in 1821. After graduating at West Point in 1842 he served through the Mexican war, resigned in 1849 and was made professor of mathematics in Washington College, Va., and in 1859 president of the military institute at Charlotte. On the outbreak of the civil war he became colonel of the 1st North Carolina volunteers and took part in the fight at Big Bethel, Va., in June, 1861. He then rose to the rank of major-general and commanded a division during the seven days' fight around Richmond in June, 1862. Afterwards he fought at South Mountain, Antietam, Fredericksburg and Chickamauga. At the close of the war Gen. Hill returned to Charlotte, N. C., where he published a monthly magazine, "Field and Farm"; and subsequently "The Land We Love"; also *Elements of Algebra*; *The Crucifixion of Christ*, and *Consideration of the Sermon on the Mount*.

HILL, Charles Augustus, a United States Congressman, born in 1833. He was admitted to the Illinois bar in 1860 and in 1862 entered the Union army, serving until the close of the war. In 1868 he was chosen state's attorney for the counties of Will and Grundy, and was elected as a Republican to the 50th Congress.

HILL, Thomas, an American clergyman and educator, born at New Brunswick, N. J., in 1818. He studied theology at Cambridge, and was ordained pastor at Waltham, Mass., in 1845. From 1859 to 1868 he was successively president of Antioch College and of Harvard College. In 1868 he resigned on account of bad health. Then he became botanist of the Hassler expedition around the coast of South America under Prof. Agassiz (1871). In 1872 he was pastor of a church at Portland, Me. Hill has published *Geometry and Faith*; *Liberal Education*; *True Order of Studies*; *Jesus the Interpreter of Nature*; *Natural Sources of Theology*, and some elementary mathematical books.

HILLIARD, Henry Washington, an American statesman, born in Cumberland county, N. C., in 1808. He was admitted to the bar at Athens, Ga., in 1829, and appointed professor in the State University of Alabama in 1831. In 1838 he was elected to the legislature as a whig, and in 1842 President Tyler sent him as United States Minister to Belgium. From 1845 to 1851 he sat in Congress. At the outbreak of the civil war he went with the South, and held the nominal rank of brigadier-general in the Confederate army. After the war he resumed the practice of law at Augusta, and afterward at Atlanta. From 1877 to 1880 he was United States Minister to Brazil. Hilliard published a volume of speeches in 1855, and a novel.

HILO, an important seaport of Hawaii, situated on Byron Bay, an inlet on the east coast of the island. It is the second town in size in the Sandwich Islands, and has a spacious and commodious harbor. Population, 4,231.

HILLSBORO, a city and county-seat of Montgomery county, Ill., 66 miles northeast of St. Louis, Mo., on the Indianapolis and St. Louis Railroad.

HILLSBORO, a post-village and county-seat of Orange county, N. C., 40 miles northwest of Raleigh. It has several tobacco factories and a military academy.

HILLSBORO, a city and county seat of Highland county, Ohio, 60 miles east of Cincinnati. It contains several educational institutions, banks, churches, factories, scale and agricultural works, and mills, and publishes several weekly papers. It is connected with Sardinia by 17 miles of narrow-gauge railroad, and is the terminus of a branch of the Marietta and Cincinnati railroad.

HILLSBOROUGH, a port of entry of Albert county, N. B., on Petitcodiac River. It has a good harbor, and exports gypsum and gas coal (albertite) to the United States.

HILLSBOROUGH, a post village of New Hampshire, in county of the same name, situated in the Contoocook Valley. It contains woolen mills, bedstead factory and shovel handle shops.

HILLSBOROUGH RIVER, or Mosquito River, in Volusia county, Fla., is a salt-water lagoon, a continuation of Halifax River, extending 30 miles south of Mosquito Inlet. It is separated from the ocean by a narrow strip of land, and was formerly called Mosquito South Lagoon.

HILLSDALE, a city and county-seat of Hillsdale county, Mich., 177 miles east of Chicago. It is the seat of Hillsdale College, and has a chair factory, machine shops, foundries and flour mills.

HILL STATES, a number of small principalities of India on the east side of the Upper Sutlej, comprising about 10,000 square miles and about 550,000 inhabitants. With the exception of this aggregate name they have but little in common with each other.

HILTED, a term used in heraldry to indicate the tincture of the handle of a sword.

HINCKS, Sir Francis, a Canadian statesman, born at Cork, Ireland, in 1807, died in 1885. He settled at Toronto in 1832, where he entered politics and edited the "Examiner." After being elected to the Canadian Parliament in 1841, he was appointed [illegible] [illegible]. [illegible] [illegible] [illegible] and held this post till 1854. He [illegible] [illegible] [illegible] governor of the Windward Islands, and in 1861 governor of British Guiana, [illegible] till 1869. After returning to Canada he [illegible] [illegible] the [illegible] [illegible] of the "Dominion of Canada." In 1869 Hincks was [illegible] [illegible] 1869 until 1873 he was the [illegible] [illegible] of [illegible].

HIND, John Russell, English astronomer, born at Nottingham, May 12, 1823. At an early period he became acquainted with the study of astronomy, and in 1840 obtained a situation in the Royal Observatory at Greenwich, where he remained till June 1844. He was then selected as assistant to [illegible] [illegible] appointed to determine the exact longitude of Valentia, and on his return entered Mr. Bishop's Observatory, Regent's Park, London. Here he calculated the orbits and ephemerides of more than seventy planets and comets, found a number of new variable stars, and between 1847 and 1854 discovered ten minor planets. He had [illegible] obtained from the Academy of Sciences at Paris the Lalande medal [illegible] [illegible] [illegible] member, and in the following year received the gold medal of the Astronomical Society of London and a pension of £200 a year from the government. In 1853 he undertook the editing of the [illegible] [illegible]. His scientific papers were generally published in the *Transactions* of the Astronomical Society, in the *Comptes Rendus* of Paris, and the *Astronomische Nachrichten* of Altona. He became president of the Royal Astronomical Society in 1880.

HINDMAN, Thomas C., a Confederate general, born in Tennessee in 1818; died Sept. 27, 1868. In the Mexican war he served as lieutenant of Mississippi volunteers. During 1859 and 1860 he was in Congress. On the outbreak of the civil war he was made a brigadier-general in the Confederate army. He served first under General S. B. Buckner in Kentucky, and commanded afterwards at Memphis. He fought at the battle of Shiloh, was made a major-general, and assigned to the chief command in Arkansas. At Chickamauga he commanded a division in General Polk's army. Was killed at Helena, Ark., by one of his former soldiers.

HINGHAM, Mass., a manufacturing town of Plymouth county, fourteen miles southwest of Boston. [illegible] [illegible] goods, wooden ware, cordage, bagging, furniture, iron castings and worsted upholstery are made here.

HINSDALE, a post-village of Cheshire county, N. H. It has good water-power, and among its manufactures are woolen goods, lumber and mowing machines.

HINSDALE, Burke Aaron, an American educator and author, born at Wadsworth, Ohio, in 1837. In 1861 he became a minister of the Christian (or Campbellite) church; was pastor of a church at Solon (1864), and afterwards at Cleveland till 1868. Then he was made professor of history and English literature in Hiram College, and was its president from 1870 to 1882. Hinsdale has published *[illegible] of the [illegible]*; *[illegible]*; *[illegible] Theological System of the [illegible]*; [illegible] and Works of President Garfield; *Schools and Studies*, etc. Hinsdale was also assistant editor of the "Christian Standard" and "Christian Quarterly," for many years.

HIP in architecture, the rafter at the angle where two sloping roofs meet. A roof is called a hipped roof when the end is sloped upwards so as to form a hip at each side.

HIP-KNOB, an ornament carved in stone or wood, set on the apex of a gable or hipped roof, and forming a kind of finial.

HIPPARION, a genus of fossil horses. See [illegible] Britannica, Vol. XII, p. [illegible].

HIPPEAU, Célestin, a French author and educationalist, born at Niort, Deux-Sèvres, May 11, 1803; died in 1883. His earlier studies were pursued in his native city, and he subsequently held positions as professor at Poitiers, Napoléon-Vendée, Strasburg, Paris and Caen. He received the [illegible] of the Legion of Honor in 1861. Among the most prominent of his writings are: *Histoire de l'Abbaye de Saint-Étienne de Caen*, [illegible] (1855); *[illegible] de la Normandie* (1863-71); and *[illegible] [illegible] en France [illegible]* (18[illegible]).

HIPPOCRAS (Latin *[illegible]*, "wine of Hippocrates"), an aromatic medicated wine, formerly much used as a cordial. It was prepared from white wine, flavored with cinnamon and other spices, lemon peel, almonds, etc., and sweetened with honey or sugar.

HIPPOCRATIC OATH, an engagement entered into by persons commencing the practice of medicine. The text of the oath has been ascribed to Hippocrates and may, perhaps, be accepted as genuine; its comparative antiquity is not denied. It is the oldest and one of the best of the codes of medical ethics.

HIPPOGRIFF, or Hippogryph (Gr. *hippos*, "a horse," and the word *gryps*, "griffin"), a fabulous animal, unknown to the ancients, which is represented by modern writers as a winged horse with the head of a griffin. The hippogriff figures as the horse of the Muses, and plays a conspicuous rôle in the *Orlando Furioso* of Ariosto.

HIPPOPHAGY, Hippophagi (Gr. "eaters of horse-flesh"), was a name given by the Greeks to a Scythian people living northeast of the Caspian Sea and to a Sarmatian tribe north of the Euxine. In some parts of Europe horse-flesh is a regular and wholesome article of diet. In 1866 the sale of horse-flesh in the Paris markets as an article of food was officially recognized and regulated, and during the siege of Paris, horse-flesh was gladly eaten by all who could get it. In Great Britain an act was passed in 1889 regulating the sale of horse-flesh, requiring that all horse-flesh exposed for sale should be expressly so described.

HIPPURIC ACID, $C_9H_9NO_3$, a compound of great interest to chemist and physiologist. It derives its name from its having been first discovered in the urine of the horse, and that fluid, or the renal secretions of the cow, affords the best and readiest means of obtaining it. The crystals of hippuric acid are moderately large, colorless, but subsequently becoming milk white, four-sided prisms, which are devoid of odor, but have a faintly bitter taste. They dissolve readily in boiling water and in spirit. It is an abundant normal constituent of the urine of the horse, cow, sheep, etc., and probably is to be found in the urine of all vegetable feeders. In the urine of healthy persons living on an ordinary mixed diet it occurs in very small quantity, but it is increased by an exclusively vegetable diet and in the well-known disease diabetes. The hippuric acid occurring in the animal organism exists in combination with bases, and chiefly as hippurate of soda and hippurate of lime. The last-named salt can be obtained by the mere evaporation of the urine of the horse. Hippuric acid readily splits into benzoic acid and glycocoll. If benzoic acid is administered it is ex-

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